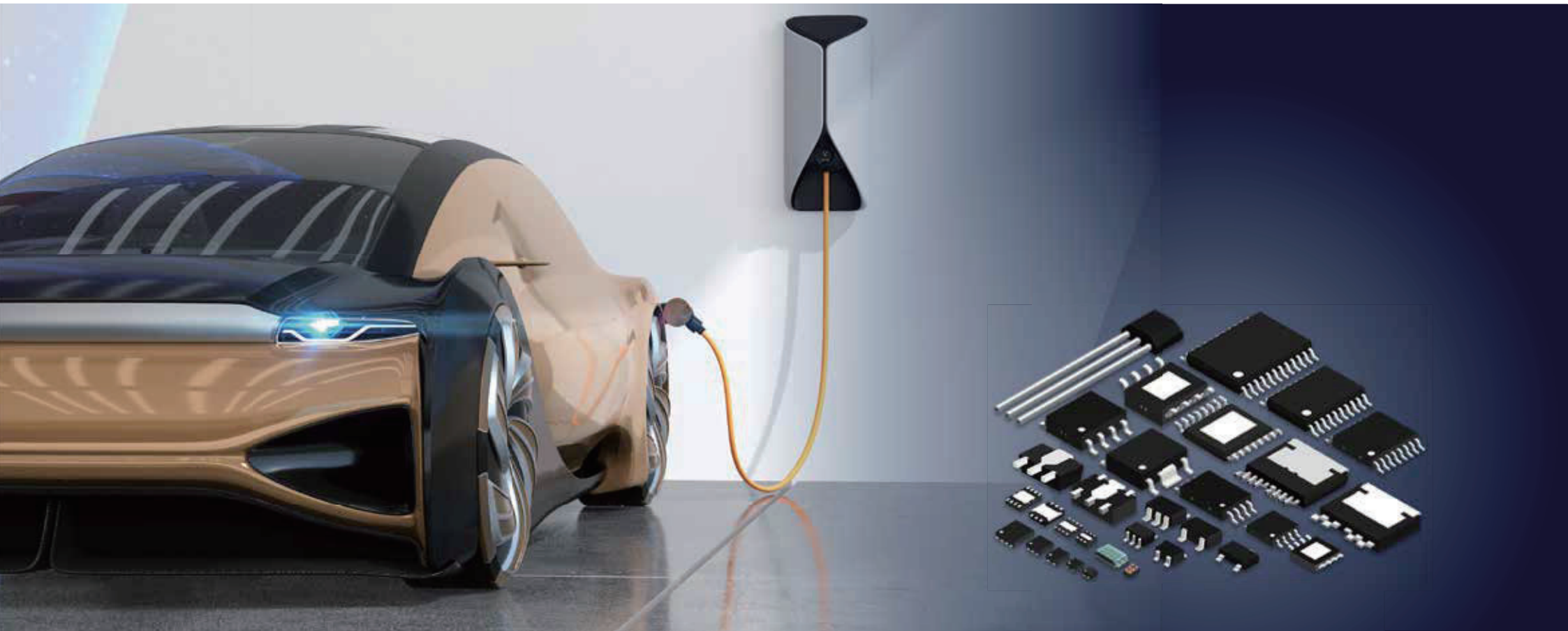


Product Catalog

Automotive ICs (Power Management ICs)

2022



ABLIC Inc.

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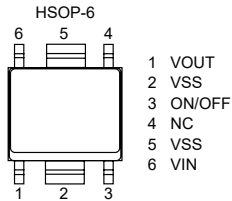
S-1142C/DxxA Series

HIGH-WITHSTAND VOLTAGE LOW CURRENT CONSUMPTION LOW DROPOUT CMOS VOLTAGE REGULATOR

● Features

- Output voltage: 2.0 V to 12.0 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 50 V
- Output voltage accuracy: $\pm 1.0\%$ ($T_j = +25^\circ\text{C}$)
 $\pm 4.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: During operation: 4.0 μA typ., 15.0 μA max. ($T_j = -40^\circ\text{C}$ to $+135^\circ\text{C}$)
During power-off: 0.1 μA typ., 3.5 μA max. ($T_j = -40^\circ\text{C}$ to $+135^\circ\text{C}$)
Possible to output 200 mA ($V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)*¹
- Output current: A ceramic capacitor of 0.1 μF or more can be used.
- Input and output capacitors: Limits overcurrent of output transistor.
- Built-in overcurrent protection circuit: Prevents damage caused by heat.
- Built-in thermal shutdown circuit: Prevents damage caused by heat.
- Built-in ON / OFF circuit: Ensures long battery life.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free

*1. Attention should be paid to the power dissipation of the package when the output current is large.



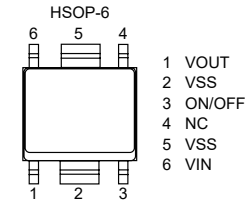
S-1142A/BxxH Series

HIGH-WITHSTAND VOLTAGE LOW CURRENT CONSUMPTION LOW DROPOUT 105°C OPERATION CMOS VOLTAGE REGULATOR

● Features

- Output voltage: 2.0 V to 15.0 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 50 V
- Output voltage accuracy: $\pm 1.0\%$ ($T_j = +25^\circ\text{C}$)
 $\pm 3.0\%$ ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: During operation: 4.0 μA typ., 9.0 μA max. ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
During power-off: 0.1 μA typ., 2.5 μA max. ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
Possible to output 200 mA ($V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)*¹
- Output current: A ceramic capacitor of 0.1 μF or more can be used.
- Input and output capacitors: Limits overcurrent of output transistor.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Prevents damage caused by heat.
- Built-in ON / OFF circuit: Ensures long battery life.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free

*1. Attention should be paid to the power dissipation of the package when the output current is large.



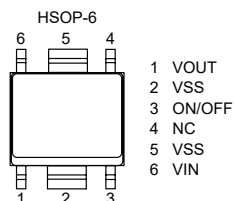
S-1142C/DxxH Series

**HIGH-WITHSTAND VOLTAGE LOW CURRENT CONSUMPTION
LOW DROPOUT 105°C OPERATION CMOS VOLTAGE REGULATOR**

● Features

- Output voltage: 2.0 V to 15.0 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 50 V
- Output voltage accuracy: $\pm 1.0\%$ ($T_j = +25^\circ\text{C}$)
 $\pm 3.0\%$ ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: During operation: 4.0 μA typ., 9.0 μA max. ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
During power-off: 0.1 μA typ., 2.5 μA max. ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
Possible to output 200 mA ($V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)*¹
A ceramic capacitor of 0.1 μF or more can be used.
- Output current:
- Input and output capacitors: A ceramic capacitor of 0.1 μF or more can be used.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Prevents damage caused by heat.
- Built-in ON / OFF circuit: Ensures long battery life.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free

*1. Attention should be paid to the power dissipation of the package when the output current is large.



S-19200A/BxxA Series

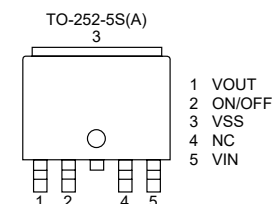
**AUTOMOTIVE, 125°C OPERATION,
50 V INPUT, 200 mA VOLTAGE REGULATOR**

● Features

- Output voltage: 2.0 V to 15.0 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 50 V
- Output voltage accuracy: $\pm 1.0\%$ ($T_j = +25^\circ\text{C}$)
 $\pm 4.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: During operation: 4.0 μA typ., 15.0 μA max. ($T_j = -40^\circ\text{C}$ to $+135^\circ\text{C}$)
During power-off: 0.1 μA typ., 3.5 μA max. ($T_j = -40^\circ\text{C}$ to $+135^\circ\text{C}$)
Possible to output 200 mA ($V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)*¹
A ceramic capacitor of 0.1 μF or more can be used.
- Output current:
- Input and output capacitors: A ceramic capacitor of 0.1 μF or more can be used.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Prevents damage caused by heat.
- Built-in ON / OFF circuit: Ensures long battery life.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 65 V load dump
- AEC-Q100 qualified*²

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



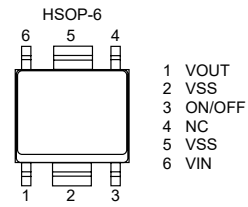
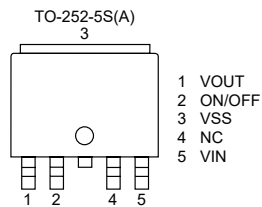
S-19200A/BxxH Series

**AUTOMOTIVE, 105°C OPERATION,
50 V INPUT, 200 mA VOLTAGE REGULATOR**

Features

- Output voltage: 2.0 V to 15.0 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 50 V
- Output voltage accuracy: $\pm 1.0\%$ ($T_j = +25^\circ\text{C}$)
 $\pm 3.0\%$ ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: During operation: 4.0 μA typ., 9.0 μA max. ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
During power-off: 0.1 μA typ., 2.5 μA max. ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
Possible to output 200 mA ($V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)*1
- Output current: A ceramic capacitor of 0.1 μF or more can be used.
- Input and output capacitors: Limits overcurrent of output transistor.
- Built-in overcurrent protection circuit: Prevents damage caused by heat.
- Built-in thermal shutdown circuit: Ensures long battery life.
- Built-in ON / OFF circuit: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 65 V load dump
- AEC-Q100 qualified*2

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.
*2. Contact our sales representatives for details.



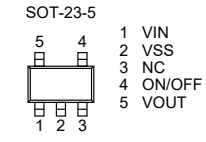
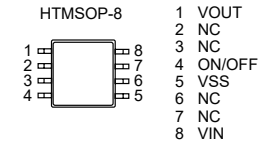
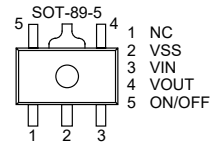
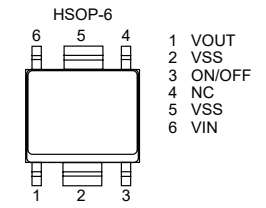
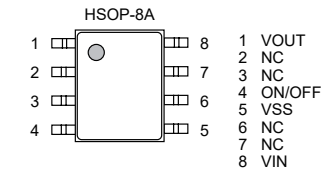
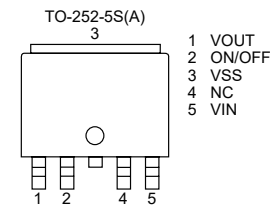
S-19212B/DxxA Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 250 mA VOLTAGE REGULATOR**

Features

- Output voltage: 2.5 V to 16.0 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 36 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: During operation: 6.5 μA typ., 8.5 μA max. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
During power-off: 0.1 μA typ., 3.5 μA max. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
Possible to output 250 mA (at $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)*1
- Output current: A ceramic capacitor can be used. (1.0 μF or more)
- Input capacitor: A ceramic capacitor can be used. (1.0 μF to 100 μF)
- Output capacitor: Limits overcurrent of output transistor.
- Built-in overcurrent protection circuit: Detection temperature 165°C typ.
- Built-in thermal shutdown circuit: Ensures long battery life.
- Built-in ON / OFF circuit: Discharge shunt function is available.
 $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*2

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.
*2. Contact our sales representatives for details.



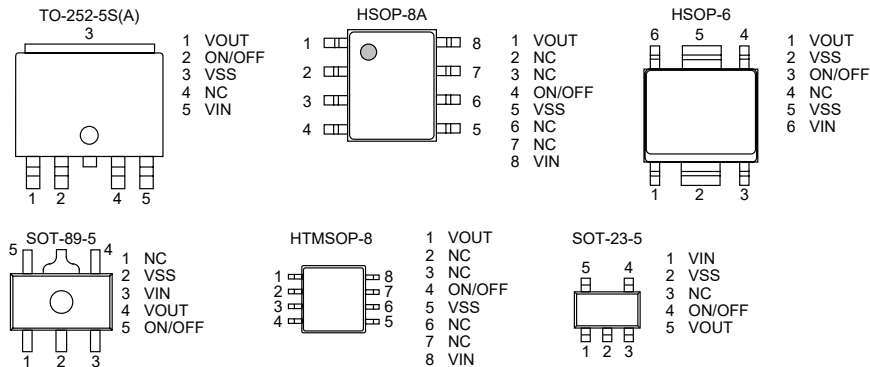
S-19212B/DxxH Series

**AUTOMOTIVE, 105°C OPERATION,
36 V INPUT, 250 mA VOLTAGE REGULATOR**

Features

- Output voltage: 2.5 V to 16.0 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 36 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: During operation: 6.5 μA typ., 8.5 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
During power-off: 0.1 μA typ., 3.5 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Output current: Possible to output 250 mA (at $V_{IN} \geq V_{OUT(S)} + 2.0\text{ V}$)^{*1}
- Input capacitor: A ceramic capacitor can be used. (1.0 μF or more)
- Output capacitor: A ceramic capacitor can be used. (1.0 μF to 100 μF)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 165°C typ.
- Built-in ON / OFF circuit: Ensures long battery life.
Discharge shunt function is available.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.
*2. Contact our sales representatives for details.



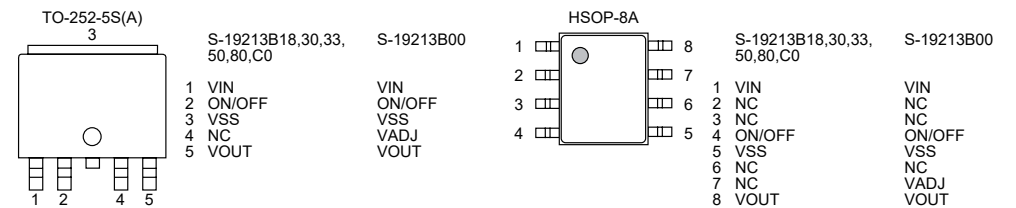
S-19213 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 500 mA VOLTAGE REGULATOR**

Features

- Output voltage (internally set): 1.8 V, 3.0 V, 3.3 V, 5.0 V, 8.0 V, 12.0 V
- Output voltage (externally set): 1.8 V to 30.0 V, settable via external resistor
- Input voltage: 2.8 V to 36.0 V
- Output voltage accuracy: $\pm 1.5\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: During operation: 5.0 μA typ., 9.8 μA max. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
During power-off: 0.1 μA typ., 2.0 μA max. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Output current: Possible to output 500 mA (at $V_{IN} \geq V_{OUT(S)} + 1.0\text{ V}$)^{*1}
- Input and output capacitors: A ceramic capacitor can be used. (1.0 μF or more)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
(with a detection function of the difference between input and output voltage)
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in ON / OFF circuit: Ensures long battery life.
Discharge shunt function is available.
Pull-down function is available.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.
*2. Contact our sales representatives for details.



S-19214 Series

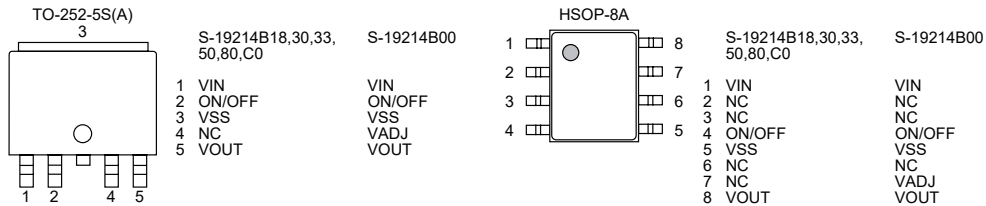
**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 1000 mA VOLTAGE REGULATOR**

Features

- Output voltage (internally set): 1.8 V, 3.0 V, 3.3 V, 5.0 V, 8.0 V, 12.0 V
- Output voltage (externally set): 1.8 V to 30.0 V, settable via external resistor
- Input voltage: 2.8 V to 36.0 V
- Output voltage accuracy: $\pm 1.5\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: During operation: 5.0 μA typ., 9.8 μA max. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
During power-off: 0.1 μA typ., 2.0 μA max. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
Possible to output 1000 mA (at $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)*¹
- Output current: Possible to output 1000 mA (at $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)*¹
- Input and output capacitors: A ceramic capacitor can be used. (1.0 μF or more)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
(with a detection function of the difference between input and output voltage)
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in ON / OFF circuit: Ensures long battery life.
Discharge shunt function is available.
Pull-down function is available.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified²

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



S-19218 Series

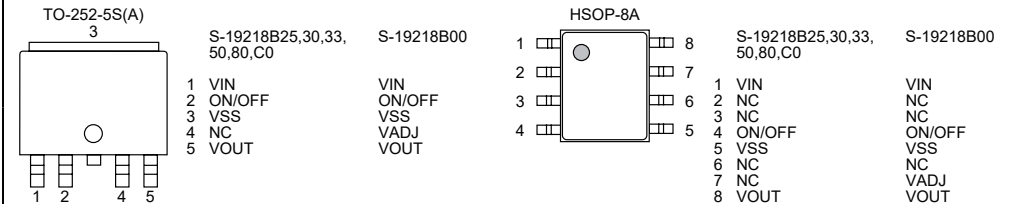
**AUTOMOTIVE, 125°C OPERATION, 36 V INPUT,
500 mA, FAST TRANSIENT RESPONSE,
VOLTAGE REGULATOR**

Features

- Output voltage (internally set): 2.5 V, 3.0 V, 3.3 V, 5.0 V, 8.0 V, 12.0 V
- Output voltage (externally set): 2.5 V to 30.0 V, settable via external resistor
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: $\pm 1.5\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: During operation: 30.0 μA typ., 50.0 μA max. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
During power-off: 0.1 μA typ., 2.0 μA max. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
Possible to output 500 mA (at $V_{IN} \geq V_{OUT(S)} + 1.0 \text{ V}$)*¹
- Output current: Possible to output 500 mA (at $V_{IN} \geq V_{OUT(S)} + 1.0 \text{ V}$)*¹
- Input capacitor: A ceramic capacitor can be used. (0.1 μF or more)
- Output capacitor: A ceramic capacitor can be used. (1.0 μF or more)
- Fast transient response:
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
(with a detection function of the difference between input and output voltage)
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in ON / OFF circuit: Ensures long battery life.
Discharge shunt function is available.
Pull-down function is available.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified²

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



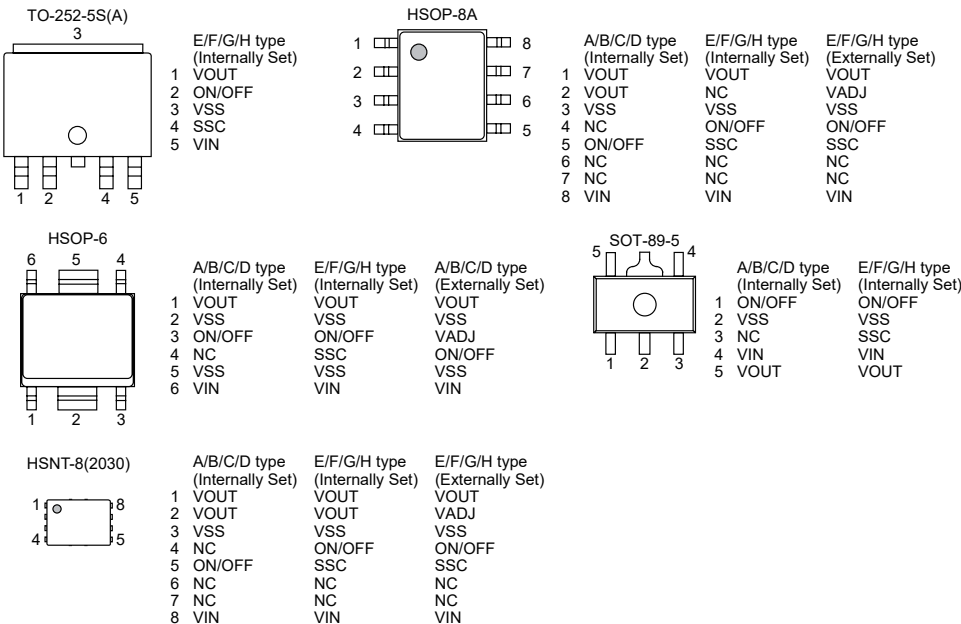
S-19243xxxA Series

AUTOMOTIVE, 125°C OPERATION, 10 V INPUT, 500 mA VOLTAGE REGULATOR WITH SOFT-START FUNCTION

Features

- Output voltage (internally set): 1.0 V to 6.0 V, selectable in 0.05 V step
- Output voltage (externally set): 1.0 V to 9.0 V, settable via external resistor (HSOP-8A, HSOP-6 and HSNT-8(2030) only)
- Input voltage: 2.5 V to 10.0 V
- Output voltage accuracy: ±2.3% (T_j = -40°C to +125°C)
- Dropout voltage: 0.09 V typ. (2.6 V output product, at I_{OUT} = 200 mA)
- Current consumption: During operation: 120 μA typ., 150 μA max. (T_j = -40°C to +150°C)
During power-off: 0.1 μA typ., 10.5 μA max. (T_j = -40°C to +125°C)
- Output current: Possible to output 500 mA (at V_{IN} ≥ V_{OUT(S)} + 1.0 V)^{*1}
- Ripple rejection: 60 dB typ. (at f = 1.0 kHz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in soft-start circuit: Adjusts output voltage rising time at power-on or at the time when ON / OFF pin is set to ON.
Adjustable type: E / F / G / H type, t_{SS} = 6.0 ms typ. (C_{SS} = 10 nF)
Soft-start time can be changed by the capacitor (C_{SS}).
Fixed type: A / B / C / D type: Fixed to t_{SS} = 1.0 ms typ.
- Built-in ON / OFF circuit: Ensures long battery life
Discharge shunt function "available" / "unavailable" is selectable.
Pull-down function "available" / "unavailable" is selectable.
T_a = -40°C to +125°C
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.
*2. Contact our sales representatives for details.



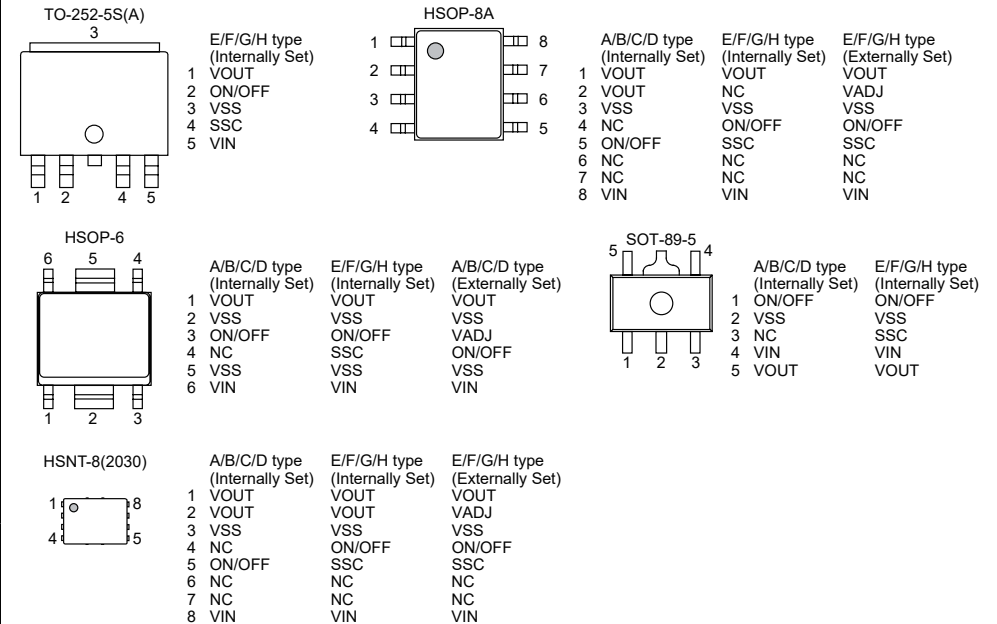
S-19243xxxH Series

AUTOMOTIVE, 105°C OPERATION, 10 V INPUT, 500 mA VOLTAGE REGULATOR WITH SOFT-START FUNCTION

Features

- Output voltage (internally set): 1.0 V to 6.0 V, selectable in 0.05 V step
- Output voltage (externally set): 1.0 V to 9.0 V, settable via external resistor (HSOP-8A, HSOP-6 and HSNT-8(2030) only)
- Input voltage: 2.5 V to 10.0 V
- Output voltage accuracy: ±2.3% (T_j = -40°C to +105°C)
- Dropout voltage: 0.09 V typ. (2.6 V output product, at I_{OUT} = 200 mA)
- Current consumption: During operation: 120 μA typ., 150 μA max. (T_j = -40°C to +150°C)
During power-off: 0.1 μA typ., 4.5 μA max. (T_j = -40°C to +105°C)
- Output current: Possible to output 500 mA (at V_{IN} ≥ V_{OUT(S)} + 1.0 V)^{*1}
- Ripple rejection: 60 dB typ. (at f = 1.0 kHz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in soft-start circuit: Adjusts output voltage rising time at power-on or at the time when ON / OFF pin is set to ON.
Adjustable type: E / F / G / H type, t_{SS} = 6.0 ms typ. (C_{SS} = 10 nF)
Soft-start time can be changed by the capacitor (C_{SS}).
Fixed type: A / B / C / D type: Fixed to t_{SS} = 1.0 ms typ.
- Built-in ON / OFF circuit: Ensures long battery life
Discharge shunt function "available" / "unavailable" is selectable.
Pull-down function "available" / "unavailable" is selectable.
T_a = -40°C to +105°C
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.
*2. Contact our sales representatives for details.



S-19244xxxA Series

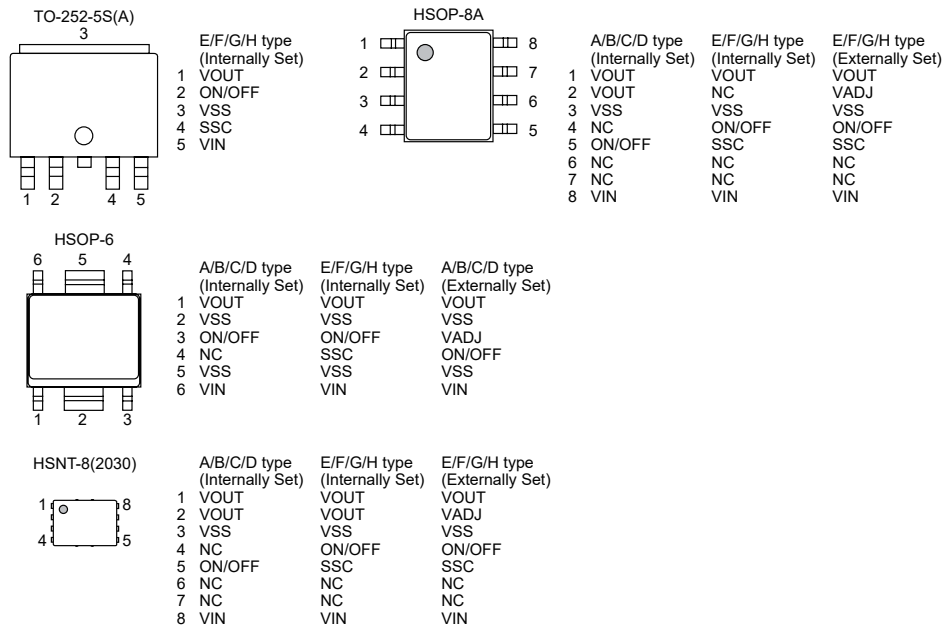
AUTOMOTIVE, 125°C OPERATION, 10 V INPUT, 1000 mA VOLTAGE REGULATOR WITH SOFT-START FUNCTION

Features

- Output voltage (internally set): 1.0 V to 6.0 V, selectable in 0.05 V step
- Output voltage (externally set): 1.0 V to 9.0 V, settable via external resistor (HSOP-8A, HSOP-6 and HSNT-8(2030) only)
- Input voltage: 2.5 V to 10.0 V
- Output voltage accuracy: $\pm 2.3\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Dropout voltage: 0.38 V typ. (2.6 V output product, at $I_{OUT} = 1000$ mA)
- Current consumption: During operation: 120 μA typ., 150 μA max. ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
During power-off: 0.1 μA typ., 10.5 μA max. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
Possible to output 1000 mA (at $V_{IN} \geq V_{OUT(S)} + 1.0$ V)*1
- Output current: 60 dB typ. (at $f = 1.0$ kHz)
- Ripple rejection: Limits overcurrent of output transistor.
- Built-in overcurrent protection circuit: Detection temperature 170°C typ.
- Built-in thermal shutdown circuit: Adjusts output voltage rising time at power-on or at the time when ON / OFF pin is set to ON.
- Built-in soft-start circuit: Adjustable type: E / F / G / H type, $t_{SS} = 6.0$ ms typ. ($C_{SS} = 10$ nF)
Soft-start time can be changed by the capacitor (C_{SS}).
Fixed type: A / B / C / D type: Fixed to $t_{SS} = 1.0$ ms typ.
- Built-in ON / OFF circuit: Ensures long battery life
Discharge shunt function "available" / "unavailable" is selectable.
Pull-down function "available" / "unavailable" is selectable.
 $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified²

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



S-19244xxxH Series

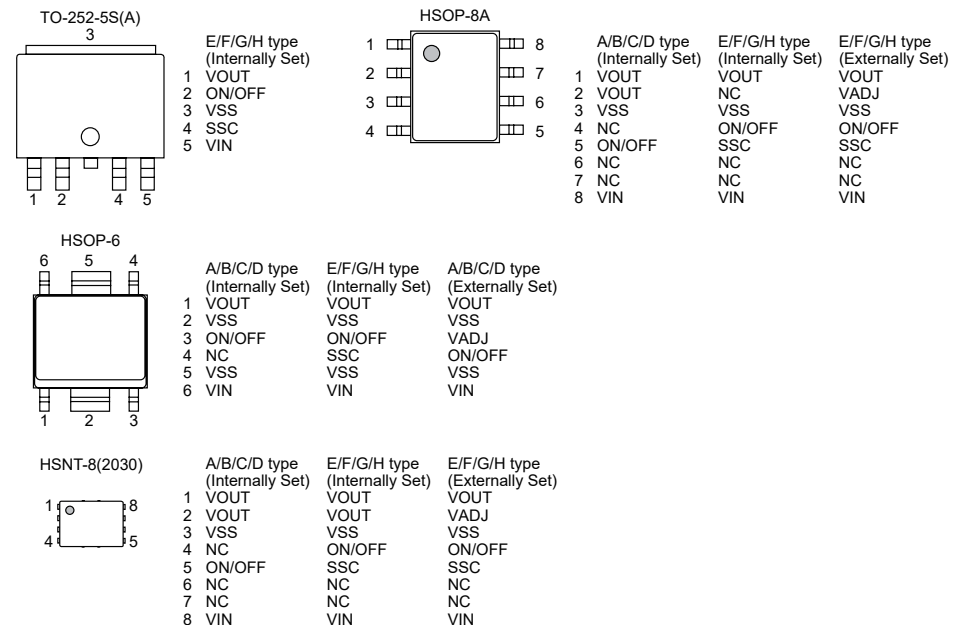
AUTOMOTIVE, 105°C OPERATION, 10 V INPUT, 1000 mA VOLTAGE REGULATOR WITH SOFT-START FUNCTION

Features

- Output voltage (internally set): 1.0 V to 6.0 V, selectable in 0.05 V step
- Output voltage (externally set): 1.0 V to 9.0 V, settable via external resistor (HSOP-8A, HSOP-6 and HSNT-8(2030) only)
- Input voltage: 2.5 V to 10.0 V
- Output voltage accuracy: $\pm 2.3\%$ ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Dropout voltage: 0.38 V typ. (2.6 V output product, at $I_{OUT} = 1000$ mA)
- Current consumption: During operation: 120 μA typ., 150 μA max. ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
During power-off: 0.1 μA typ., 4.5 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
Possible to output 1000 mA (at $V_{IN} \geq V_{OUT(S)} + 1.0$ V)*1
- Output current: 60 dB typ. (at $f = 1.0$ kHz)
- Ripple rejection: Limits overcurrent of output transistor.
- Built-in overcurrent protection circuit: Detection temperature 170°C typ.
- Built-in thermal shutdown circuit: Adjusts output voltage rising time at power-on or at the time when ON / OFF pin is set to ON.
- Built-in soft-start circuit: Adjustable type: E / F / G / H type, $t_{SS} = 6.0$ ms typ. ($C_{SS} = 10$ nF)
Soft-start time can be changed by the capacitor (C_{SS}).
Fixed type: A / B / C / D type: Fixed to $t_{SS} = 1.0$ ms typ.
- Built-in ON / OFF circuit: Ensures long battery life
Discharge shunt function "available" / "unavailable" is selectable.
Pull-down function "available" / "unavailable" is selectable.
 $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified²

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



S-19246xxxH Series

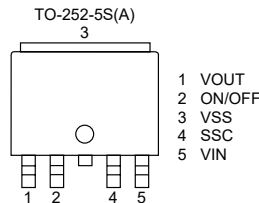
**AUTOMOTIVE, 105°C OPERATION,
10 V INPUT, 2000 mA VOLTAGE REGULATOR
WITH SOFT-START FUNCTION**

● Features

- Output voltage: 1.0 V to 6.0 V, selectable in 0.05 V step
- Input voltage: 2.5 V to 10.0 V
- Output voltage accuracy: $\pm 2.3\%$ ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Dropout voltage: 0.62 V typ. (3.0 V output product, at $I_{OUT} = 2000$ mA)
- Current consumption:
 - During operation: 120 μA typ., 150 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
 - During power-off: 0.1 μA typ., 4.5 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Output current: Possible to output 2000 mA (at $V_{IN} \geq V_{OUT(S)} + 1.0$ V)^{*1}
- Ripple rejection: 60 dB typ. (at $f = 1.0$ kHz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in soft-start circuit:
 - Adjusts output voltage rising time at power-on or at the time when ON / OFF pin is set to ON.
 - $t_{SS} = 6.0$ ms typ. ($C_{SS} = 10$ nF)
 - Soft-start time can be changed by the capacitor (C_{SS}).
- Built-in ON / OFF circuit:
 - Ensures long battery life
 - Discharge shunt function "available" / "unavailable" is selectable.
 - Pull-down function "available" / "unavailable" is selectable.
 - $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



S-19253xxxH Series

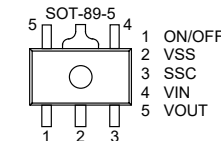
**AUTOMOTIVE, 105°C OPERATION,
6.5 V INPUT, 500 mA VOLTAGE REGULATOR
WITH SOFT-START FUNCTION**

● Features

- Output voltage: 1.0 V to 5.5 V, selectable in 0.05 V step
- Input voltage: 2.5 V to 6.5 V
- Output voltage accuracy: $\pm 3.0\%$ ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Dropout voltage: 0.09 V typ. (2.6 V output product, at $I_{OUT} = 200$ mA)
- Current consumption:
 - During operation: 120 μA typ., 150 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
 - During power-off: 0.1 μA typ., 4.5 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Output current: Possible to output 500 mA (at $V_{IN} \geq V_{OUT(S)} + 1.0$ V)^{*1}
- Ripple rejection: 60 dB typ. (at $f = 1.0$ kHz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in soft-start circuit:
 - Adjusts output voltage rising time at power-on or at the time when ON / OFF pin is set to ON.
 - Adjustable type: $t_{SS} = 6.0$ ms typ. ($C_{SS} = 10$ nF)
 - Soft-start time can be changed by the capacitor (C_{SS}).
- Built-in ON / OFF circuit:
 - Ensures long battery life.
 - Discharge shunt function is available.
 - Pull-down function is available.
 - $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



S-19254xxxH Series

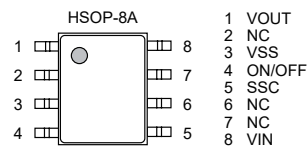
AUTOMOTIVE, 105°C OPERATION, 6.5 V INPUT, 1000 mA VOLTAGE REGULATOR WITH SOFT-START FUNCTION

● Features

- Output voltage: 1.0 V to 5.5 V, selectable in 0.05 V step
- Input voltage: 2.5 V to 6.5 V
- Output voltage accuracy: $\pm 3.0\%$ ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Dropout voltage: 0.38 V typ. (2.6 V output product, at $I_{OUT} = 1000$ mA)
- Current consumption: During operation: 120 μA typ., 150 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
During power-off: 0.1 μA typ., 4.5 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Output current: Possible to output 1000 mA (at $V_{IN} \geq V_{OUT(S)} + 1.0$ V)^{*1}
- Ripple rejection: 60 dB typ. (at $f = 1.0$ kHz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in soft-start circuit: Adjusts output voltage rising time at power-on or at the time when ON / OFF pin is set to ON.
Adjustable type: $t_{SS} = 6.0$ ms typ. ($C_{SS} = 10$ nF)
Soft-start time can be changed by the capacitor (C_{SS}).
- Built-in ON / OFF circuit: Ensures long battery life.
Discharge shunt function is available.
Pull-down function is available.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



S-19251 Series

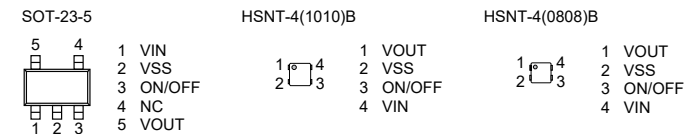
AUTOMOTIVE, 105°C OPERATION, 5.5 V INPUT, 150 mA VOLTAGE REGULATOR

● Features

- Output voltage: 1.0 V to 3.5 V, selectable in 0.05 V step
- Input voltage: 1.5 V to 5.5 V
- Output voltage accuracy: $\pm 2.5\%$ ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: During operation: 20 μA typ., 50 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
During power-off: 0.1 μA typ., 4.5 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Dropout voltage: 0.16 V typ. (2.8 V output product, $I_{OUT} = 100$ mA)
- Output current: Possible to output 150 mA ($V_{IN} \geq V_{OUT(S)} + 1.0$ V)^{*1}
- Ripple rejection: 75 dB typ. (1.2 V output product, $f = 1.0$ kHz)
70 dB typ. (2.8 V output product, $f = 1.0$ kHz)
- Input capacitor: A ceramic capacitor can be used. (1.0 μF or more)
- Output capacitor: A ceramic capacitor can be used. (1.0 μF or more)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 150°C typ.
- Built-in ON / OFF circuit: Ensures long battery life.
Discharge shunt function "available" / "unavailable" is selectable.
Pull-down function "available" / "unavailable" is selectable.
 $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



S-19252 Series

AUTOMOTIVE, 105°C OPERATION, 5.5 V INPUT, 150 mA VOLTAGE REGULATOR WITH SOFT-START FUNCTION

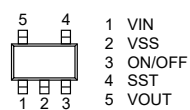
● Features

- Output voltage: 1.0 V to 3.6 V, selectable in 0.05 V step
- Input voltage: 1.5 V to 5.5 V
- Output voltage accuracy: ± 15 mV ($1.0\text{ V} \leq V_{\text{OUT(S)}} < 1.5\text{ V}$, $T_a = +25^\circ\text{C}$)
 $\pm 1.0\%$ ($1.5\text{ V} \leq V_{\text{OUT(S)}} \leq 3.6\text{ V}$, $T_a = +25^\circ\text{C}$)
 $\pm 3.0\%$ ($1.0\text{ V} \leq V_{\text{OUT(S)}} \leq 3.6\text{ V}$, $T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: During operation: 36 μA typ., 57 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
During power-off: 0.1 μA typ., 4.2 μA max. ($T_j = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
70 mV typ. (2.8 V output product, at $I_{\text{OUT}} = 100\text{ mA}$)
- Dropout voltage: Possible to output 150 mA (at $V_{\text{IN}} \geq V_{\text{OUT(S)}} + 1.0\text{ V}$)*
70 mV typ. ($V_{\text{OUT(S)}} \leq 2.5\text{ V}$, at $f = 10\text{ kHz}$)
80 dB typ. (at $f = 1.0\text{ kHz}$)
- Output current: A ceramic capacitor can be used. (1.0 μF or more)
- Ripple rejection: A ceramic capacitor can be used. (1.0 μF or more)
The rising time of output voltage immediately after power-on or after the ON / OFF pin is set to ON is adjustable.
The soft-start time of SOT-23-5 can be switched to $t_{\text{SS0}} = 0.1\text{ ms}$ typ. / $t_{\text{SS1}} = 1.0\text{ ms}$ typ. with the SST pin.
The soft-start time of SC-82AB is fixed to $t_{\text{SS0}} = 0.1\text{ ms}$ typ.
The soft-start time of HSNT-4(1010)B is fixed to either $t_{\text{SS0}} = 0.1\text{ ms}$ typ. or $t_{\text{SS1}} = 1.0\text{ ms}$ typ.
- Input capacitor: Limits overcurrent of output transistor.
- Output capacitor: Ensures long battery life.
- Built-in soft-start circuit: Discharge shunt function "available" / "unavailable" is selectable.
Pull-down function "available" / "unavailable" is selectable.
 $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Built-in overcurrent protection circuit:
- Built-in ON / OFF circuit:
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified²

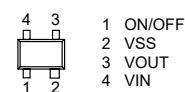
*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.

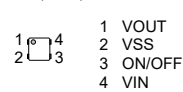
SOT-23-5



SC-82AB



HSNT-4(1010)B



S-19310 Series

AUTOMOTIVE, 125°C OPERATION, 36 V INPUT, 40 mA VOLTAGE REGULATOR WITH RESET FUNCTION

● Features

Regulator block

- Output voltage: 2.9 V to 5.3 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Dropout voltage: 240 mV typ. ($V_{\text{OUT(S)}} = 5.0\text{ V}$, $I_{\text{OUT}} = 30\text{ mA}$)
- Output current: Possible to output 40 mA ($V_{\text{IN}} = V_{\text{OUT(S)}} + 2.0\text{ V}$)*
A ceramic capacitor can be used. (1.0 μF or more)
- Input and output capacitors: Limits overcurrent of output transistor
- Built-in overcurrent protection circuit: Detection temperature 160°C typ.
- Built-in thermal shutdown circuit:

Detector block

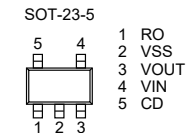
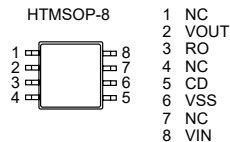
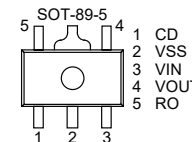
- Detection voltage: 2.6 V to $V_{\text{OUT(S)}} - 0.3\text{ V}$, selectable in 0.1 V step
- Operation voltage: A type: 1.8 V to 36.0 V
B type: 2.5 V to 36.0 V
- Detection voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Hysteresis width selectable from "Available": $5.0\% \leq V_{\text{HYS}} \leq 30.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
"Unavailable": $V_{\text{HYS}} = 0\%$
- Release delay time accuracy: $\pm 20\%$ ($C_D = 3.3\text{ nF}$, $T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Output form: Nch open-drain output
CMOS output

Overall

- Current consumption: 2.2 μA typ. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified²

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



S-19311 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 200 mA VOLTAGE REGULATOR
WITH RESET FUNCTION**

● Features

Regulator block

- Output voltage: 3.0 V to 5.3 V, selectable in 0.1 V step
- Input voltage: 4.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 120 mV typ. (5.0 V output product, $I_{OUT} = 100$ mA)
- Output current: Possible to output 200 mA ($V_{IN} = V_{OUT(S)} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 2.2 μF or more can be used.
- Ripple rejection: 70 dB typ. ($f = 100$ Hz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.

Detector block

- Detection voltage: 2.6 V to 5.0 V, selectable in 0.1 V step
- Detection voltage accuracy: ± 100 mV ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 18 ms typ. ($C_{DLY} = 47$ nF)

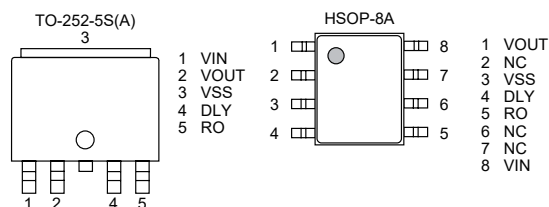
Overall

- Current consumption: During operation: 60 μA typ., 95 μA max. ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19312 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 400 mA VOLTAGE REGULATOR
WITH RESET FUNCTION**

● Features

Regulator block

- Output voltage: 3.0 V to 5.3 V, selectable in 0.1 V step
- Input voltage: 4.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 120 mV typ. (5.0 V output product, $I_{OUT} = 100$ mA)
- Output current: Possible to output 400 mA ($V_{IN} = V_{OUT(S)} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 2.2 μF or more can be used.
- Ripple rejection: 70 dB typ. ($f = 100$ Hz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.

Detector block

- Detection voltage: 2.6 V to 5.0 V, selectable in 0.1 V step
- Detection voltage accuracy: ± 100 mV ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 18 ms typ. ($C_{DLY} = 47$ nF)

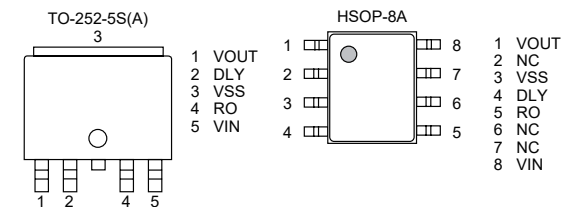
Overall

- Current consumption: During operation: 60 μA typ., 95 μA max. ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19315 Series

AUTOMOTIVE, 125°C OPERATION, 36 V INPUT, 40 mA VOLTAGE REGULATOR WITH SENSE-INPUT RESET FUNCTION

Features

Regulator block

- Output voltage: 1.0 V to 5.3 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: ± 0.03 V ($1.0 \text{ V} \leq V_{\text{OUT(S)}} < 1.5 \text{ V}$, $T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
 $\pm 2.0\%$ ($1.5 \text{ V} \leq V_{\text{OUT(S)}} \leq 5.3 \text{ V}$, $T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
240 mV typ. ($V_{\text{OUT(S)}} = 5.0 \text{ V}$, $I_{\text{OUT}} = 30 \text{ mA}$)
- Dropout voltage: 240 mV typ. ($V_{\text{OUT(S)}} = 5.0 \text{ V}$, $I_{\text{OUT}} = 30 \text{ mA}$)
- Output current: Possible to output 40 mA ($1.0 \text{ V} \leq V_{\text{OUT(S)}} < 2.0 \text{ V}$, $V_{\text{IN}} = 4.0 \text{ V}$)*¹
Possible to output 40 mA ($2.0 \text{ V} \leq V_{\text{OUT(S)}} \leq 5.3 \text{ V}$, $V_{\text{IN}} = V_{\text{OUT(S)}} + 2.0 \text{ V}$)*¹
A ceramic capacitor can be used. (1.0 μF or more)
Limits overcurrent of output transistor
Detection temperature 160°C typ.
Discharges output capacitor electrical charge during detector detection
- Input and output capacitors: A ceramic capacitor can be used. (1.0 μF or more)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor
- Built-in thermal shutdown circuit: Detection temperature 160°C typ.
- Built-in discharge shunt circuit: Discharges output capacitor electrical charge during detector detection

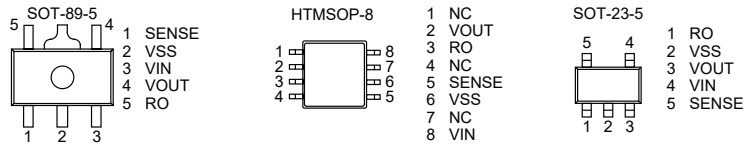
Detector block

- Detection voltage: 3.0 V to 11.3 V, selectable in 0.1 V step
- Operation voltage: 3.0 V to 36.0 V
- Detection voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Hysteresis width selectable from "Available" / "Unavailable": "Available": $5.0\% \leq V_{\text{HYS}} \leq 30.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
"Unavailable": $V_{\text{HYS}} = 0\%$
- Output form: Nch open-drain output

Overall

- Current consumption: During operation: 2.0 μA typ. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
During detector detection: 0.5 μA typ. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
 $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*²

- *1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.
*2. Contact our sales representatives for details.



S-19316 Series

AUTOMOTIVE, 125°C OPERATION, 36 V INPUT, 40 mA VOLTAGE REGULATOR WITH INPUT MONITORING RESET FUNCTION

Features

Regulator block

- Output voltage: A type: 1.0 V to 5.3 V, selectable in 0.1 V step
B type: 1.8 V to 5.3 V, selectable in 0.1 V step
3.0 V to 36.0 V
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: ± 0.03 V ($1.0 \text{ V} \leq V_{\text{OUT(S)}} < 1.5 \text{ V}$, $T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
 $\pm 2.0\%$ ($1.5 \text{ V} \leq V_{\text{OUT(S)}} \leq 5.3 \text{ V}$, $T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
240 mV typ. ($V_{\text{OUT(S)}} = 5.0 \text{ V}$, $I_{\text{OUT}} = 30 \text{ mA}$)
- Dropout voltage: 240 mV typ. ($V_{\text{OUT(S)}} = 5.0 \text{ V}$, $I_{\text{OUT}} = 30 \text{ mA}$)
- Output current: Possible to output 40 mA ($1.0 \text{ V} \leq V_{\text{OUT(S)}} < 2.0 \text{ V}$, $V_{\text{IN}} \geq 4.0 \text{ V}$)*¹
Possible to output 40 mA ($2.0 \text{ V} \leq V_{\text{OUT(S)}} \leq 5.3 \text{ V}$, $V_{\text{IN}} = V_{\text{OUT(S)}} + 2.0 \text{ V}$)*¹
A ceramic capacitor can be used. (1.0 μF or more)
Limits overcurrent of output transistor
Detection temperature 160°C typ.
- Input and output capacitors: A ceramic capacitor can be used. (1.0 μF or more)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor
- Built-in thermal shutdown circuit: Detection temperature 160°C typ.

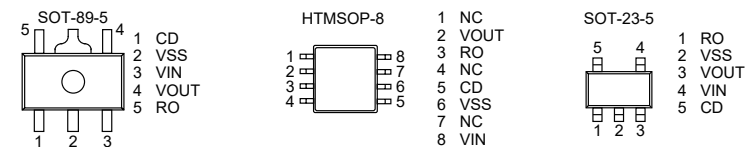
Detector block

- Detection voltage: 3.0 V to 11.3 V, selectable in 0.1 V step
- Operation voltage: A type: 1.8 V to 36.0 V
B type: 2.5 V to 36.0 V
- Detection voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Hysteresis width selectable from "Available" / "Unavailable": "Available": $5.0\% \leq V_{\text{HYS}} \leq 30.0\%$ ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
"Unavailable": $V_{\text{HYS}} = 0\%$
- Release delay time accuracy: $\pm 20\%$ ($C_D = 3.3 \text{ nF}$, $T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Output form: Nch open-drain output
CMOS output

Overall

- Current consumption: 2.2 μA typ. ($T_j = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*²

- *1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.
*2. Contact our sales representatives for details.



S-19720 Series

AUTOMOTIVE, 125°C OPERATION, 36 V INPUT, 50 mA VOLTAGE TRACKER WITH REVERSE CURRENT PROTECTION

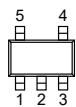
● Feature

- Input voltage: 4.0 V to 36.0 V
- Offset voltage: ± 5 mV ($0.1 \text{ mA} \leq I_{OUT} \leq 50 \text{ mA}$)
- Dropout voltage: 160 mV typ. ($V_{ADJ/EN} = 4.0 \text{ V}$, $I_{OUT} = 10 \text{ mA}$)
- Current consumption:
 - During operation: 30 μA typ.
 - During power-off: 4.0 μA typ.
- Output current: Possible to output 50 mA ($V_{IN} = V_{ADJ/EN} + 2.0 \text{ V}$)*¹
- Input capacitor: A ceramic capacitor can be used. (1.0 μF or more)
- Output capacitor: A ceramic capacitor can be used. (1.0 μF to 1000 μF)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 175°C typ.
- Reverse current protection function: $I_{REV} = -5 \mu\text{A}$ min. ($V_{IN} = 0 \text{ V}$, $V_{ADJ/EN} = 5.0 \text{ V}$, $V_{OUT} = 16.0 \text{ V}$)
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 in process*²

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

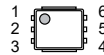
*2. Contact our sales representatives for details.

SOT-23-5



1 ADJ/EN
2 VSS
3 VIN
4 VOUT
5 VSS

HSNT-6(2025)



1 VIN
2 NC
3 ADJ/EN
4 VSS
5 NC
6 VOUT

S-19110AxxA to S-19110HxxA Series

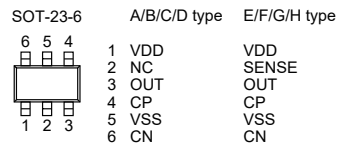
**AUTOMOTIVE, 125°C OPERATION,
36 V, SENSE-INPUT VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

Features

- Detection voltage: 5.0 V to 10.0 V (0.05 V step)
- Detection voltage accuracy: $\pm 2.0\%$ ($T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Detection delay time accuracy: $\pm 20\%$ ($C_N = 3.3\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Release voltage: 5.25 V to 13.0 V (0.05 V step)
- Release voltage accuracy: $\pm 2.0\%$ ($T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$, $5.0\% \leq V_{HYS} \leq 20.0\%$)
 $\pm 2.5\%$ ($T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$, $20.0\% < V_{HYS} \leq 30.0\%$)
- Release delay time accuracy: $\pm 20\%$ ($C_P = 3.3\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: 600 nA typ.
- Operation voltage range: 1.8 V to 36.0 V
- Hysteresis width^{*1}: "Available" / "unavailable" is selectable.
5.0% to 30.0% ($T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Output form: Nch open-drain output
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*2}

*1. When "available" is selected, the hysteresis width can be set in the range of 5.0% to 30.0%.

*2. Contact our sales representatives for details.



S-19110JxxA to S-19110RxxA Series

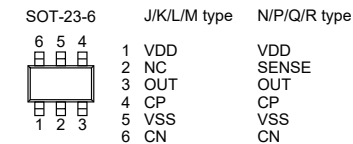
**AUTOMOTIVE, 125°C OPERATION,
36 V, SENSE-INPUT VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

Features

- Detection voltage: J / K / L / M type (VDD detection product): 3.6 V to 4.95 V (0.05 V step)
N / P / Q / R type (SENSE detection product): 3.0 V to 4.95 V (0.05 V step)
- Detection voltage accuracy: $\pm 3.0\%$ ($-V_{DET(S)} = 3.0\text{ V}$ to 4.15 V , $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
 $\pm 2.5\%$ ($-V_{DET(S)} = 4.2\text{ V}$ to 4.95 V , $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Detection delay time accuracy: $\pm 20\%$ ($C_N = 3.3\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Release voltage: J / K / L / M type (VDD detection product): 3.8 V to 6.4 V (0.05 V step)
N / P / Q / R type (SENSE detection product): 3.15 V to 6.4 V (0.05 V step)
- Release voltage accuracy: $\pm 3.0\%$ ($-V_{DET(S)} = 3.0\text{ V}$ to 4.15 V , $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$, $5.0\% \leq V_{HYS} \leq 20.0\%$)
 $\pm 3.5\%$ ($-V_{DET(S)} = 3.0\text{ V}$ to 4.15 V , $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$, $20.0\% < V_{HYS} \leq 30.0\%$)
 $\pm 2.5\%$ ($-V_{DET(S)} = 4.2\text{ V}$ to 4.95 V , $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$, $5.0\% \leq V_{HYS} \leq 20.0\%$)
 $\pm 3.0\%$ ($-V_{DET(S)} = 4.2\text{ V}$ to 4.95 V , $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$, $20.0\% < V_{HYS} \leq 30.0\%$)
- Release delay time accuracy: $\pm 20\%$ ($C_P = 3.3\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: 600 nA typ.
- Operation voltage range: 1.8 V to 36.0 V
- Hysteresis width^{*1}: "Available" / "unavailable" is selectable.
5.0% to 30.0% ($T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Output form: Nch open-drain output
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*2}

*1. When "available" is selected, the hysteresis width can be set in the range of 5.0% to 30.0%.

*2. Contact our sales representatives for details.



S-19110AxxH to S-19110HxxH Series

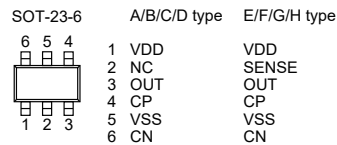
**AUTOMOTIVE, 105°C OPERATION,
36 V, SENSE-INPUT VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

● Features

- Detection voltage: 5.0 V to 10.0 V (0.05 V step)
- Detection voltage accuracy: $\pm 1.5\%$ ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Detection delay time accuracy: $\pm 20\%$ ($C_N = 3.3\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Release voltage: 5.25 V to 13.0 V (0.05 V step)
- Release voltage accuracy: $\pm 1.5\%$ ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$, $5.0\% \leq V_{HYS} \leq 20.0\%$)
 $\pm 2.0\%$ ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$, $20.0\% < V_{HYS} \leq 30.0\%$)
- Release delay time accuracy: $\pm 20\%$ ($C_P = 3.3\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: 600 nA typ.
- Operation voltage range: 1.8 V to 36.0 V
- Hysteresis width*1: "Available" / "unavailable" is selectable.
5.0% to 30.0% ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Output form: Nch open-drain output
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*2

*1. When "available" is selected, the hysteresis width can be set in the range of 5.0% to 30.0%.

*2. Contact our sales representatives for details.



S-19110JxxH to S-19110RxxH Series

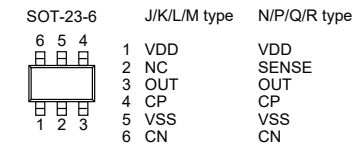
**AUTOMOTIVE, 105°C OPERATION,
36 V, SENSE-INPUT VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

● Features

- Detection voltage: J / K / L / M type (VDD detection product): 3.6 V to 4.95 V (0.05 V step)
N / P / Q / R type (SENSE detection product): 3.0 V to 4.95 V (0.05 V step)
- Detection voltage accuracy: $\pm 3.0\%$ ($-V_{DET(S)} = 3.0\text{ V}$ to 4.15 V , $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
 $\pm 2.5\%$ ($-V_{DET(S)} = 4.2\text{ V}$ to 4.95 V , $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Detection delay time accuracy: $\pm 20\%$ ($C_N = 3.3\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Release voltage: J / K / L / M type (VDD detection product): 3.8 V to 6.4 V (0.05 V step)
N / P / Q / R type (SENSE detection product): 3.15 V to 6.4 V (0.05 V step)
- Release voltage accuracy: $\pm 3.0\%$ ($-V_{DET(S)} = 3.0\text{ V}$ to 4.15 V , $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$, $5.0\% \leq V_{HYS} \leq 20.0\%$)
 $\pm 3.5\%$ ($-V_{DET(S)} = 3.0\text{ V}$ to 4.15 V , $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$, $20.0\% < V_{HYS} \leq 30.0\%$)
 $\pm 2.5\%$ ($-V_{DET(S)} = 4.2\text{ V}$ to 4.95 V , $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$, $5.0\% \leq V_{HYS} \leq 20.0\%$)
 $\pm 3.0\%$ ($-V_{DET(S)} = 4.2\text{ V}$ to 4.95 V , $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$, $20.0\% < V_{HYS} \leq 30.0\%$)
- Release delay time accuracy: $\pm 20\%$ ($C_P = 3.3\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: 600 nA typ.
- Operation voltage range: 1.8 V to 36.0 V
- Hysteresis width*1: "Available" / "unavailable" is selectable.
5.0% to 30.0% ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Output form: Nch open-drain output
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*2

*1. When "available" is selected, the hysteresis width can be set in the range of 5.0% to 30.0%.

*2. Contact our sales representatives for details.



S-19100xxxA Series

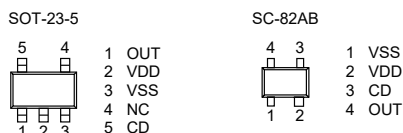
**AUTOMOTIVE, 125°C OPERATION,
10 V VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

Features

- Detection voltage: 1.2 V to 4.6 V (0.1 V step)
- Detection voltage accuracy: $\pm 3.0\%$ ($2.4\text{ V} \leq -V_{\text{DET}} \leq 4.6\text{ V}$, $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
 $\pm(2.5\% + 12\text{ mV})$ ($1.2\text{ V} \leq -V_{\text{DET}} < 2.4\text{ V}$, $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: 270 nA typ. ($1.2\text{ V} \leq -V_{\text{DET}} < 2.3\text{ V}$)
- Operation voltage range: 0.6 V to 10.0 V (CMOS output product)
- Hysteresis width*1: $5\% \pm 2\%$ ($T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Delay time accuracy: $\pm 15\%$ ($C_D = 4.7\text{ nF}$, $T_a = +25^\circ\text{C}$)
- Output form: Nch open-drain output (active "L")
CMOS output (active "L")
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*2

*1. The product without hysteresis width is also available.

*2. Contact our sales representatives for details.



S-19100xxxH Series

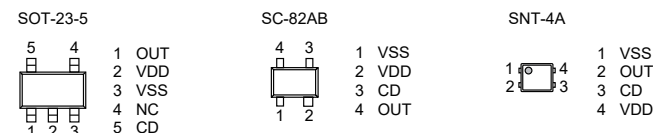
**AUTOMOTIVE, 105°C OPERATION,
10 V VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

Features

- Detection voltage: 1.2 V to 4.6 V (0.1 V step)
- Detection voltage accuracy: $\pm 2.5\%$ ($2.4\text{ V} \leq -V_{\text{DET}} \leq 4.6\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
 $\pm(2.0\% + 12\text{ mV})$ ($1.2\text{ V} \leq -V_{\text{DET}} < 2.4\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: 270 nA typ. ($1.2\text{ V} \leq -V_{\text{DET}} < 2.3\text{ V}$)
- Operation voltage range: 0.6 V to 10.0 V (CMOS output product)
- Hysteresis width*1: $5\% \pm 2\%$ ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Delay time accuracy: $\pm 15\%$ ($C_D = 4.7\text{ nF}$, $T_a = +25^\circ\text{C}$)
- Output form: Nch open-drain output (active "L")
CMOS output (active "L")
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*2

*1. The product without hysteresis width is also available.

*2. Contact our sales representatives for details.



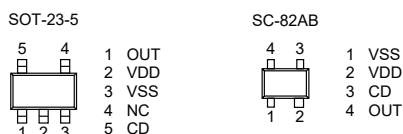
S-19101xxxA Series

**AUTOMOTIVE, 125°C OPERATION,
10 V VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

Features

- Detection voltage: 1.2 V to 4.6 V (0.1 V step)
- Detection voltage accuracy: $\pm 3.0\%$ ($2.4\text{ V} \leq -V_{\text{DET}} \leq 4.6\text{ V}$, $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
 $\pm(2.5\% + 12\text{ mV})$ ($1.2\text{ V} \leq -V_{\text{DET}} < 2.4\text{ V}$, $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$)
- Current consumption: 270 nA typ. ($1.2\text{ V} \leq -V_{\text{DET}} < 2.3\text{ V}$)
- Operation voltage range: 0.6 V to 10.0 V (CMOS output product)
- Delay time accuracy: $\pm 15\%$ ($C_D = 4.7\text{ nF}$, $T_a = +25^\circ\text{C}$)
- Output form: Nch open-drain output (active "L")
CMOS output (active "L")
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



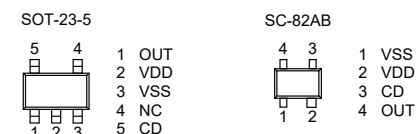
S-19101xxxH Series

**AUTOMOTIVE, 105°C OPERATION,
10 V VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

Features

- Detection voltage: 1.2 V to 4.6 V (0.1 V step)
- Detection voltage accuracy: $\pm 2.5\%$ ($2.4\text{ V} \leq -V_{\text{DET}} \leq 4.6\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
 $\pm(2.0\% + 12\text{ mV})$ ($1.2\text{ V} \leq -V_{\text{DET}} < 2.4\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: 270 nA typ. ($1.2\text{ V} \leq -V_{\text{DET}} < 2.3\text{ V}$)
- Operation voltage range: 0.6 V to 10.0 V (CMOS output product)
- Delay time accuracy: $\pm 15\%$ ($C_D = 4.7\text{ nF}$, $T_a = +25^\circ\text{C}$)
- Output form: Nch open-drain output (active "L")
CMOS output (active "L")
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

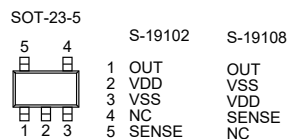
*1. Contact our sales representatives for details.



S-19102/19108 Series**AUTOMOTIVE, 105°C OPERATION,
10 V, SENSE-INPUT VOLTAGE DETECTOR****Features**

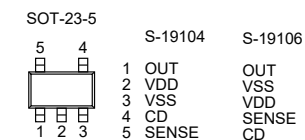
- Detection voltage: 1.0 V to 5.0 V (0.1 V step)
- Detection voltage accuracy: $\pm 3.5\%$ ($2.2\text{ V} \leq -V_{\text{DET(S)}} \leq 5.0\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
 $\pm(2.5\% + 22\text{ mV})$ ($1.0\text{ V} \leq -V_{\text{DET(S)}} < 2.2\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: 500 nA typ.
- Operation voltage range: 0.95 V to 10.0 V
- Hysteresis width: $5\% \pm 2\%$ ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Output form: Nch open-drain output (Active "L")
CMOS output (Active "L")
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.

**S-19104/19106 Series****AUTOMOTIVE, 105°C OPERATION,
10 V, SENSE-INPUT VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)****Features**

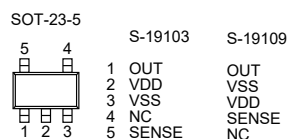
- Detection voltage: 1.0 V to 5.0 V (0.1 V step)
- Detection voltage accuracy: $\pm 3.5\%$ ($2.2\text{ V} \leq -V_{\text{DET(S)}} \leq 5.0\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
 $\pm(2.5\% + 22\text{ mV})$ ($1.0\text{ V} \leq -V_{\text{DET(S)}} < 2.2\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: 500 nA typ.
- Operation voltage range: 0.95 V to 10.0 V
- Hysteresis width: $5\% \pm 2\%$ ($T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Release delay time accuracy: $\pm 34\%$ ($C_D = 4.7\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Output form: Nch open-drain output (Active "L")
CMOS output (Active "L")
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.

**S-19103/19109 Series****AUTOMOTIVE, 105°C OPERATION,
10 V, SENSE-INPUT VOLTAGE DETECTOR****Features**

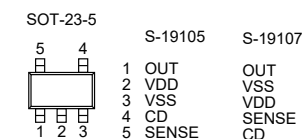
- Detection voltage: 1.0 V to 5.0 V (0.1 V step)
- Detection voltage accuracy: $\pm 3.5\%$ ($2.2\text{ V} \leq -V_{\text{DET(S)}} \leq 5.0\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
 $\pm(2.5\% + 22\text{ mV})$ ($1.0\text{ V} \leq -V_{\text{DET(S)}} < 2.2\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: 500 nA typ.
- Operation voltage range: 0.95 V to 10.0 V
- Output form: Nch open-drain output (Active "L")
CMOS output (Active "L")
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.

**S-19105/19107 Series****AUTOMOTIVE, 105°C OPERATION,
10 V, SENSE-INPUT VOLTAGE DETECTOR
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)****Features**

- Detection voltage: 1.0 V to 5.0 V (0.1 V step)
- Detection voltage accuracy: $\pm 3.5\%$ ($2.2\text{ V} \leq -V_{\text{DET(S)}} \leq 5.0\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
 $\pm(2.5\% + 22\text{ mV})$ ($1.0\text{ V} \leq -V_{\text{DET(S)}} < 2.2\text{ V}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Current consumption: 500 nA typ.
- Operation voltage range: 0.95 V to 10.0 V
- Release delay time accuracy: $\pm 34\%$ ($C_D = 4.7\text{ nF}$, $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$)
- Output form: Nch open-drain output (Active "L")
CMOS output (Active "L")
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



S-191L/191NxxxxS Series

**AUTOMOTIVE, 150°C OPERATION, 36 V,
SUPPLY VOLTAGE DIVIDED OUTPUT, WINDOW VOLTAGE DETECTOR
WITH SENSE PIN REVERSE CONNECTION PROTECTION**

Features

Detector block

- Detection voltage: Undervoltage detection voltage 4.0 V to 10.0 V (0.05 V step)
Overvoltage detection voltage 16.0 V to 18.0 V (0.1 V step)
- Detection voltage accuracy: Undervoltage detection voltage ±2.0%
Overvoltage detection voltage ±2.0%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±20% (C_D = 3.3 nF)
- Output form: Nch open-drain output

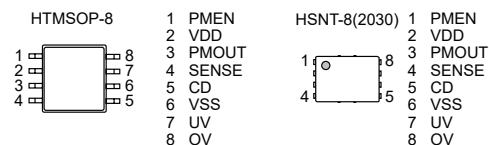
Supply voltage divider block

- Output voltage: $V_{PMOUT} = V_{SENSE}/6$ (S-191L Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/8$ (S-191L Series P / Q / R type)
 $V_{PMOUT} = V_{SENSE}/12$ (S-191N Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/14$ (S-191N Series P / Q / R type)
- Output capacitor (C_{PM}): A ceramic capacitor can be used (0.1 μF to 0.22 μF).
- Built-in enable circuit: Ensures long battery life.

Overall

- Current consumption: During supply voltage divided output operates 1.3 μA typ.
During supply voltage divided output stops 0.9 μA typ.
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: Ta = -40°C to +150°C
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 in process*1

*1. Contact our sales representatives for details.



S-191L/191NxxxxA Series

**AUTOMOTIVE, 125°C OPERATION, 36 V,
SUPPLY VOLTAGE DIVIDED OUTPUT, WINDOW VOLTAGE DETECTOR
WITH SENSE PIN REVERSE CONNECTION PROTECTION**

Features

Detector block

- Detection voltage: Undervoltage detection voltage 4.0 V to 10.0 V (0.05 V step)
Overvoltage detection voltage 16.0 V to 18.0 V (0.1 V step)
- Detection voltage accuracy: Undervoltage detection voltage ±1.5%
Overvoltage detection voltage ±1.5%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±15% (C_D = 3.3 nF)
- Output form: Nch open-drain output

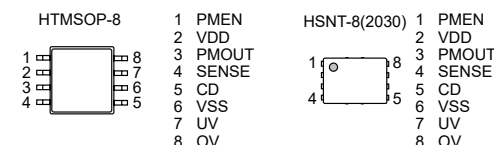
Supply voltage divider block

- Output voltage: $V_{PMOUT} = V_{SENSE}/6$ (S-191L Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/8$ (S-191L Series P / Q / R type)
 $V_{PMOUT} = V_{SENSE}/12$ (S-191N Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/14$ (S-191N Series P / Q / R type)
- Output capacitor (C_{PM}): A ceramic capacitor can be used (0.1 μF to 0.22 μF).
- Built-in enable circuit: Ensures long battery life.

Overall

- Current consumption: During supply voltage divided output operates 1.3 μA typ.
During supply voltage divided output stops 0.9 μA typ.
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



S-191L/191NxxxxH Series

**AUTOMOTIVE, 105°C OPERATION, 36 V,
SUPPLY VOLTAGE DIVIDED OUTPUT, WINDOW VOLTAGE DETECTOR
WITH SENSE PIN REVERSE CONNECTION PROTECTION**

Features

Detector block

- Detection voltage: Undervoltage detection voltage 4.0 V to 10.0 V (0.05 V step)
Overvoltage detection voltage 16.0 V to 18.0 V (0.1 V step)
- Detection voltage accuracy: Undervoltage detection voltage ±1.5%
Overvoltage detection voltage ±1.5%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±15% (C_D = 3.3 nF)
- Output form: Nch open-drain output

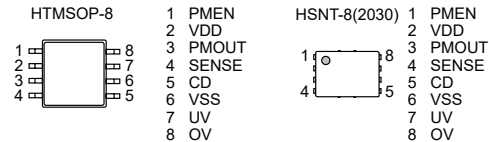
Supply voltage divider block

- Output voltage: $V_{PMOUT} = V_{SENSE}/6$ (S-191L Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/8$ (S-191L Series P / Q / R type)
 $V_{PMOUT} = V_{SENSE}/12$ (S-191N Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/14$ (S-191N Series P / Q / R type)
A ceramic capacitor can be used (0.1 μF to 0.22 μF).
Ensures long battery life.
- Output capacitor (C_{PM}):
- Built-in enable circuit:

Overall

- Current consumption: During supply voltage divided output operates 1.3 μA typ.
During supply voltage divided output stops 0.9 μA typ.
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: Ta = -40°C to +105°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



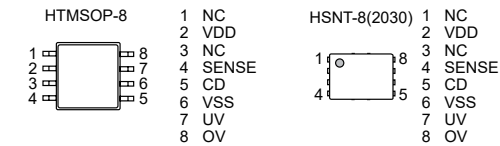
S-191ExxxxS Series

**AUTOMOTIVE, 150°C OPERATION, 36 V,
WINDOW VOLTAGE DETECTOR
WITH SENSE PIN REVERSE CONNECTION PROTECTION**

Features

- Detection voltage: Undervoltage detection voltage 4.0 V to 10.0 V (0.05 V step)
Overvoltage detection voltage 16.0 V to 18.0 V (0.1 V step)
- Detection voltage accuracy: Undervoltage detection voltage ±2.0%
Overvoltage detection voltage ±2.0%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±20% (C_D = 3.3 nF)
- Current consumption: 0.9 μA typ.
- Output form: Nch open-drain output
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: Ta = -40°C to +150°C
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 in process*1

*1. Contact our sales representatives for details.



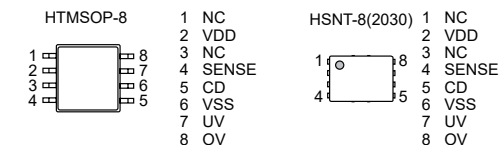
S-191ExxxxA Series

**AUTOMOTIVE, 125°C OPERATION, 36 V,
WINDOW VOLTAGE DETECTOR
WITH SENSE PIN REVERSE CONNECTION PROTECTION**

Features

- Detection voltage: Undervoltage detection voltage 4.0 V to 10.0 V (0.05 V step)
Overvoltage detection voltage 16.0 V to 18.0 V (0.1 V step)
- Detection voltage accuracy: Undervoltage detection voltage ±1.5%
Overvoltage detection voltage ±1.5%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±15% (C_D = 3.3 nF)
- Current consumption: 0.9 μA typ.
- Output form: Nch open-drain output
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



S-191ExxxxH Series

**AUTOMOTIVE, 105°C OPERATION, 36 V,
WINDOW VOLTAGE DETECTOR
WITH SENSE PIN REVERSE CONNECTION PROTECTION**

Features

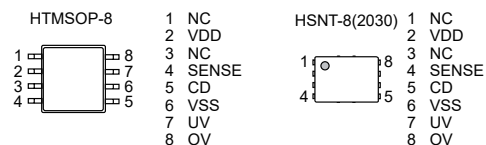
- Detection voltage:

Undervoltage detection voltage	4.0 V to 10.0 V (0.05 V step)
Overvoltage detection voltage	16.0 V to 18.0 V (0.1 V step)
- Detection voltage accuracy:

Undervoltage detection voltage	±1.5%
Overvoltage detection voltage	±1.5%
- Hysteresis width selectable from "Available" / "Unavailable":

"Available":	5.0%, 10.0%
"Unavailable":	0%
- Release delay time accuracy: ±15% ($C_D = 3.3 \text{ nF}$)
- Current consumption: 0.9 μA typ.
- Output form: Nch open-drain output
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



S-19117/19119xxxS Series

**AUTOMOTIVE, 150°C OPERATION, 36 V,
SUPPLY VOLTAGE DIVIDED OUTPUT, VOLTAGE DETECTOR
WITH SENSE PIN REVERSE CONNECTION PROTECTION**

Features

Detector block

- Detection voltage: 4.0 V to 10.0 V (0.05 V step)
- Detection voltage accuracy: ±2.0%
- Hysteresis width selectable from "Available" / "Unavailable":

"Available":	5.0%, 10.0%
"Unavailable":	0%
- Release delay time accuracy: ±20% ($C_D = 3.3 \text{ nF}$)
- Output form: Nch open-drain output

Supply voltage divider block

- Output voltage:

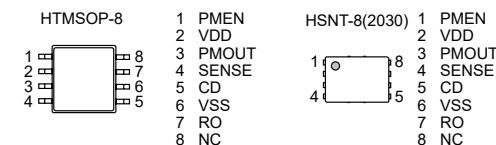
$V_{PMOUT} = V_{SENSE}/6$ (S-19117 Series L / M / N type)
$V_{PMOUT} = V_{SENSE}/8$ (S-19117 Series P / Q / R type)
$V_{PMOUT} = V_{SENSE}/12$ (S-19119 Series L / M / N type)
$V_{PMOUT} = V_{SENSE}/14$ (S-19119 Series P / Q / R type)
- Output capacitor (C_{PM}): A ceramic capacitor can be used (0.1 μF to 0.22 μF).
- Built-in enable circuit: Ensures long battery life.

Overall

- Current consumption:

During supply voltage divided output operates	1.15 μA typ.
During supply voltage divided output stops	0.75 μA typ.
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+150^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 in process*1

*1. Contact our sales representatives for details.



S-19117/19119xxxA Series

**AUTOMOTIVE, 125°C OPERATION, 36 V,
SUPPLY VOLTAGE DIVIDED OUTPUT, VOLTAGE DETECTOR
WITH SENSE PIN REVERSE CONNECTION PROTECTION**

Features

Detector block

- Detection voltage: 4.0 V to 10.0 V (0.05 V step)
- Detection voltage accuracy: ±1.5%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±15% (C_D = 3.3 nF)
- Output form: Nch open-drain output

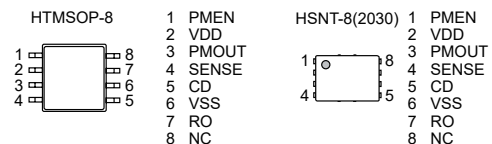
Supply voltage divider block

- Output voltage: $V_{PMOUT} = V_{SENSE}/6$ (S-19117 Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/8$ (S-19117 Series P / Q / R type)
 $V_{PMOUT} = V_{SENSE}/12$ (S-19119 Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/14$ (S-19119 Series P / Q / R type)
A ceramic capacitor can be used (0.1 μF to 0.22 μF).
- Output capacitor (C_{PM}): A ceramic capacitor can be used (0.1 μF to 0.22 μF).
- Built-in enable circuit: Ensures long battery life.

Overall

- Current consumption: During supply voltage divided output operates 1.15 μA typ.
During supply voltage divided output stops 0.75 μA typ.
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



S-19117/19119xxxH Series

**AUTOMOTIVE, 105°C OPERATION, 36 V,
SUPPLY VOLTAGE DIVIDED OUTPUT, VOLTAGE DETECTOR
WITH SENSE PIN REVERSE CONNECTION PROTECTION**

Features

Detector block

- Detection voltage: 4.0 V to 10.0 V (0.05 V step)
- Detection voltage accuracy: ±1.5%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±15% (C_D = 3.3 nF)
- Output form: Nch open-drain output

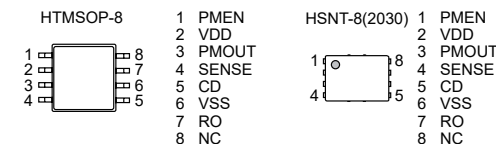
Supply voltage divider block

- Output voltage: $V_{PMOUT} = V_{SENSE}/6$ (S-19117 Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/8$ (S-19117 Series P / Q / R type)
 $V_{PMOUT} = V_{SENSE}/12$ (S-19119 Series L / M / N type)
 $V_{PMOUT} = V_{SENSE}/14$ (S-19119 Series P / Q / R type)
A ceramic capacitor can be used (0.1 μF to 0.22 μF).
- Output capacitor (C_{PM}): A ceramic capacitor can be used (0.1 μF to 0.22 μF).
- Built-in enable circuit: Ensures long battery life.

Overall

- Current consumption: During supply voltage divided output operates 1.15 μA typ.
During supply voltage divided output stops 0.75 μA typ.
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: Ta = -40°C to +105°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



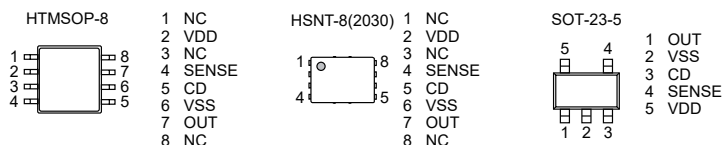
S-19113xxxS Series

AUTOMOTIVE, 150°C OPERATION, 36 V, VOLTAGE DETECTOR WITH SENSE PIN REVERSE CONNECTION PROTECTION, DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)

Features

- Detection voltage: 4.0 V to 10.0 V (0.05 V step)
- Detection voltage accuracy: $\pm 2.0\%$
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: $\pm 20\%$ ($C_D = 3.3$ nF)
- Current consumption: 0.6 μ A typ.
- Output form: Nch open-drain output
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+150^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 in process*1

*1. Contact our sales representatives for details.



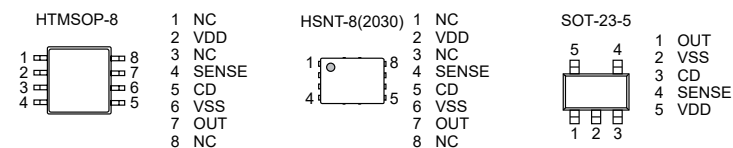
S-19113xxxH Series

AUTOMOTIVE, 105°C OPERATION, 36 V, VOLTAGE DETECTOR WITH SENSE PIN REVERSE CONNECTION PROTECTION, DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)

Features

- Detection voltage: 4.0 V to 10.0 V (0.05 V step)
- Detection voltage accuracy: $\pm 1.5\%$
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: $\pm 15\%$ ($C_D = 3.3$ nF)
- Current consumption: 0.6 μ A typ.
- Output form: Nch open-drain output
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



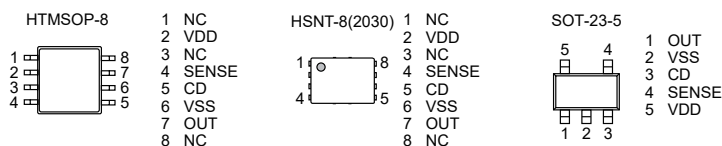
S-19113xxxA Series

AUTOMOTIVE, 125°C OPERATION, 36 V, VOLTAGE DETECTOR WITH SENSE PIN REVERSE CONNECTION PROTECTION, DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)

Features

- Detection voltage: 4.0 V to 10.0 V (0.05 V step)
- Detection voltage accuracy: $\pm 1.5\%$
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: $\pm 15\%$ ($C_D = 3.3$ nF)
- Current consumption: 0.6 μ A typ.
- Output form: Nch open-drain output
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



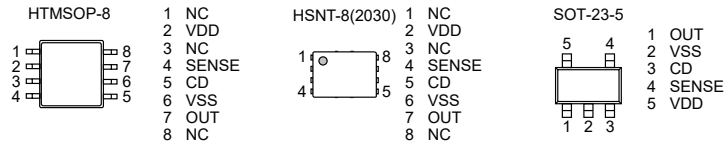
S-19115xxxS Series

**AUTOMOTIVE, 150°C OPERATION, 36 V,
VOLTAGE DETECTOR FOR OVERVOLTAGE DETECTION
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

Features

- Detection voltage: 16.0 V to 18.0 V (0.1 V step)
- Detection voltage accuracy: ±2.0%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±20% ($C_D = 3.3$ nF)
- Current consumption: 0.6 μ A typ.
- Output form: Nch open-drain output
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+150^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 in process^{*1}

*1. Contact our sales representatives for details.



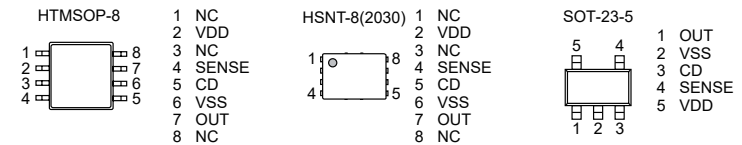
S-19115xxxH Series

**AUTOMOTIVE, 105°C OPERATION, 36 V,
VOLTAGE DETECTOR FOR OVERVOLTAGE DETECTION
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

Features

- Detection voltage: 16.0 V to 18.0 V (0.1 V step)
- Detection voltage accuracy: ±1.5%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±15% ($C_D = 3.3$ nF)
- Current consumption: 0.6 μ A typ.
- Output form: Nch open-drain output
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*1}

*1. Contact our sales representatives for details.



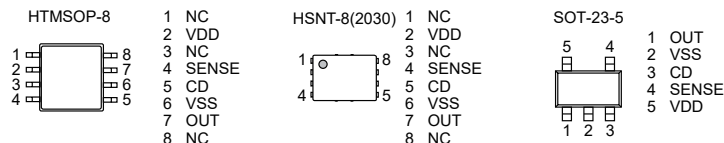
S-19115xxxA Series

**AUTOMOTIVE, 125°C OPERATION, 36 V,
VOLTAGE DETECTOR FOR OVERVOLTAGE DETECTION
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

Features

- Detection voltage: 16.0 V to 18.0 V (0.1 V step)
- Detection voltage accuracy: ±1.5%
- Hysteresis width selectable from "Available" / "Unavailable": "Available": 5.0%, 10.0%
"Unavailable": 0%
- Release delay time accuracy: ±15% ($C_D = 3.3$ nF)
- Current consumption: 0.6 μ A typ.
- Output form: Nch open-drain output
- Built-in reverse connection protection circuit: Reduces current in the SENSE pin during a reverse connection.
- Operation voltage range: 3.0 V to 36.0 V
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*1}

*1. Contact our sales representatives for details.



S-19500/19501 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 200 mA, BUILT-IN WATCHDOG TIMER
VOLTAGE REGULATOR WITH RESET FUNCTION**

Features

Regulator block

- Output voltage: 3.0 V to 5.3 V, selectable in 0.1 V step
- Input voltage: 4.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 120 mV typ. (5.0 V output product, $I_{OUT} = 100$ mA)
- Output current: Possible to output 200 mA ($V_{IN} = V_{OUT(S)} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 2.2 μF or more can be used.
- Ripple rejection: 70 dB typ. ($f = 100$ Hz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.

Detector block

- Detection voltage: 2.6 V to 5.0 V, selectable in 0.1 V step
- Detection voltage accuracy: ± 100 mV ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 18 ms typ. ($C_{DLY} = 47$ nF)

Watchdog timer block

- Watchdog activation current is adjustable: 1.5 mA typ. (WADJ pin is open)
- Watchdog trigger time is adjustable^{*2}: 43 ms typ. ($C_{DLY} = 47$ nF)
- Product type is selectable: S-19500 Series (Product with WEN pin (Output: WO / RO pin))
S-19501 Series (Product without WEN pin (Output: WO pin and RO pin))
- Autonomous watchdog operation function: Watchdog timer operates due to detection of load current.
- Watchdog mode: Time-out mode

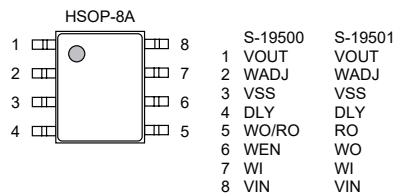
Overall

- Current consumption: 60 μA typ. ($I_{OUT} = 0$ mA, During the watchdog timer deactivation)
75 μA typ. ($I_{OUT} \leq 5$ mA, During the watchdog timer activation)
 $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time and the watchdog trigger time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19504/19505 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 250 mA, BUILT-IN WATCHDOG TIMER
VOLTAGE REGULATOR WITH RESET FUNCTION**

Features

Regulator block

- Output voltage: 3.3 V, 5.0 V
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 100 mV typ. (5.0 V output product, $I_{OUT} = 100$ mA)
- Output current: Possible to output 250 mA ($V_{IN} = V_{OUT(S)} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 1.0 μF or more can be used.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.

Detector block

- Detection voltage: 2.6 V to 4.7 V, selectable in 0.1 V step
- Detection voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 20 ms typ. ($C_{DLY} = 10$ nF)

Watchdog timer block

- Watchdog activation current is adjustable: 1.5 mA typ. (WADJ pin is open)
- Watchdog trigger time is adjustable^{*2}: 46 ms typ. ($C_{DLY} = 10$ nF)
- Product type is selectable: S-19504 Series (Product with WEN pin (Output: WO / RO pin))
S-19505 Series (Product without WEN pin (Output: WO pin and RO pin))
- Autonomous watchdog operation function: Watchdog timer operates due to detection of load current.
- Watchdog mode: Time-out mode

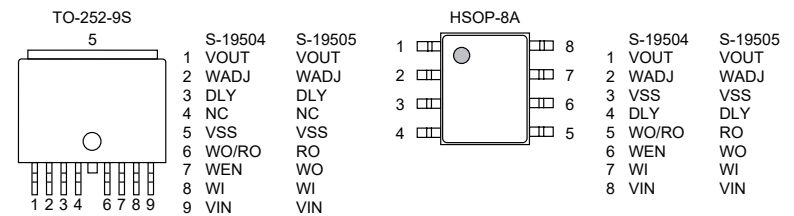
Overall

- Current consumption: 3.0 μA typ. (During watchdog timer deactivation)
5.0 μA typ. (During watchdog timer activation)
 $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time and the watchdog trigger time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19514/19515 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 250 mA, BUILT-IN WINDOW WATCHDOG TIMER
VOLTAGE REGULATOR WITH RESET FUNCTION**

● Features

Regulator block

- Output voltage: 3.3 V, 5.0 V
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 100 mV typ. (5.0 V output product, $I_{\text{OUT}} = 100$ mA)
- Output current: Possible to output 250 mA ($V_{\text{IN}} = V_{\text{OUT(S)}} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 1.0 μF or more can be used.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.

Detector block

- Detection voltage: 2.6 V to 4.7 V, selectable in 0.1 V step
- Detection voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 20 ms typ. ($C_{\text{DLY}} = 10$ nF)

Watchdog timer block

- Watchdog activation current is adjustable: 1.5 mA typ. (WADJ pin is open)
- Watchdog trigger time is adjustable^{*2}: 46 ms typ. ($C_{\text{DLY}} = 10$ nF)
- Product type is selectable: S-19514 Series (Product with WEN pin (Output: WO / RO pin))
S-19515 Series (Product without WEN pin (Output: WO pin and RO pin))
- Autonomous watchdog operation function: Watchdog timer operates due to detection of load current.
- Watchdog mode: Window mode

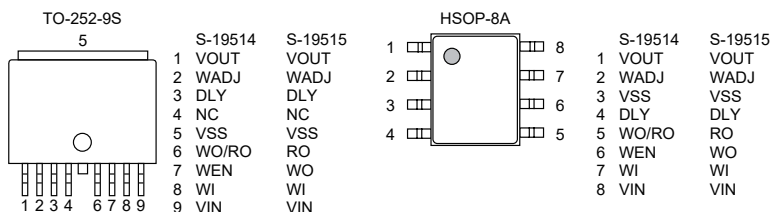
Overall

- Current consumption: 3.0 μA typ. (During watchdog timer deactivation)
5.0 μA typ. (During watchdog timer activation)
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time and the watchdog trigger time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19518 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 250 mA, BUILT-IN WINDOW WATCHDOG TIMER
VOLTAGE REGULATOR WITH RESET FUNCTION**

● Features

Regulator block

- Output voltage: 3.3 V, 5.0 V
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 100 mV typ. (5.0 V output product, $I_{\text{OUT}} = 100$ mA)
- Output current: Possible to output 250 mA ($V_{\text{IN}} = V_{\text{OUT(S)}} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 1.0 μF or more can be used.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in ON / OFF circuit: Ensures long battery life.

Detector block

- Detection voltage: 2.6 V to 4.7 V, selectable in 0.1 V step
- Detection voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 20 ms typ. ($C_{\text{DLY}} = 10$ nF)

Watchdog timer block

- Watchdog activation current: 1.5 mA typ.
- Watchdog trigger time is adjustable^{*2}: 46 ms typ. ($C_{\text{DLY}} = 10$ nF)
- Autonomous watchdog operation function: Watchdog timer operates due to detection of load current.
- Watchdog mode: Window mode

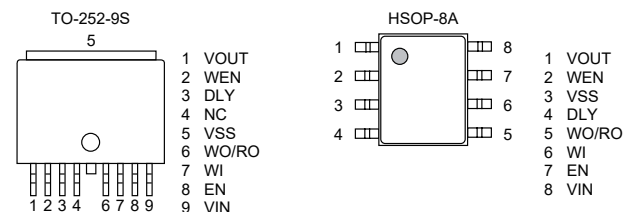
Overall

- Current consumption: 3.2 μA typ. (During regulator operation, during watchdog timer deactivation)
0.1 μA typ. (During regulator stop)
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time and the watchdog trigger time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19502/19503 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 400 mA, BUILT-IN WATCHDOG TIMER
VOLTAGE REGULATOR WITH RESET FUNCTION**

Features

Regulator block

- Output voltage: 3.0 V to 5.3 V, selectable in 0.1 V step
- Input voltage: 4.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_J = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 120 mV typ. (5.0 V output product, $I_{OUT} = 100$ mA)
- Output current: Possible to output 400 mA ($V_{IN} = V_{OUT(S)} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 2.2 μF or more can be used.
- Ripple rejection: 70 dB typ. ($f = 100$ Hz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.

Detector block

- Detection voltage: 2.6 V to 5.0 V, selectable in 0.1 V step
- Detection voltage accuracy: ± 100 mV ($T_J = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 18 ms typ. ($C_{DLY} = 47$ nF)

Watchdog timer block

- Watchdog activation current is adjustable: 1.5 mA typ. (WADJ pin is open)
- Watchdog trigger time is adjustable^{*2}: 43 ms typ. ($C_{DLY} = 47$ nF)
- Product type is selectable: S-19502 Series (Product with WEN pin (Output: WO / RO pin))
S-19503 Series (Product without WEN pin (Output: WO pin and RO pin))
- Autonomous watchdog operation function: Watchdog timer operates due to detection of load current.
- Watchdog mode: Time-out mode

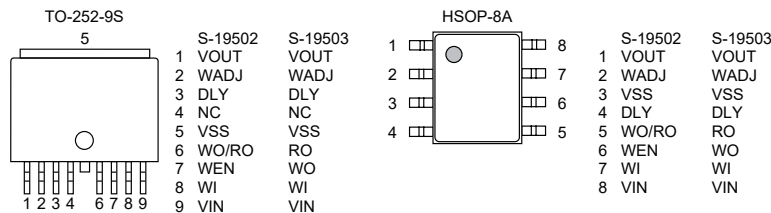
Overall

- Current consumption: 60 μA typ. ($I_{OUT} = 0$ mA, During the watchdog timer deactivation)
75 μA typ. ($I_{OUT} \leq 5$ mA, During the watchdog timer activation)
 $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time and the watchdog trigger time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19506/19507 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 500 mA, BUILT-IN WATCHDOG TIMER
VOLTAGE REGULATOR WITH RESET FUNCTION**

Features

Regulator block

- Output voltage: 3.3 V, 5.0 V
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_J = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 100 mV typ. (5.0 V output product, $I_{OUT} = 100$ mA)
- Output current: Possible to output 500 mA ($V_{IN} = V_{OUT(S)} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 1.0 μF or more can be used.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.

Detector block

- Detection voltage: 2.6 V to 4.7 V, selectable in 0.1 V step
- Detection voltage accuracy: $\pm 2.0\%$ ($T_J = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 20 ms typ. ($C_{DLY} = 10$ nF)

Watchdog timer block

- Watchdog activation current is adjustable: 1.5 mA typ. (WADJ pin is open)
- Watchdog trigger time is adjustable^{*2}: 46 ms typ. ($C_{DLY} = 10$ nF)
- Product type is selectable: S-19506 Series (Product with WEN pin (Output: WO / RO pin))
S-19507 Series (Product without WEN pin (Output: WO pin and RO pin))
- Autonomous watchdog operation function: Watchdog timer operates due to detection of load current.
- Watchdog mode: Time-out mode

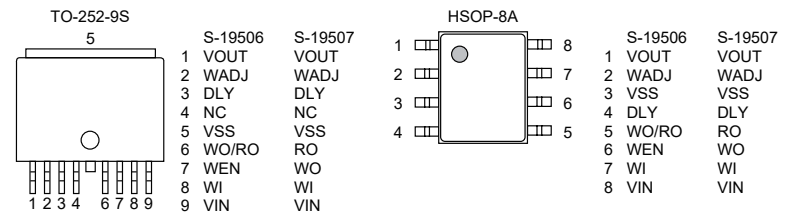
Overall

- Current consumption: 3.0 μA typ. (During watchdog timer deactivation)
5.0 μA typ. (During watchdog timer activation)
 $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time and the watchdog trigger time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19516/19517 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 500 mA, BUILT-IN WINDOW WATCHDOG TIMER
VOLTAGE REGULATOR WITH RESET FUNCTION**

Features

Regulator block

- Output voltage: 3.3 V, 5.0 V
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 100 mV typ. (5.0 V output product, $I_{\text{OUT}} = 100$ mA)
- Output current: Possible to output 500 mA ($V_{\text{IN}} = V_{\text{OUT(S)}} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 1.0 μF or more can be used.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.

Detector block

- Detection voltage: 2.6 V to 4.7 V, selectable in 0.1 V step
- Detection voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 20 ms typ. ($C_{\text{DLY}} = 10$ nF)

Watchdog timer block

- Watchdog activation current is adjustable: 1.5 mA typ. (WADJ pin is open)
- Watchdog trigger time is adjustable^{*2}: 46 ms typ. ($C_{\text{DLY}} = 10$ nF)
- Product type is selectable: S-19516 Series (Product with WEN pin (Output: WO / RO pin))
S-19517 Series (Product without WEN pin (Output: WO pin and RO pin))
- Autonomous watchdog operation function: Watchdog timer operates due to detection of load current.
- Watchdog mode: Window mode

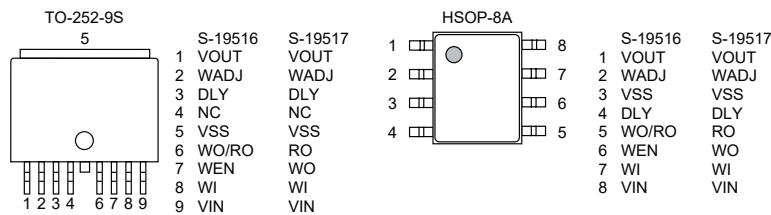
Overall

- Current consumption: 3.0 μA typ. (During watchdog timer deactivation)
5.0 μA typ. (During watchdog timer activation)
 $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time and the watchdog trigger time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19509 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 500 mA, BUILT-IN WATCHDOG TIMER
VOLTAGE REGULATOR WITH RESET FUNCTION**

Features

Regulator block

- Output voltage: 3.3 V, 5.0 V
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 100 mV typ. (5.0 V output product, $I_{\text{OUT}} = 100$ mA)
- Output current: Possible to output 500 mA ($V_{\text{IN}} = V_{\text{OUT(S)}} + 1.0$ V)^{*1}
- Input and output capacitors: A ceramic capacitor of 1.0 μF or more can be used.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in ON / OFF circuit: Ensures long battery life.

Detector block

- Detection voltage: 2.6 V to 4.7 V, selectable in 0.1 V step
- Detection voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable^{*2}: 20 ms typ. ($C_{\text{DLY}} = 10$ nF)

Watchdog timer block

- Watchdog activation current: 1.5 mA typ. (WADJ pin is open)
- Watchdog trigger time is adjustable^{*2}: 46 ms typ. ($C_{\text{DLY}} = 10$ nF)
- Product type is selectable: S-19509A Series
(TO-252-9S package product, HSOP-8A package product)
S-19509B Series (HTSSOP-16 package product)
- Autonomous watchdog operation function: Watchdog timer operates due to detection of load current.
- Watchdog mode: Time-out mode

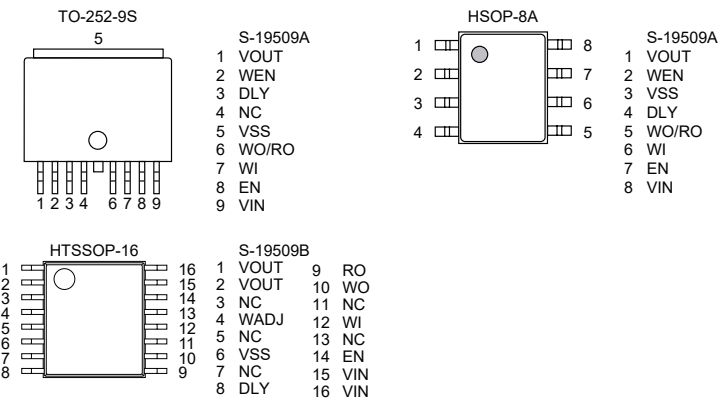
Overall

- Current consumption: 3.2 μA typ. (During regulator operation, during watchdog timer deactivation)
0.1 μA typ. (During regulator stop)
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*3}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time and the watchdog trigger time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19519 Series

AUTOMOTIVE, 125°C OPERATION, 36 V INPUT, 500 mA, BUILT-IN WINDOW WATCHDOG TIMER VOLTAGE REGULATOR WITH RESET FUNCTION

Features

Regulator block

- Output voltage: 3.3 V, 5.0 V
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 100 mV typ. (5.0 V output product, $I_{OUT} = 100$ mA)
- Output current: Possible to output 500 mA ($V_{IN} = V_{OUT(S)} + 1.0$ V)*1
- Input and output capacitors: A ceramic capacitor of 1.0 μF or more can be used.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in ON / OFF circuit: Ensures long battery life.

Detector block

- Detection voltage: 2.6 V to 4.7 V, selectable in 0.1 V step
- Detection voltage accuracy: $\pm 2.0\%$ ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable*2: 20 ms typ. ($C_{DLY} = 10$ nF)

Watchdog timer block

- Watchdog activation current: 1.5 mA typ. (WADJ pin is open)
- Watchdog trigger time is adjustable*2: 46 ms typ. ($C_{DLY} = 10$ nF)
- Product type is selectable: S-19519A Series (TO-252-9S package product, HSOP-8A package product) S-19519B Series (HTSSOP-16 package product)
- Autonomous watchdog operation function: Watchdog timer operates due to detection of load current.
- Watchdog mode: Window mode

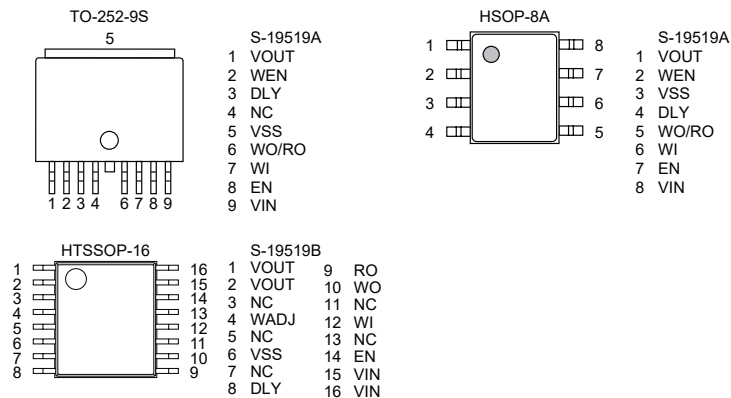
Overall

- Current consumption: 3.2 μA typ. (During regulator operation, during watchdog timer deactivation) 0.1 μA typ. (During regulator stop)
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*3

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. The release delay time and the watchdog trigger time can be adjusted by connecting C_{DLY} to the DLY pin.

*3. Contact our sales representatives for details.



S-19400/19401 Series

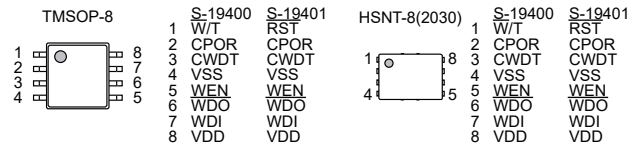
**AUTOMOTIVE, 125°C OPERATION,
3.8 μA CURRENT CONSUMPTION
WATCHDOG TIMER WITH RESET FUNCTION**

Features

- Detection voltage: 2.0 V to 5.0 V, selectable in 0.1 V step
- Detection voltage accuracy: ±2.0%
- Input voltage: $V_{DD} = 0.9 \text{ V to } 6.0 \text{ V}$
- Hysteresis width: 5% typ.
- Current consumption during watchdog timer operation: 3.8 μA typ.
- Reset time-out period: 14.5 ms typ. ($C_{POR} = 2200 \text{ pF}$)
- Watchdog time-out period: 24.6 ms typ. ($C_{WDT} = 470 \text{ pF}$)
- Watchdog operation is switchable: Enable, Disable
- Watchdog operation voltage range: $V_{DD} = 2.5 \text{ V to } 6.0 \text{ V}$
- Watchdog mode switching function*1: Time-out mode, window mode
- Watchdog input edge is selectable: Rising edge, falling edge, both rising and falling edges
- Product type is selectable: S-19400 Series
(Product with \overline{W} / T pin (Output: \overline{WDO} pin))
S-19401 Series
(Product without \overline{W} / T pin (Output: \overline{RST} pin, \overline{WDO} pin))
 $T_a = -40^\circ\text{C to } +125^\circ\text{C}$
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*2

*1. The S-19401 Series is fixed to the window mode.

*2. Contact our sales representatives for details.



S-19405 Series

**AUTOMOTIVE, 125°C OPERATION,
3.8 μA CURRENT CONSUMPTION
WATCHDOG TIMER WITH RESET FUNCTION**

Features

- Detection voltage: 2.0 V to 5.0 V, selectable in 0.1 V step
- Detection voltage accuracy: ±2.0%
- Input voltage: $V_{DD} = 0.9 \text{ V to } 6.0 \text{ V}$
- Hysteresis width: 5% typ.
- Current consumption during watchdog timer operation: 3.8 μA typ.
- Reset time-out period: 14.5 ms typ. ($C_{POR} = 2200 \text{ pF}$)
- Watchdog time-out period: 24.6 ms typ. ($C_{WDT} = 470 \text{ pF}$)
- Watchdog operation is switchable: Enable, Disable
- Watchdog operation voltage range: $V_{DD} = 2.5 \text{ V to } 6.0 \text{ V}$
- Watchdog input edge is selectable: Rising edge, falling edge
- Operation temperature range: $T_a = -40^\circ\text{C to } +125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



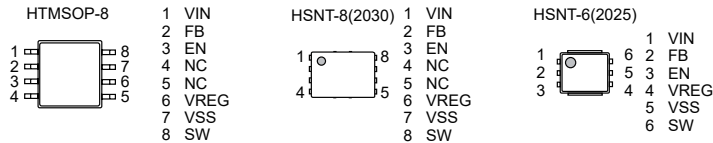
S-19902A/19902B/19903A/19903B Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 600 mA SYNCHRONOUS
STEP-DOWN SWITCHING REGULATOR**

Features

- Input voltage: 4.0 V to 36.0 V
- Output voltage (externally set): 2.5 V to 12.0 V
- Output current: 600 mA
- FB pin voltage accuracy: ±1.5%
- Efficiency: 91%
- Oscillation frequency: 2.2 MHz typ.
- Overcurrent protection function: 1.2 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



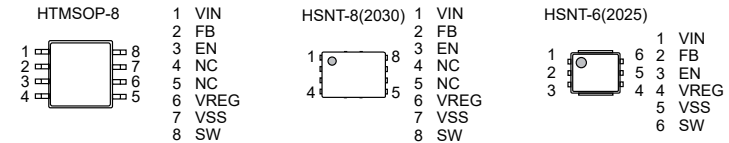
S-19932A/19932B/19933A/19933B Series

**AUTOMOTIVE, 125°C OPERATION,
18 V INPUT, 600 mA SYNCHRONOUS
STEP-DOWN SWITCHING REGULATOR**

Features

- Input voltage: 4.0 V to 18.0 V
- Output voltage (externally set): 1.0 V to 12.0 V
- Output current: 600 mA
- FB pin voltage accuracy: ±1.5%
- Efficiency: 91%
- Oscillation frequency: 2.2 MHz typ.
- Overcurrent protection function: 1.2 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



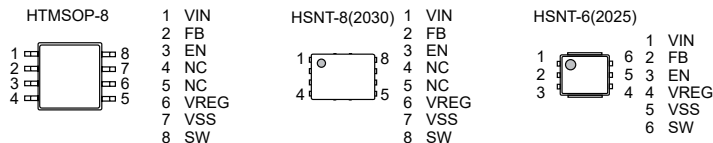
S-19902C/19902D/19903C/19903D Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 600 mA SYNCHRONOUS
STEP-DOWN SWITCHING REGULATOR**

Features

- Input voltage: 4.0 V to 36.0 V
- Output voltage (externally set): 2.5 V to 12.0 V
- Output current: 600 mA
- FB pin voltage accuracy: ±1.5%
- Efficiency: 95%
- Oscillation frequency: 400 kHz typ.
- Overcurrent protection function: 1.2 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



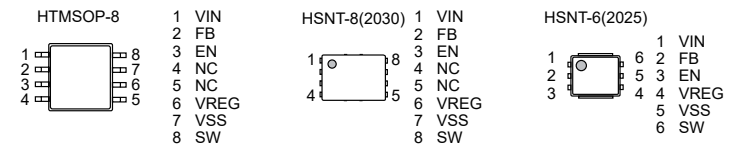
S-19932C/19932D/19933C/19933D Series

**AUTOMOTIVE, 125°C OPERATION,
18 V INPUT, 600 mA SYNCHRONOUS
STEP-DOWN SWITCHING REGULATOR**

Features

- Input voltage: 4.0 V to 18.0 V
- Output voltage (externally set): 2.5 V to 12.0 V
- Output current: 600 mA
- FB pin voltage accuracy: ±1.5%
- Efficiency: 95%
- Oscillation frequency: 400 kHz typ.
- Overcurrent protection function: 1.2 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



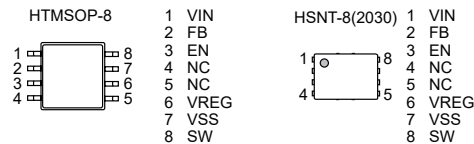
S-19904A/19904B/19905A/19905B Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 1 A, SYNCHRONOUS
STEP-DOWN SWITCHING REGULATOR**

Features

- Input voltage: 4.0 V to 36.0 V
- Output voltage (externally set): 2.5 V to 12.0 V
- Output current: 1 A
- FB pin voltage accuracy: ±1.5%
- Efficiency: 91%
- Oscillation frequency: 2.2 MHz typ.
- Overcurrent protection function: 1.85 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



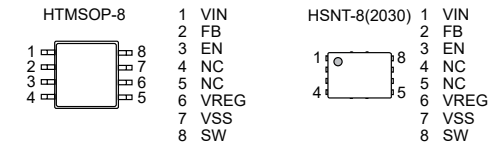
S-19914A/19914B/19915A/19915B Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 1 A, LOW EMI, SYNCHRONOUS
STEP-DOWN SWITCHING REGULATOR**

Features

- Input voltage: 4.0 V to 36.0 V
- Output voltage (externally set): 2.5 V to 12.0 V
- Output current: 1 A
- FB pin voltage accuracy: ±1.5%
- Efficiency: 91%
- Oscillation frequency: 2.2 MHz typ.
- Spread spectrum clock generation function: F_{SSS} = +6% typ. (Diffusion rate)
- Overcurrent protection function: 1.85 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



S-19912A/19912B/19913A/19913B Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 600 mA, LOW EMI, SYNCHRONOUS
STEP-DOWN SWITCHING REGULATOR**

Features

- Input voltage: 4.0 V to 36.0 V
- Output voltage (externally set): 2.5 V to 12.0 V
- Output current: 600 mA
- FB pin voltage accuracy: ±1.5%
- Efficiency: 91%
- Oscillation frequency: 2.2 MHz typ.
- Spread spectrum clock generation function: F_{SSS} = +6% typ. (Diffusion rate)
- Overcurrent protection function: 1.2 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 in qualified*1

*1. Contact our sales representatives for details.



S-19934A/19934B/19935A/19935B Series

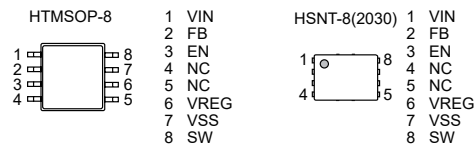
AUTOMOTIVE, 125°C OPERATION, 18 V INPUT, 1 A, SYNCHRONOUS STEP-DOWN SWITCHING REGULATOR

● Features

- Input voltage: 4.0 V to 18.0 V
- Output voltage (externally set): 1.0 V to 12.0 V
- Output current: 1 A
- FB pin voltage accuracy: ±1.5%
- Efficiency: 91%
- Oscillation frequency: 2.2 MHz typ.
- Overcurrent protection function: 1.85 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free

- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



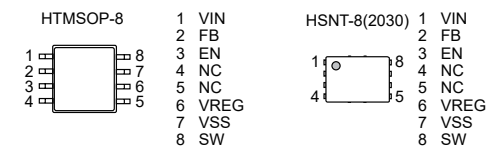
S-19944A/19944B/19945A/19945B Series

AUTOMOTIVE, 125°C OPERATION, 18 V INPUT, 1 A, LOW EMI, SYNCHRONOUS STEP-DOWN SWITCHING REGULATOR

● Features

- Input voltage: 4.0 V to 18.0 V
- Output voltage (externally set): 1.0 V to 12.0 V
- Output current: 1 A
- FB pin voltage accuracy: ±1.5%
- Efficiency: 91%
- Oscillation frequency: 2.2 MHz typ.
- Spread spectrum clock generation function: F_{SS} = +6% typ. (Diffusion rate)
- Overcurrent protection function: 1.85 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



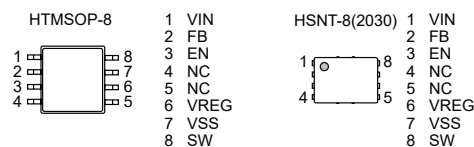
S-19942A/19942B/19943A/19943B Series

AUTOMOTIVE, 125°C OPERATION, 18 V INPUT, 600 mA, LOW EMI, SYNCHRONOUS STEP-DOWN SWITCHING REGULATOR

● Features

- Input voltage: 4.0 V to 18.0 V
- Output voltage (externally set): 1.0 V to 12.0 V
- Output current: 600 mA
- FB pin voltage accuracy: ±1.5%
- Efficiency: 91%
- Oscillation frequency: 2.2 MHz typ.
- Spread spectrum clock generation function: F_{SS} = +6% typ. (Diffusion rate)
- Overcurrent protection function: 1.2 A typ. (pulse-by-pulse method)
- Thermal shutdown function: 170°C typ. (detection temperature)
- Short-circuit protection function: Hiccup control, Latch control
- 100% duty cycle operation:
- Soft-start function: 5.8 ms typ.
- Under voltage lockout function (UVLO): 3.35 V typ. (detection voltage)
- Input and output capacitors: Ceramic capacitor compatible
- Operation temperature range: Ta = -40°C to +125°C
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified*1

*1. Contact our sales representatives for details.



S-19700 Series

**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 400 mA VOLTAGE REGULATOR
WITH CURRENT MONITOR AND ADJUSTABLE CURRENT LIMIT**

● Features

- Output voltage (externally set): 3.3 V to 20.0 V, settable via an external resistor
- Output voltage (internally set): 3.3 V to 15.0 V, selectable in 0.1 V step
- Input voltage: 4.5 V to 36.0 V
- Output voltage accuracy: $\pm 2.3\%$ ($1.0 \text{ mA} \leq I_{OUT} \leq 30 \text{ mA}$, $T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 240 mV typ. (3.3 V output product, $I_{OUT} = 300 \text{ mA}$)
- Current consumption: During operation: 80 μA typ., 170 μA max. ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
During power-off: 1.0 μA typ., 5.0 μA max. ($T_j = -40^\circ\text{C}$ to $+90^\circ\text{C}$)
- Output current: Possible to output 400 mA ($V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)^{*1}
- Output capacitor: A ceramic capacitor of 4.7 μF or more can be used.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in overvoltage detection circuit: Detects an output short-circuit of the higher voltage.
- Built-in ON / OFF circuit: Ensures long battery life.
- Constant current source pull-down is selectable.
- Current monitoring function: Possible to monitor load current by monitoring the CSO pin voltage.
- Current limit function: Possible to adjust a current limit value via an external resistor.
- Reverse current protection function: $I_{REV} = 45 \mu\text{A}$ max.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



S-19701 Series

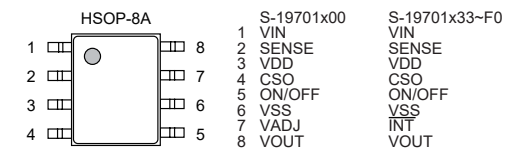
**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 600 mA VOLTAGE REGULATOR
WITH CURRENT MONITOR AND ADJUSTABLE CURRENT LIMIT**

● Features

- Output voltage (externally set): 3.3 V to 20.0 V, settable via an external resistor
- Output voltage (internally set): 3.3 V to 15.0 V, selectable in 0.1 V step
- Input voltage: 4.5 V to 36.0 V
- Output voltage accuracy: $\pm 2.3\%$ ($1.0 \text{ mA} \leq I_{OUT} \leq 30 \text{ mA}$, $T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
- Dropout voltage: 240 mV typ. (3.3 V output product, $I_{OUT} = 300 \text{ mA}$)
- Current consumption: During operation: 80 μA typ., 170 μA max. ($T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$)
During power-off: 1.0 μA typ., 5.0 μA max. ($T_j = -40^\circ\text{C}$ to $+90^\circ\text{C}$)
- Output current: Possible to output 600 mA ($V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$)^{*1}
- Output capacitor: A ceramic capacitor of 4.7 μF or more can be used.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in overvoltage detection circuit: Detects an output short-circuit of the higher voltage.
- Built-in ON / OFF circuit: Ensures long battery life.
- Constant current source pull-down is selectable.
- Current monitoring function: Possible to monitor load current by monitoring the CSO pin voltage.
- Current limit function: Possible to adjust a current limit value via an external resistor.
- Reverse current protection function: $I_{REV} = 45 \mu\text{A}$ max.
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified^{*2}

*1. Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

*2. Contact our sales representatives for details.



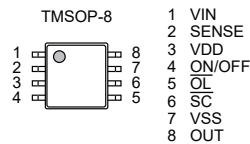
S-19680 Series

**AUTOMOTIVE, 105°C OPERATION,
HIGH SIDE SWITCH
WITH CURRENT MONITOR**

Features

- Power supply voltage: $V_{DD} = 2.7\text{ V to }10.0\text{ V}$
- Current consumption during operation: $I_{SS1} = 12\ \mu\text{A typ.}, I_{SS1} = 24\ \mu\text{A max.}$ ($T_J = -40^\circ\text{C to }+105^\circ\text{C}$)
- ON resistance: $R_{ON} = 1.1\ \Omega\ \text{typ.}, R_{ON} = 3.7\ \Omega\ \text{max.}$ ($T_J = -40^\circ\text{C to }+105^\circ\text{C}$)
- Limit current: 40 mA to 100 mA, selectable in 10 mA step
- Load short-circuit detection current: $I_{LIM} \times 0.3\ \text{to } I_{LIM} \times 1.0$ ($I_{SHORT} \geq 30\ \text{mA}$), selectable in 0.1 step
- Load open detection current: 2.5 mA to 30 mA, selectable in 2.5 mA step
- Built-in thermal shutdown circuit: Detection temperature 165°C typ.
Selectable in hysteresis type or latch type
Ensures long battery life.
- Built-in ON / OFF circuit: Ensures long battery life.
- Operation temperature range: $T_a = -40^\circ\text{C to }+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified *1

*1. Contact our sales representatives for details.



S-19682B Series

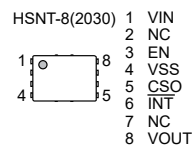
**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 300 mA, HIGH SIDE SWITCH
WITH CURRENT MONITOR**

Features

- Input voltage: 4.5 V to 36.0 V
- Current consumption: During operation: $55\ \mu\text{A typ.}, 95\ \mu\text{A max.}$ ($T_J = -40^\circ\text{C to }+150^\circ\text{C}$)
During power-off: $0.6\ \mu\text{A typ.}, 2.0\ \mu\text{A max.}$ ($T_J = -40^\circ\text{C to }+125^\circ\text{C}$)
- ON resistance: $R_{ON} = 0.6\ \Omega\ \text{typ.}, 1.0\ \Omega\ \text{max.}$ ($T_J = -40^\circ\text{C to }+125^\circ\text{C}$)
- Limit current: 100 mA to 300 mA, selectable in 10 mA step
- Limit current accuracy: $\pm 10\%$ ($I_{LIM(S)} = 200\ \text{mA to }300\ \text{mA}$)
- Current monitor function: Possible to monitor load current by monitoring the CSO pin voltage.
- Built-in thermal shutdown circuit: Latch type*1, detection temperature 170°C typ.
- Built-in overvoltage detection circuit: Detects an output short-circuit of the higher voltage.
- Built-in ON / OFF circuit: Ensures long battery life.
- Under voltage lockout function (UVLO): 2.6 V typ. (Detection voltage)
- Operation temperature range: $T_a = -40^\circ\text{C to }+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 in process*2

*1. Please contact our sales representatives for products with hysteresis type.

*2. Contact our sales office for details.



S-19683B Series

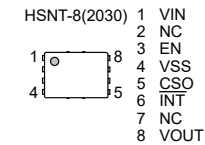
**AUTOMOTIVE, 125°C OPERATION,
36 V INPUT, 600 mA, HIGH SIDE SWITCH
WITH CURRENT MONITOR**

Features

- Input voltage: 4.5 V to 36.0 V
- Current consumption: During operation: $55\ \mu\text{A typ.}, 95\ \mu\text{A max.}$ ($T_J = -40^\circ\text{C to }+150^\circ\text{C}$)
During power-off: $0.6\ \mu\text{A typ.}, 2.0\ \mu\text{A max.}$ ($T_J = -40^\circ\text{C to }+125^\circ\text{C}$)
- ON resistance: $R_{ON} = 0.6\ \Omega\ \text{typ.}, 1.0\ \Omega\ \text{max.}$ ($T_J = -40^\circ\text{C to }+125^\circ\text{C}$)
- Limit current: 300 mA to 600 mA, selectable in 10 mA step
- Limit current accuracy: $\pm 10\%$
- Current monitor function: Possible to monitor load current by monitoring the CSO pin voltage.
- Built-in thermal shutdown circuit: Latch type*1, detection temperature 170°C typ.
- Built-in overvoltage detection circuit: Detects an output short-circuit of the higher voltage.
- Built-in ON / OFF circuit: Ensures long battery life.
- Under voltage lockout function (UVLO): 2.6 V typ. (Detection voltage)
- Operation temperature range: $T_a = -40^\circ\text{C to }+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 in process*2

*1. Please contact our sales representatives for products with hysteresis type.

*2. Contact our sales office for details.



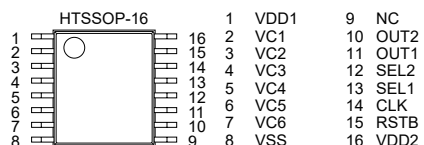
S-19192 Series

AUTOMOTIVE, 105°C OPERATION, BATTERY MONITORING IC FOR 3-SERIAL TO 6-SERIAL CELL PACK

Features

- High-accuracy voltage detection circuit for each cell
 - Overcharge detection voltage n (n = 1 to 6): 2.500 V to 4.500 V (25 mV step) Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$)
Accuracy ± 30 mV ($T_a = -5^\circ\text{C}$ to $+55^\circ\text{C}$)
 - Overcharge release voltage n (n = 1 to 6): 2.300 V to 4.500 V¹ Accuracy ± 50 mV
 - Overdischarge detection voltage n (n = 1 to 6): 1.500 V to 3.000 V (100 mV step)^{2, *3} Accuracy ± 80 mV
 - Overdischarge release voltage n (n = 1 to 6): 1.500 V to 3.300 V⁴ Accuracy ± 100 mV
- Self-test results to confirm overcharge and overdischarge detection operations can be output from OUT2 pin.
 - Delay time shortening during self-test: Available, unavailable
 - Self-test result output latch: Available, unavailable
- Each delay time is settable by an internal circuit only (External capacitors are not necessary).
 - Detection delay time: 32 ms, 64 ms, 128 ms, 256 ms
 - Release delay time: 2.0 ms, 4.0 ms, 8.0 ms, 16.0 ms
- Switching control for 3-serial to 6-serial cell is possible by inputting voltage to the SEL1 pin and the SEL2 pin.
- Two detection signal types:
 - Common: OUT1 pin: Overcharge and overdischarge detection signal
 - Separate: OUT1 pin: Overcharge detection signal
OUT2 pin: Overdischarge detection signal
- Output form: CMOS output, Nch open-drain output
- Output logic: Active "H", active "L"
- High-withstand voltage: Absolute maximum rating 28.0 V
- Wide operation voltage range: 6.0 V to 28.0 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Low current consumption
 - During operation: 18 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified⁵
- This IC has been developed for the battery management system in accordance with ISO 26262. ABLIC Inc. can provide a safety manual for this IC.^{5, *6}

- Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage n (n = 1 to 6) is selectable from 0 V to 400 mV in 50 mV step.)
- Set the voltage difference between the overcharge detection voltage and overdischarge detection voltage to 2.5 V or lower.
Set the voltage ratio so that the following formula is satisfied:
 $\text{Overcharge detection voltage} \times 0.7 > \text{Overdischarge detection voltage}$
- When the S-19192 Series is used for monitoring a 3-serial-cell battery, set the overdischarge detection voltage n (n = 1 to 6) to 2.0 V or higher.
- Overdischarge release voltage = Overdischarge detection voltage + Overdischarge hysteresis voltage (Overdischarge hysteresis voltage n (n = 1 to 6) is selectable from 0 V to 0.7 V in 100 mV step.)
- Contact our sales representatives for details.
- A Non-Disclosure Agreement is necessary when providing the documents.



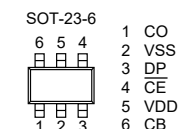
S-19190 Series

AUTOMOTIVE, 105°C OPERATION, VOLTAGE MONITORING IC WITH CELL BALANCING FUNCTION

Features

- High-accuracy voltage detection circuit
 - Cell balancing detection voltage: 2.0 V to 4.6 V (5 mV step) Accuracy ± 12 mV ($2.0 \text{ V} \leq V_{BU} < 2.4 \text{ V}$)
Accuracy $\pm 0.5\%$ ($2.4 \text{ V} \leq V_{BU} \leq 4.6 \text{ V}$)
 - Cell balancing release voltage: 2.0 V to 4.6 V¹ Accuracy ± 24 mV ($2.0 \text{ V} \leq V_{BL} < 2.4 \text{ V}$)
Accuracy $\pm 1.0\%$ ($2.4 \text{ V} \leq V_{BL} \leq 4.6 \text{ V}$)
 - Overcharge detection voltage: 2.0 V to 4.6 V (5 mV step) Accuracy ± 12 mV ($2.0 \text{ V} \leq V_{CU} < 2.4 \text{ V}$)
Accuracy $\pm 0.5\%$ ($2.4 \text{ V} \leq V_{CU} \leq 4.6 \text{ V}$)
 - Overcharge release voltage: 2.0 V to 4.6 V² Accuracy ± 24 mV ($2.0 \text{ V} \leq V_{CL} < 2.4 \text{ V}$)
Accuracy $\pm 1.0\%$ ($2.4 \text{ V} \leq V_{CL} \leq 4.6 \text{ V}$)
- Built-in Nch transistor with ON resistance of 5 Ω typ. between the CB pin and the VSS pin
- Current consumption: 2.0 μA max. ($T_a = +25^\circ\text{C}$)
- Delay times are generated only by an internal circuit (External capacitors are unnecessary).
- CO pin output form and output logic are selectable: CMOS output Active "H", active "L"
Nch open-drain output Active "H", active "L"
- Switchable to power-saving mode by using the $\overline{\text{CE}}$ pin
- Operation temperature range: $T_a = -40^\circ\text{C}$ to $+105^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified³

- Cell balancing release voltage = Cell balancing detection voltage – Cell balancing hysteresis voltage (Cell balancing hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 50 mV step.)
- Overcharge release voltage = Overcharge detection voltage – Overcharge hysteresis voltage (Overcharge hysteresis voltage can be selected as 0 V or from a range of 0.1 V to 0.7 V in 50 mV step.)
- Contact our sales representatives for details.



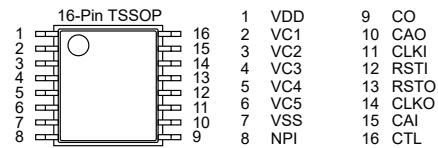
S-8235A Series

FOR AUTOMOTIVE BATTERY PROTECTION IC FOR 3-SERIAL TO 5-SERIAL CELL PACK (SECONDARY PROTECTION)

● Features

- High-accuracy voltage detection circuit for each cell
 - Overcharge detection voltage n (n = 1 to 5)
 - 3.60 V to 4.50 V (50 mV step)
 - Accuracy ± 20 mV ($T_a = +25^\circ\text{C}$)
 - Accuracy ± 30 mV ($T_a = -5^\circ\text{C}$ to $+55^\circ\text{C}$)
 - Overcharge hysteresis voltage n (n = 1 to 5)
 - 0.0 mV to -550 mV (50 mV step)
 - -300 mV to -550 mV Accuracy $\pm 20\%$
 - -100 mV to -250 mV Accuracy ± 50 mV
 - 0.0 mV to -50 mV Accuracy ± 25 mV
- Self-test operation to confirm overcharge detection is available.
- Cascade connection is available.
- Delay times for overcharge detection can be set by an internal circuit only (External capacitors are unnecessary).
- High-withstand voltage: Absolute maximum rating 26 V
- Wide operation voltage range: 6 V to 24 V
- Wide operation temperature range: $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$
- Low current consumption
 - At $V_{\text{CUn}} - 1.0$ V for each cell: 10 μA max. ($T_a = +25^\circ\text{C}$)
 - At 2.3 V for each cell: 8 μA max. ($T_a = +25^\circ\text{C}$)
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified ^{*1}

*1. Contact our sales office for details.

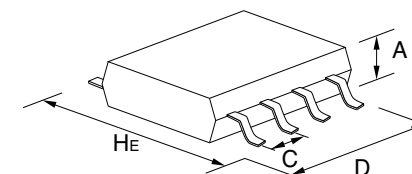


Package List

Package Type	Pin Count	Package Name	Package Size (mm)			Pitch (mm)
			H _E	D	A (max.)	C
Lead insertion type	3	TO-92	7.0	5.2	4.2	2.5/1.27
	3	TO-92S	4.95	4.1	1.62	2.5/1.27
Flat-lead type	3	SOT-89-3	4.0	4.5	1.6	1.5
	5	SOT-89-5	4.5	4.5	1.6	1.5
Gull-wing type	4	SC-82AB	2.1	2.0	1.1	1.3
	5	SC-88A	2.1	2.0	1.1	0.65
	3	SOT-23-3	2.8	2.9	1.3	1.9
	3	SOT-23-3S	2.8	2.9	1.2	1.9
	3	TSOT-23-3S	2.85	2.9	0.8	1.9
	5	SOT-23-5	2.8	2.9	1.3	0.95
	6	SOT-23-6	2.8	2.9	1.35	0.95
	6	SOT-23-6W	2.8	2.9	1.3	0.95
	8	8-Pin SOP (JEDEC)	6.0	5.02	1.75	1.27
	8	8-Pin TSSOP	6.4	3.0	1.1	0.65
	8	8-Pin TSSOP	6.4	3.0	1.1	0.65
	16	16-Pin TSSOP	6.4	5.1	1.1	0.65
	20	20-Pin TSSOP	6.4	6.5	1.2	0.65
	24	24-Pin SSOP	7.6	7.9	1.4	0.65
	8	TMSOP-8	4.0	2.9	0.8	0.65
	8	HTMSOP-8	4.0	2.9	0.8	0.65
	16	HTSSOP-16	6.4	5.12	1.1	0.65
	6	HSOP-6	6.0	5.02	1.75	1.91
	8	HSOP-8A	6.0	5.02	1.68	1.27
	8	HSOP-8A	6.0	5.02	1.65	1.27
	8	HSOP-8Q	6.0	5.02	1.68	1.27
	5	TO-252-5S(A)	6.5	6.5	1.4	1.27
	9	TO-252-9S	6.5	6.5	1.4	0.65

Package Type	Pin Count	Package Name	Package Size (mm)			Pitch (mm)
			H _E	D	A (max.)	C
Non-lead type	6	6-Pin HSON(A)	3.0	2.9	0.9	0.95
	6	SON-6C	2.55	1.56	0.65	0.5
	4	SNT-4A	1.6	1.2	0.5	0.65
	6	SNT-6A SNT-6A(H)	1.8	1.57	0.5	0.5
	8	SNT-8A	2.46	1.97	0.5	0.5
	4	HSNT-4(0808)	0.8	0.8	0.4	0.4
	4	HSNT-4(0808)B	0.8	0.8	0.41	0.4
	4	HSNT-4(1010)	1.0	1.0	0.4	0.65
	4	HSNT-4(1010)B	1.0	1.0	0.41	0.65
	6	HSNT-6(1212)	1.2	1.2	0.4	0.4
	6	HSNT-6A	2.46	1.96	0.5	0.5
	6	HSNT-6(2025)	2.46	1.96	0.5	0.5
	8	HSNT-8(1616)	1.6	1.6	0.4	0.4
	8	HSNT-8(2030)	3.0	2.0	0.5	0.5
	6	DFN-6(1414)A	1.4	1.4	0.6	0.5
	6	DFN-6(1518)A	1.8	1.5	0.33	0.5
	8	DFN-8(1616)A	1.6	1.6	0.6	0.4
	8	DFN-8(2030)	3.0	2.0	0.5	0.5
	8	DFN-8(2030)A	3.0	2.0	0.6	0.5
	8	DFN-8(2030)B	3.0	2.0	0.8	0.5

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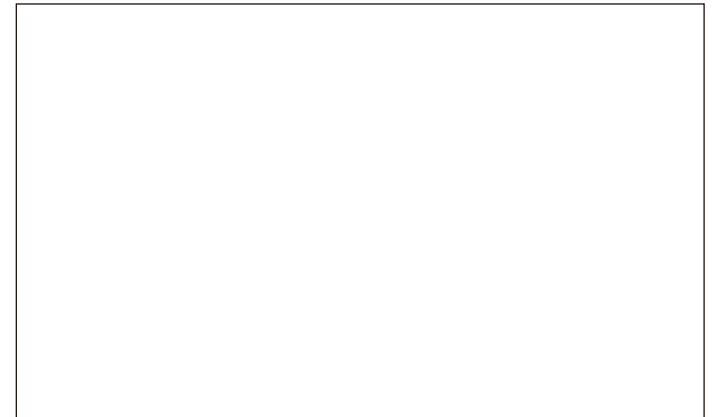
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