

# Product Catalogue

## Automotive ICs (Power Management ICs)

**2020-2021**



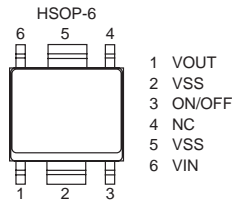
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**S-1142C/DxxA Series****HIGH-WITHSTAND VOLTAGE LOW CURRENT CONSUMPTION  
LOW DROPOUT CMOS VOLTAGE REGULATOR****● Features**

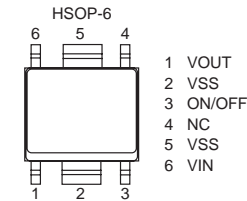
- Output voltage: 2.0 V to 12.0 V, selectable in 0.1 V step
- Input voltage: 3.0 V to 50 V
- Output voltage accuracy:  $\pm 1.0\%$  ( $T_j = +25^\circ\text{C}$ )  
 $\pm 4.0\%$  ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Current consumption: During operation: 4.0  $\mu\text{A}$  typ., 15.0  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+135^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 3.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+135^\circ\text{C}$ )  
Possible to output 200 mA ( $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$ )\*<sup>1</sup>  
A ceramic capacitor of 0.1  $\mu\text{F}$  or more can be used.
- Output current: A ceramic capacitor of 0.1  $\mu\text{F}$  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  $+125^\circ\text{C}$
- 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  $\mu\text{A}$  typ., 9.0  $\mu\text{A}$  max. ( $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 2.5  $\mu\text{A}$  max. ( $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
Possible to output 200 mA ( $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$ )\*<sup>1</sup>  
A ceramic capacitor of 0.1  $\mu\text{F}$  or more can be used.
- Output current: A ceramic capacitor of 0.1  $\mu\text{F}$  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.

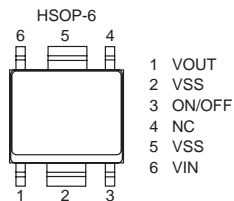




**S-1142C/DxxH Series****HIGH-WITHSTAND VOLTAGE LOW CURRENT CONSUMPTION  
LOW DROPOUT 105°C OPERATION CMOS VOLTAGE REGULATOR****● Features**

- 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  $\mu\text{A}$  typ., 9.0  $\mu\text{A}$  max. ( $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 2.5  $\mu\text{A}$  max. ( $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
Possible to output 200 mA ( $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$ )<sup>\*1</sup>  
A ceramic capacitor of 0.1  $\mu\text{F}$  or more can be used.
- Output current: A ceramic capacitor of 0.1  $\mu\text{F}$  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

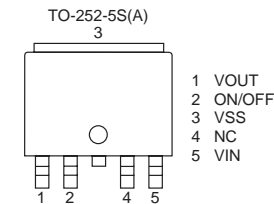
\*1. Attention should be paid to the power dissipation of the package when the output current is large.

**S-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  $\mu\text{A}$  typ., 15.0  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+135^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 3.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+135^\circ\text{C}$ )  
Possible to output 200 mA ( $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$ )<sup>\*1</sup>  
A ceramic capacitor of 0.1  $\mu\text{F}$  or more can be used.
- Output current: A ceramic capacitor of 0.1  $\mu\text{F}$  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  $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 65 V load dump
- AEC-Q100 qualified<sup>\*2</sup>

\*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 office for details.



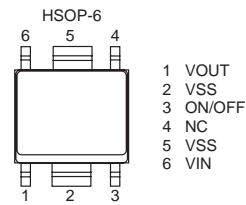
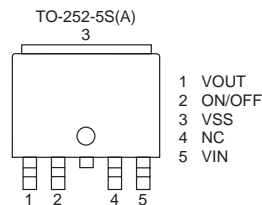
## S-19200A/BxxH Series

**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  $\mu\text{A}$  typ., 9.0  $\mu\text{A}$  max. ( $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 2.5  $\mu\text{A}$  max. ( $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )
- Output current: Possible to output 200 mA ( $V_{IN} \geq V_{OUT(S)} + 2.0\text{ V}$ )<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 0.1  $\mu\text{F}$  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
- Withstand 65 V load dump
- AEC-Q100 qualified<sup>\*2</sup>

\*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 office for details.



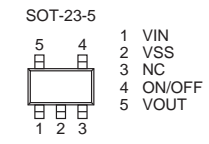
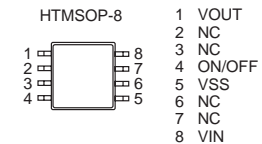
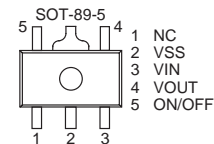
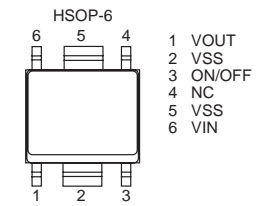
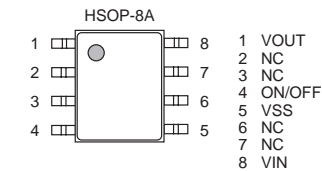
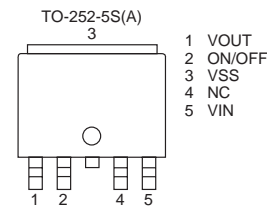
## S-19212B/DxxA Series

**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  $\mu\text{A}$  typ., 8.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 3.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Output current: Possible to output 250 mA (at  $V_{IN} \geq V_{OUT(S)} + 2.0\text{ V}$ )<sup>\*1</sup>
- Input capacitor: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  or more)
- Output capacitor: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  to 100  $\mu\text{F}$ )
- 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  $+125^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified<sup>\*2</sup>

\*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.



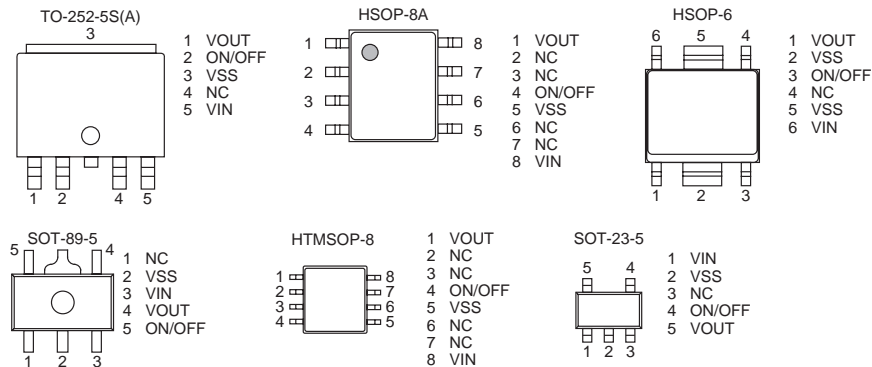
## S-19212B/DxxH Series

**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  $\mu\text{A}$  typ., 8.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 3.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )
- Output current: Possible to output 250 mA (at  $V_{IN} \geq V_{OUT(S)} + 2.0\text{ V}$ )<sup>\*1</sup>
- Input capacitor: A ceramic capacitor can be used.
- Output capacitor: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  or more)
- 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<sup>\*2</sup>

\*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.



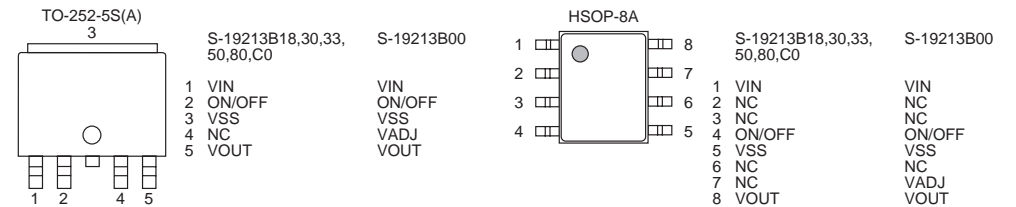
## S-19213 Series

**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  $\mu\text{A}$  typ., 9.8  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 2.0  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Output current: Possible to output 500 mA (at  $V_{IN} \geq V_{OUT(S)} + 1.0\text{ V}$ )<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  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<sup>\*2</sup>

\*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.



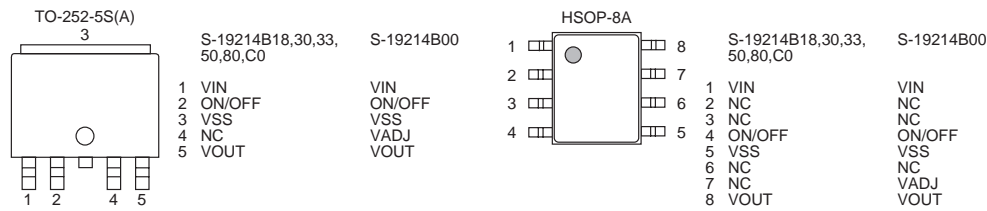
# S-19214 Series

**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: ±1.5% ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Current consumption: During operation: 5.0  $\mu\text{A}$  typ., 9.8  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 2.0  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )  
Possible to output 1000 mA (at  $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$ )\*<sup>1</sup>
- Output current: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  or more)
- Input and output capacitors: Limits overcurrent of output transistor.  
(with a detection function of the difference between input and output voltage)
- Built-in overcurrent protection circuit: Detection temperature 170°C typ.
- Built-in thermal shutdown circuit: Ensures long battery life.  
Discharge shunt function is available.  
Pull-down function is available.  
 $T_a = -40^\circ\text{C}$  to  $+125^\circ\text{C}$
- Built-in ON / OFF circuit: Ta =  $-40^\circ\text{C}$  to  $+125^\circ\text{C}$
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified<sup>2</sup>

\*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.



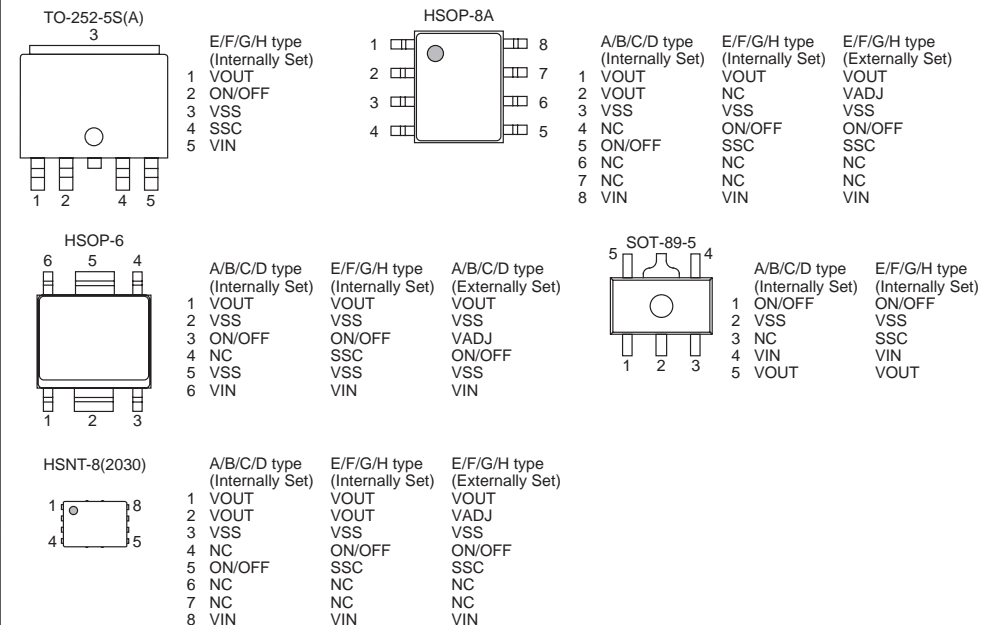
# S-19243xxxA Series

**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% ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Dropout voltage: 0.09 V typ. (2.6 V output product, at  $I_{OUT} = 200 \text{ mA}$ )
- Current consumption: During operation: 120  $\mu\text{A}$  typ., 150  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 10.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )  
Possible to output 500 mA (at  $V_{IN} \geq V_{OUT(S)} + 1.0 \text{ V}$ )\*<sup>1</sup>
- Output current: 60 dB typ. (at  $f = 1.0 \text{ kHz}$ )
- Ripple rejection: Limits overcurrent of output transistor.  
Detection temperature 170°C typ.
- Built-in overcurrent protection 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,  $t_{SS} = 6.0 \text{ ms}$  typ. ( $C_{SS} = 10 \text{ nF}$ )  
Soft-start time can be changed by the capacitor ( $C_{SS}$ ).  
Fixed type: A / B / C / D type: Fixed to  $t_{SS} = 1.0 \text{ ms}$  typ.
- Built-in thermal shutdown 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  $+125^\circ\text{C}$
- Built-in ON / OFF circuit: Ta =  $-40^\circ\text{C}$  to  $+125^\circ\text{C}$
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified<sup>2</sup>

\*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.

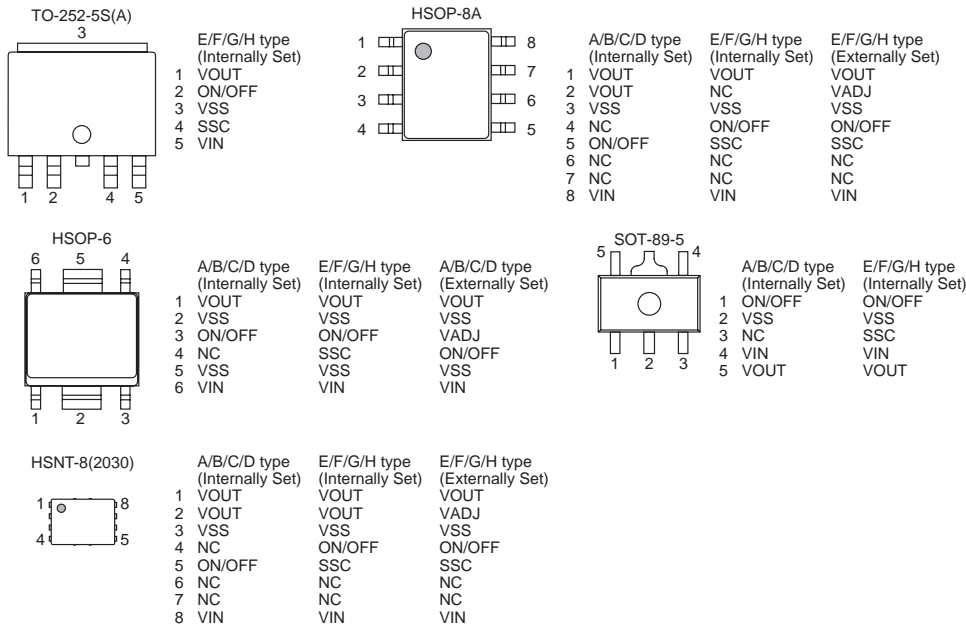


## S-19243xxxH Series

**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:  $\pm 2.3\%$  ( $T_j = -40^\circ\text{C}$  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  $\mu\text{A}$  typ., 150  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 4.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
Possible to output 500 mA (at  $V_{IN} \geq V_{OUT(S)} + 1.0$  V)\*1
  - Output current: Limits overcurrent of output transistor.
  - Ripple rejection: 60 dB typ. (at  $f = 1.0$  kHz)
  - 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:
  - Lead-free (Sn 100%), halogen-free
  - AEC-Q100 qualified<sup>2</sup>
- \*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.

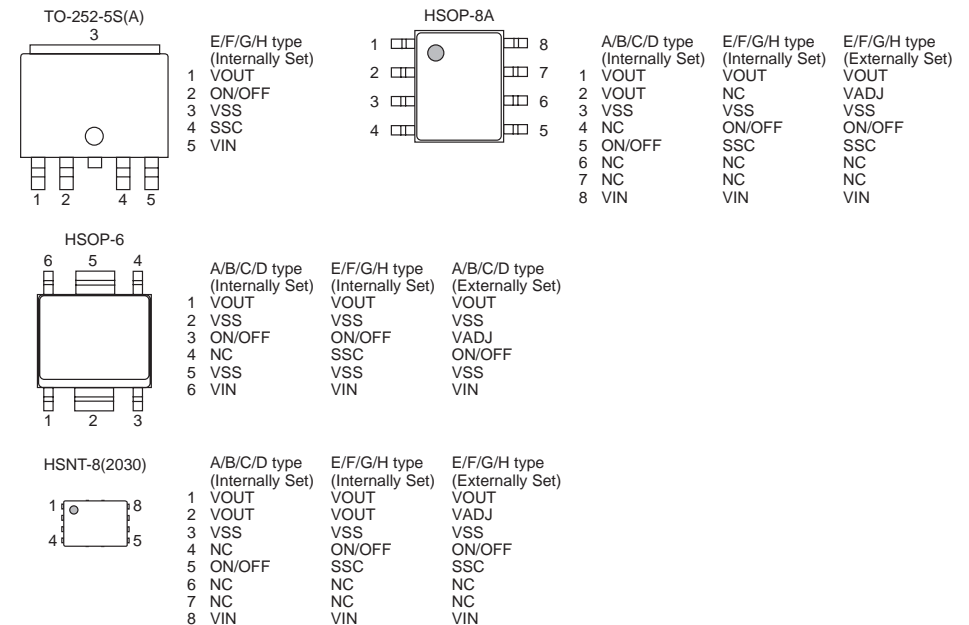


## S-19244xxxA Series

**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  $\mu\text{A}$  typ., 150  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 10.5  $\mu\text{A}$  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: Limits overcurrent of output transistor.
  - Ripple rejection: 60 dB typ. (at  $f = 1.0$  kHz)
  - 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:
  - Lead-free (Sn 100%), halogen-free
  - AEC-Q100 qualified<sup>2</sup>
- \*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

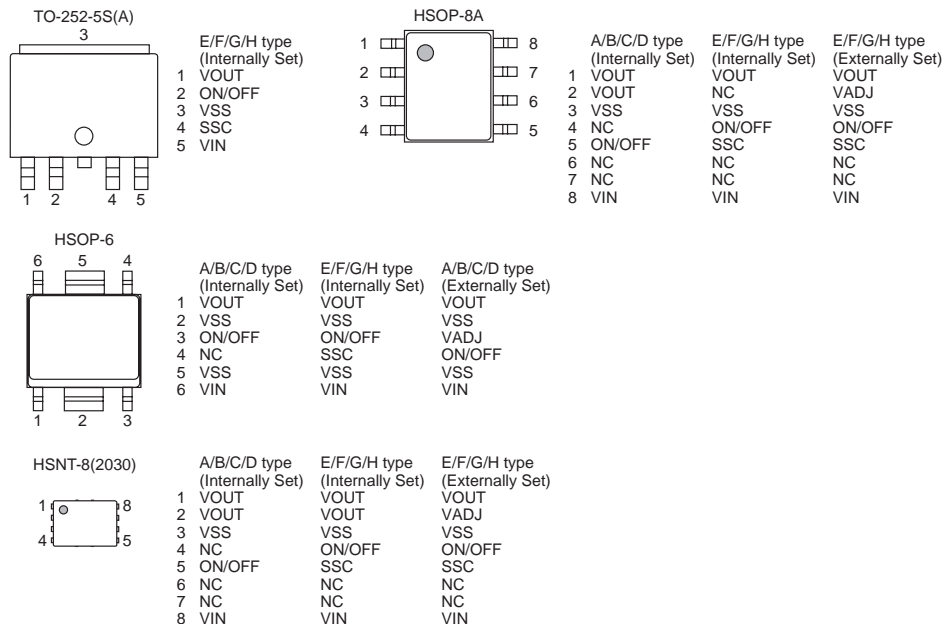
### AUTOMOTIVE, 105°C OPERATION, 10 V INPUT, 1000 mA VOLTAGE REGULATOR WITH SOFT-START FUNCTION

#### 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  $\mu\text{A}$  typ., 150  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 4.5  $\mu\text{A}$  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)<sup>\*1</sup>
- Output current: Limits overcurrent of output transistor.
- 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.  
 $T_a = -40^\circ\text{C}$  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<sup>\*2</sup>

\*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

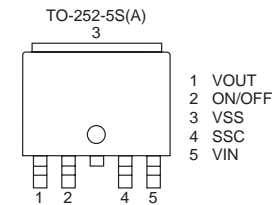
### AUTOMOTIVE, 105°C OPERATION, 10 V INPUT, 2000 mA VOLTAGE REGULATOR WITH SOFT-START FUNCTION

#### 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  $\mu\text{A}$  typ., 150  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 4.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
Possible to output 2000 mA (at  $V_{IN} \geq V_{OUT(S)} + 1.0$  V)<sup>\*1</sup>
- Output current: Limits overcurrent of output transistor.
- 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<sup>\*2</sup>

\*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.



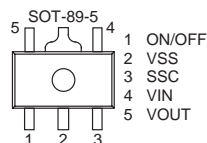
## S-19253xxxH Series

**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  $\mu\text{A}$  typ., 150  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 4.5  $\mu\text{A}$  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)<sup>\*1</sup>
- Ripple rejection: 60 dB typ. (at  $f = 1.0$  kHz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.  
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.  
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<sup>\*2</sup>

\*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.



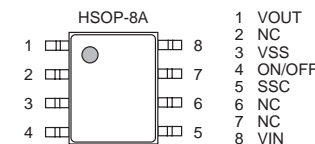
## S-19254xxxH Series

**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  $\mu\text{A}$  typ., 150  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 4.5  $\mu\text{A}$  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)<sup>\*1</sup>
- Ripple rejection: 60 dB typ. (at  $f = 1.0$  kHz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.  
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.  
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<sup>\*2</sup>

\*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

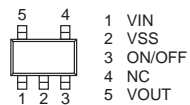
**AUTOMOTIVE, 105°C OPERATION,  
5.5 V INPUT, 150 mA VOLTAGE REGULATOR**

### Features

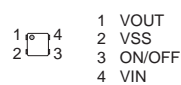
- Output voltage: 1.0 V to 3.5 V, selectable in 0.05 V step
- Input voltage: 1.5 V to 5.5 V
- Output voltage accuracy:  $\pm 2.5\%$  ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )
- Current consumption: During operation: 20  $\mu\text{A}$  typ., 50  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 4.5  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
0.16 V typ. (2.8 V output product,  $I_{\text{OUT}} = 100$  mA)
- Dropout voltage: Possible to output 150 mA ( $V_{\text{IN}} \geq V_{\text{OUT(S)}} + 1.0$  V)<sup>\*1</sup>
- Output current: 75 dB typ. (1.2 V output product,  $f = 1.0$  kHz)
- Ripple rejection: 70 dB typ. (2.8 V output product,  $f = 1.0$  kHz)
- Input capacitor: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  or more)
- Output capacitor: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  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<sup>\*2</sup>

\*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.

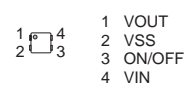
SOT-23-5



HSNT-4(1010)B



HSNT-4(0808)B



## S-19252 Series

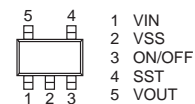
**AUTOMOTIVE, 105°C OPERATION,  
5.5 V INPUT, 150 mA VOLTAGE REGULATOR  
WITH SOFT-START FUNCTION**

### Features

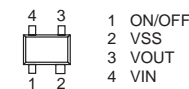
- Output voltage: 1.0 V to 3.6 V, selectable in 0.05 V step
- Input voltage: 1.5 V to 5.5 V
- Output voltage accuracy:  $\pm 15$  mV ( $1.0 \text{ V} \leq V_{\text{OUT(S)}} < 1.5 \text{ V}$ ,  $T_a = +25^\circ\text{C}$ )  
 $\pm 1.0\%$  ( $1.5 \text{ V} \leq V_{\text{OUT(S)}} \leq 3.6 \text{ V}$ ,  $T_a = +25^\circ\text{C}$ )  
 $\pm 3.0\%$  ( $1.0 \text{ V} \leq V_{\text{OUT(S)}} \leq 3.6 \text{ V}$ ,  $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )
- Current consumption: During operation: 36  $\mu\text{A}$  typ., 57  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
During power-off: 0.1  $\mu\text{A}$  typ., 4.2  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
70 mV typ. (2.8 V output product, at  $I_{\text{OUT}} = 100$  mA)
- Dropout voltage: Possible to output 150 mA (at  $V_{\text{IN}} \geq V_{\text{OUT(S)}} + 1.0$  V)<sup>\*1</sup>
- Output current: 70 dB typ. ( $V_{\text{OUT(S)}} \leq 2.5$  V, at  $f = 10$  kHz)
- Ripple rejection: 80 dB typ. (at  $f = 1.0$  kHz)
- Input capacitor: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  or more)
- Output capacitor: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  or more)
- Built-in soft-start circuit: 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  $t_{\text{SS0}} = 0.1$  ms typ. /  $t_{\text{SS1}} = 1.0$  ms typ. with the SST pin.  
The soft-start time of SC-82AB is fixed to  $t_{\text{SS0}} = 0.1$  ms typ.  
The soft-start time of HSNT-4(1010)B is fixed to either  $t_{\text{SS0}} = 0.1$  ms typ. or  $t_{\text{SS1}} = 1.0$  ms typ.
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- 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<sup>\*2</sup>

\*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.

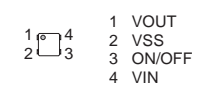
SOT-23-5



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 ( $V_{\text{IN}} = V_{\text{OUT(S)}} + 2.0\text{ V}$ )\*1
- Input and output capacitors: A ceramic capacitor can be used. (1.0  $\mu\text{F}$  or more)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor
- Built-in thermal shutdown circuit: Detection temperature 160°C typ.

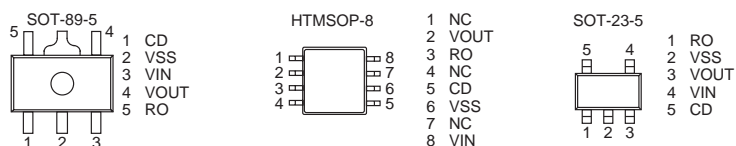
#### Detector block

- Detection voltage: 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" / "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  $\mu\text{A}$  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-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,  $I_{\text{OUT}} = 100\text{ mA}$ )
- Output current: Possible to output 200 mA ( $V_{\text{IN}} = V_{\text{OUT(S)}} + 1.0\text{ V}$ )\*1
- Input and output capacitors: A ceramic capacitor of 2.2  $\mu\text{F}$  or more can be used.
- Ripple rejection: 70 dB typ. ( $f = 100\text{ Hz}$ )
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.

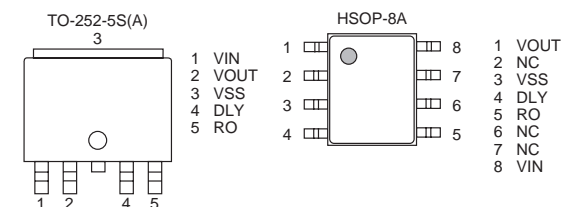
#### Detector block

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

#### Overall

- Current consumption: During operation: 60  $\mu\text{A}$  typ., 95  $\mu\text{A}$  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  $C_{\text{DLY}}$  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)<sup>\*1</sup>  
A ceramic capacitor of 2.2  $\mu\text{F}$  or more can be used.
- Input and output capacitors: 70 dB typ. ( $f = 100$  Hz)
- Ripple rejection: Limits overcurrent of output transistor.
- Built-in overcurrent protection circuit: Detection temperature 170°C typ.
- Built-in thermal shutdown circuit:

#### Detector block

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

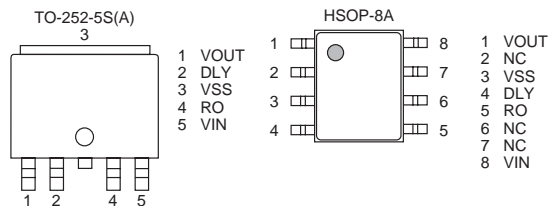
#### Overall

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

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

#### Detector block

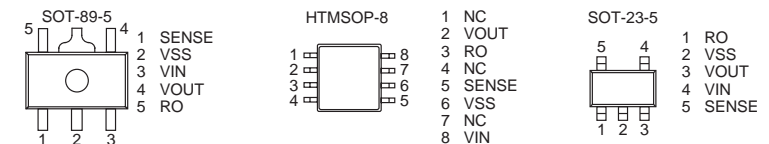
- Detection voltage: 3.0 V to 11.3 V, selectable in 0.1 V step
- Operation voltage: 3.0 V to 36.0 V
- Detection voltage accuracy:  $\pm 2.0\%$  ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Hysteresis width selectable from "Available":  $5.0\% \leq V_{HYS} \leq 30.0\%$  ( $T_j = -40^\circ\text{C}$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

#### Overall

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

\*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
- Input voltage: 3.0 V to 36.0 V
- Output voltage accuracy:  $\pm 0.03$  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  $+125^\circ\text{C}$ )
- 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 ( $1.0 \text{ V} \leq V_{\text{OUT(S)}} < 2.0 \text{ V}$ ,  $V_{\text{IN}} \geq 4.0 \text{ V}$ )\*  
Possible to output 40 mA ( $2.0 \text{ V} \leq V_{\text{OUT(S)}} \leq 5.3 \text{ V}$ ,  $V_{\text{IN}} = V_{\text{OUT(S)}} + 2.0 \text{ V}$ )\*  
A ceramic capacitor can be used. (1.0  $\mu\text{F}$  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

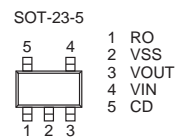
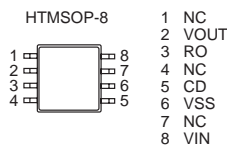
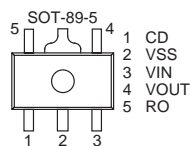
- Detection voltage: 3.0 V to 11.3 V, selectable in 0.1 V step
- Operation voltage: A type: 1.8 V to 36.0 V  
B type: 2.5 V to 36.0 V
- Detection voltage accuracy:  $\pm 2.0\%$  ( $T_j = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Hysteresis width selectable from "Available" / "Unavailable": "Available":  $5.0\% \leq V_{\text{HYS}} \leq 30.0\%$  ( $T_j = -40^\circ\text{C}$  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  $\mu\text{A}$  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-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:  $\pm 20\%$  ( $C_N = 3.3$  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:  $\pm 20\%$  ( $C_P = 3.3$  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<sup>\*1</sup>: "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<sup>\*2</sup>

\*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.

| SOT-23-6  | A/B/C/D type | E/F/G/H type |
|---|--------------|--------------|
|  | 1 VDD        | VDD          |
|  | 2 NC         | SENSE        |
|  | 3 OUT        | OUT          |
|  | 4 CP         | CP           |
|  | 5 VSS        | VSS          |
|  | 6 CN         | CN           |

## 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:  $\pm 3.0\%$  ( $-V_{DET(S)} = 3.0$  V to 4.15 V,  $T_a = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )  
 $\pm 2.5\%$  ( $-V_{DET(S)} = 4.2$  V to 4.95 V,  $T_a = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Detection delay time accuracy:  $\pm 20\%$  ( $C_N = 3.3$  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:  $\pm 3.0\%$  ( $-V_{DET(S)} = 3.0$  V to 4.15 V,  $T_a = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ ,  $5.0\% \leq V_{HYS} \leq 20.0\%$ )  
 $\pm 3.5\%$  ( $-V_{DET(S)} = 3.0$  V to 4.15 V,  $T_a = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ ,  $20.0\% < V_{HYS} \leq 30.0\%$ )  
 $\pm 2.5\%$  ( $-V_{DET(S)} = 4.2$  V to 4.95 V,  $T_a = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ ,  $5.0\% \leq V_{HYS} \leq 20.0\%$ )  
 $\pm 3.0\%$  ( $-V_{DET(S)} = 4.2$  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:  $\pm 20\%$  ( $C_P = 3.3$  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<sup>\*1</sup>: "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<sup>\*2</sup>

\*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.

| SOT-23-6  | J/K/L/M type | N/P/Q/R type |
|---|--------------|--------------|
|  | 1 VDD        | VDD          |
|  | 2 NC         | SENSE        |
|  | 3 OUT        | OUT          |
|  | 4 CP         | CP           |
|  | 5 VSS        | VSS          |
|  | 6 CN         | CN           |

## S-19110AxxH to S-19110HxxH Series

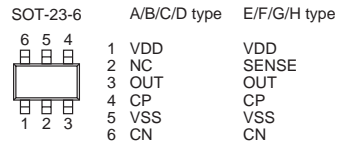
**AUTOMOTIVE, 105°C OPERATION,  
36 V, SENSE-INPUT VOLTAGE DETECTOR  
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

### 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<sup>\*1</sup>: "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<sup>\*2</sup>

\*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

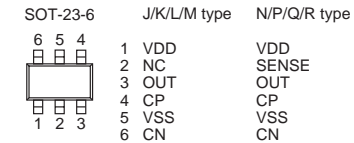
**AUTOMOTIVE, 105°C OPERATION,  
36 V, SENSE-INPUT VOLTAGE DETECTOR  
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)**

### 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  $4.15\text{ V}$ ,  $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
 $\pm 2.5\%$  ( $-V_{DET(S)} = 4.2\text{ V}$  to  $4.95\text{ V}$ ,  $T_a = -40^\circ\text{C}$  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  $4.15\text{ V}$ ,  $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ ,  $5.0\% \leq V_{HYS} \leq 20.0\%$ )  
 $\pm 3.5\%$  ( $-V_{DET(S)} = 3.0\text{ V}$  to  $4.15\text{ V}$ ,  $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ ,  $20.0\% < V_{HYS} \leq 30.0\%$ )  
 $\pm 2.5\%$  ( $-V_{DET(S)} = 4.2\text{ V}$  to  $4.95\text{ V}$ ,  $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ ,  $5.0\% \leq V_{HYS} \leq 20.0\%$ )  
 $\pm 3.0\%$  ( $-V_{DET(S)} = 4.2\text{ V}$  to  $4.95\text{ V}$ ,  $T_a = -40^\circ\text{C}$  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<sup>\*1</sup>: "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<sup>\*2</sup>

\*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.



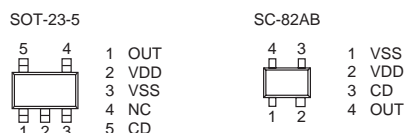


**S-19100xxxA Series****AUTOMOTIVE, 125°C OPERATION,  
10 V VOLTAGE DETECTOR  
WITH DELAY FUNCTION (EXTERNAL DELAY TIME SETTING)****Features**

- 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  $+125^\circ\text{C}$ )  
270 nA typ. ( $1.2\text{ V} \leq -V_{\text{DET}} < 2.3\text{ V}$ )
- 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.

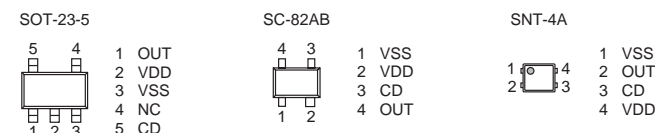
\*2. Contact our sales representatives for details.

**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  $+105^\circ\text{C}$ )  
270 nA typ. ( $1.2\text{ V} \leq -V_{\text{DET}} < 2.3\text{ V}$ )
- 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

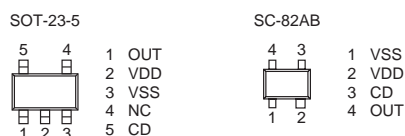
\*1. The product without hysteresis width is also available.

\*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**

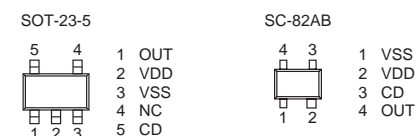
- Detection voltage: 1.2 V to 4.6 V (0.1 V step)
- Detection voltage accuracy:  $\pm 3.0\%$  ( $2.4\text{ V} \leq -V_{\text{DET}} \leq 4.6\text{ V}$ ,  $T_a = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )  
 $\pm(2.5\% + 12\text{ mV})$  ( $1.2\text{ V} \leq -V_{\text{DET}} < 2.4\text{ V}$ ,  $T_a = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ )  
270 nA typ. ( $1.2\text{ V} \leq -V_{\text{DET}} < 2.3\text{ V}$ )
- 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  $+105^\circ\text{C}$ )  
270 nA typ. ( $1.2\text{ V} \leq -V_{\text{DET}} < 2.3\text{ V}$ )
- 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

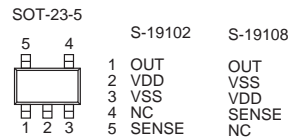
\*1. Contact our sales representatives for details.



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

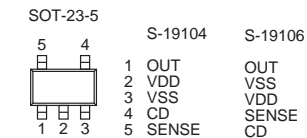
- Detection voltage: 1.0 V to 5.0 V (0.1 V step)
- Detection voltage accuracy:  $\pm 3.5\%$  ( $2.2\text{ V} \leq -V_{\text{DET(S)}} \leq 5.0\text{ V}$ ,  $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
 $\pm(2.5\% + 22\text{ mV})$  ( $1.0\text{ V} \leq -V_{\text{DET(S)}} < 2.2\text{ V}$ ,  $T_a = -40^\circ\text{C}$  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<sup>\*1</sup>

\*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**

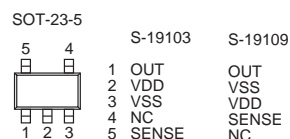
- Detection voltage: 1.0 V to 5.0 V (0.1 V step)
- Detection voltage accuracy:  $\pm 3.5\%$  ( $2.2\text{ V} \leq -V_{\text{DET(S)}} \leq 5.0\text{ V}$ ,  $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
 $\pm(2.5\% + 22\text{ mV})$  ( $1.0\text{ V} \leq -V_{\text{DET(S)}} < 2.2\text{ V}$ ,  $T_a = -40^\circ\text{C}$  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<sup>\*1</sup>

\*1. Contact our sales representatives for details.

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

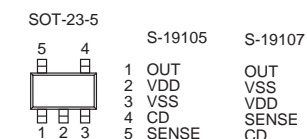
- Detection voltage: 1.0 V to 5.0 V (0.1 V step)
- Detection voltage accuracy:  $\pm 3.5\%$  ( $2.2\text{ V} \leq -V_{\text{DET(S)}} \leq 5.0\text{ V}$ ,  $T_a = -40^\circ\text{C}$  to  $+105^\circ\text{C}$ )  
 $\pm(2.5\% + 22\text{ mV})$  ( $1.0\text{ V} \leq -V_{\text{DET(S)}} < 2.2\text{ V}$ ,  $T_a = -40^\circ\text{C}$  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<sup>\*1</sup>

\*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<sup>\*1</sup>

\*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)<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 2.2  $\mu\text{F}$  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:  $\pm 100$  mV ( $T_J = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ )
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable<sup>\*2</sup>: 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<sup>\*2</sup>: 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

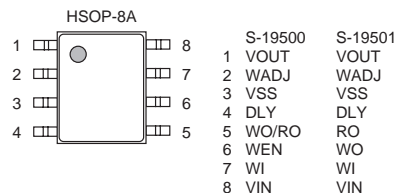
#### Overall

- Current consumption: 60  $\mu\text{A}$  typ. ( $I_{OUT} = 0$  mA, During the watchdog timer deactivation)  
75  $\mu\text{A}$  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<sup>\*3</sup>

\*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)<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 1.0  $\mu\text{F}$  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<sup>\*2</sup>: 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<sup>\*2</sup>: 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

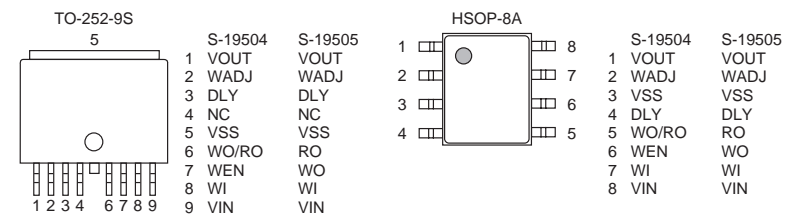
#### Overall

- Current consumption: 3.0  $\mu\text{A}$  typ. (During watchdog timer deactivation)  
5.0  $\mu\text{A}$  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<sup>\*3</sup>

\*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)<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 1.0  $\mu\text{F}$  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<sup>\*2</sup>: 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<sup>\*2</sup>: 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

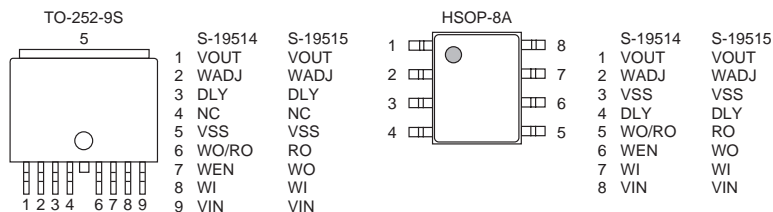
**Overall**

- Current consumption: 3.0  $\mu\text{A}$  typ. (During watchdog timer deactivation)  
5.0  $\mu\text{A}$  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<sup>\*3</sup>

\*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  $C_{\text{DLY}}$  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)<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 1.0  $\mu\text{F}$  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<sup>\*2</sup>: 20 ms typ. ( $C_{\text{DLY}} = 10$  nF)

**Watchdog timer block**

- Watchdog activation current: 1.5 mA typ.
- Watchdog trigger time is adjustable<sup>\*2</sup>: 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

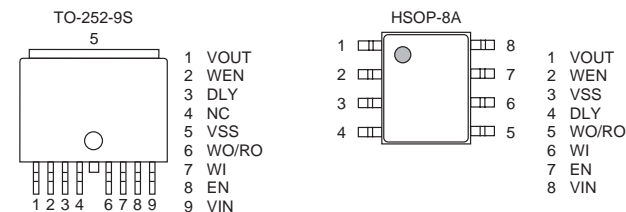
**Overall**

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

\*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  $C_{\text{DLY}}$  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)<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 2.2  $\mu\text{F}$  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:  $\pm 100$  mV ( $T_J = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ )
- Hysteresis width: 0.12 V min.
- Release delay time is adjustable<sup>\*2</sup>: 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<sup>\*2</sup>: 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

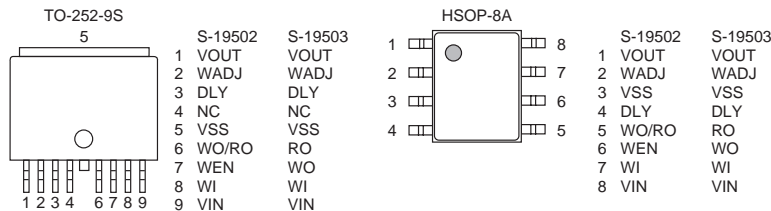
#### Overall

- Current consumption: 60  $\mu\text{A}$  typ. ( $I_{OUT} = 0$  mA, During the watchdog timer deactivation)  
75  $\mu\text{A}$  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<sup>\*3</sup>

\*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)<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 1.0  $\mu\text{F}$  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<sup>\*2</sup>: 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<sup>\*2</sup>: 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

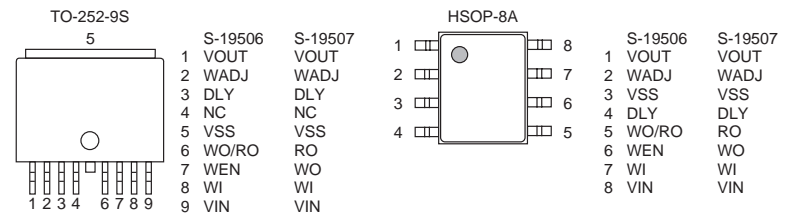
#### Overall

- Current consumption: 3.0  $\mu\text{A}$  typ. (During watchdog timer deactivation)  
5.0  $\mu\text{A}$  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<sup>\*3</sup>

\*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)<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 1.0  $\mu\text{F}$  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<sup>\*2</sup>: 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<sup>\*2</sup>: 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

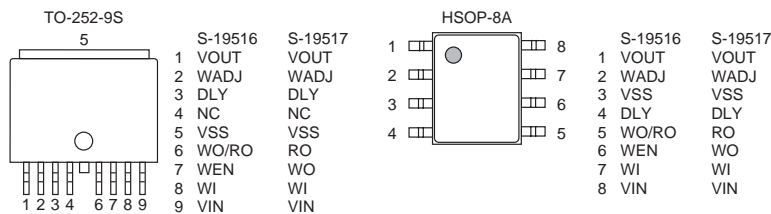
#### Overall

- Current consumption: 3.0  $\mu\text{A}$  typ. (During watchdog timer deactivation)  
5.0  $\mu\text{A}$  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<sup>\*3</sup>

\*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  $C_{\text{DLY}}$  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)<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 1.0  $\mu\text{F}$  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<sup>\*2</sup>: 20 ms typ. ( $C_{\text{DLY}} = 10$  nF)

#### Watchdog timer block

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

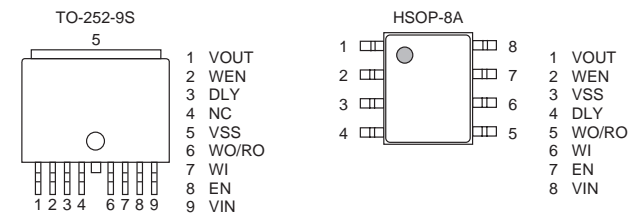
#### Overall

- Current consumption: 3.2  $\mu\text{A}$  typ. (During regulator operation, during watchdog timer deactivation)  
0.1  $\mu\text{A}$  typ. (During regulator stop)
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- Withstand 45 V load dump
- AEC-Q100 qualified<sup>\*3</sup>

\*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  $C_{\text{DLY}}$  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,  $I_{\text{OUT}} = 100$  mA)
- Output current: Possible to output 500 mA ( $V_{\text{IN}} = V_{\text{OUT(S)}} + 1.0$  V)<sup>\*1</sup>
- Input and output capacitors: A ceramic capacitor of 1.0  $\mu\text{F}$  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<sup>\*2</sup>: 20 ms typ. ( $C_{\text{DLY}} = 10$  nF)

**Watchdog timer block**

- Watchdog activation current: 1.5 mA typ.
- Watchdog trigger time is adjustable<sup>\*2</sup>: 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

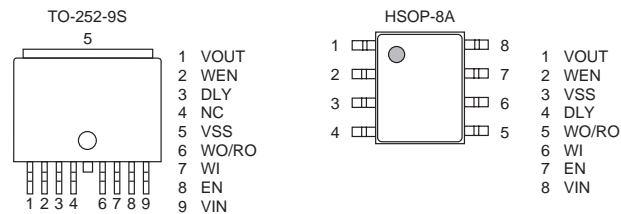
**Overall**

- Current consumption: 3.2  $\mu\text{A}$  typ. (During regulator operation, during watchdog timer deactivation)  
0.1  $\mu\text{A}$  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<sup>\*3</sup>

\*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  $C_{\text{DLY}}$  to the DLY pin.

\*3. Contact our sales representatives for details.



## S-19400/19401 Series

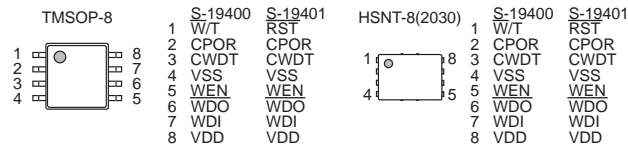
**AUTOMOTIVE, 125°C OPERATION,  
3.8 μA CURRENT CONSUMPTION  
WATCHDOG TIMER WITH RESET FUNCTION**

### 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.



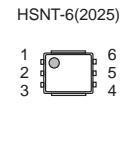
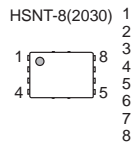
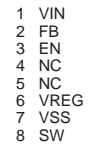
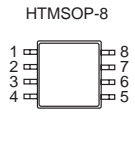
## S-19902A/19902B/19903A/19903B Series

**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.



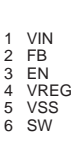
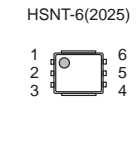
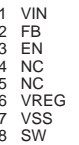
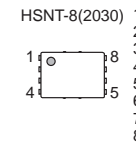
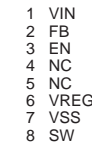
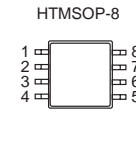
## S-19932A/19932B/19933A/19933B Series

**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.



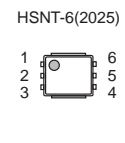
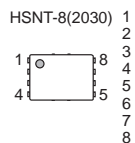
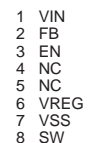
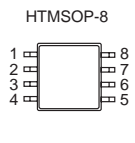
## S-19902C/19902D/19903C/19903D Series

**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.



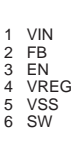
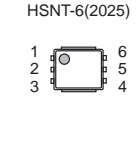
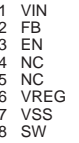
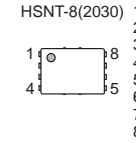
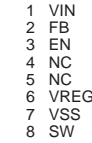
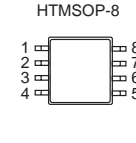
## S-19932C/19932D/19933C/19933D Series

**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.

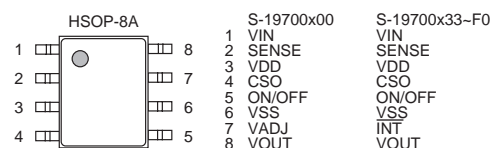


**S-19700 Series****AUTOMOTIVE, 125°C OPERATION,  
36 V INPUT, 400 mA VOLTAGE REGULATOR  
WITH CURRENT MONITOR AND ADJUSTABLE CURRENT LIMIT****Features**

- 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  $\mu\text{A}$  typ., 170  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ )  
During power-off: 1.0  $\mu\text{A}$  typ., 5.0  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+90^\circ\text{C}$ )
- Output current: Possible to output 400 mA ( $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$ )<sup>\*1</sup>
- Output capacitor: A ceramic capacitor of 4.7  $\mu\text{F}$  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<sup>\*2</sup>

\*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  $\mu\text{A}$  typ., 170  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ )  
During power-off: 1.0  $\mu\text{A}$  typ., 5.0  $\mu\text{A}$  max. ( $T_j = -40^\circ\text{C}$  to  $+90^\circ\text{C}$ )
- Output current: Possible to output 600 mA ( $V_{IN} \geq V_{OUT(S)} + 2.0 \text{ V}$ )<sup>\*1</sup>
- Output capacitor: A ceramic capacitor of 4.7  $\mu\text{F}$  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<sup>\*2</sup>

\*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

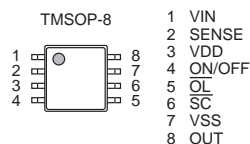
FOR AUTOMOTIVE 105°C OPERATION CURRENT MONITOR  
HIGH SIDE SWITCH

## ● Features

- Power supply voltage:
- Current consumption during operation:
- ON resistance:
- Limit current:
- Load short-circuit detection current:
- Load open detection current:
- Built-in thermal shutdown circuit:
- Built-in ON / OFF circuit:
- Operation temperature range:
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified<sup>\*1</sup>

$V_{DD} = 2.7 \text{ V to } 10.0 \text{ V}$   
 $I_{SS1} = 12 \mu\text{A typ.}, I_{SS1} = 24 \mu\text{A max.}$  ( $T_j = -40^\circ\text{C to } +105^\circ\text{C}$ )  
 $R_{ON} = 1.1 \Omega \text{ typ.}, R_{ON} = 3.7 \Omega \text{ max.}$  ( $T_j = -40^\circ\text{C to } +105^\circ\text{C}$ )  
 40 mA to 100 mA, selectable in 10 mA step  
 $I_{LIM} \times 0.3 \text{ to } I_{LIM} \times 1.0$  ( $I_{SHORT} \geq 30 \text{ mA}$ ), selectable in 0.1 step  
 2.5 mA to 30 mA, selectable in 2.5 mA step  
 Detection temperature 165°C typ.  
 Selectable in hysteresis type or latch type  
 Ensures long battery life.  
 $T_a = -40^\circ\text{C to } +105^\circ\text{C}$

\*1. Contact our sales office for details.

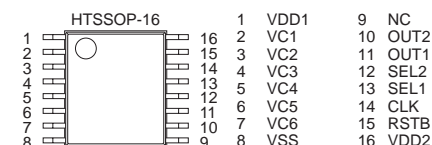


## S-19192 Series

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  $\pm 20 \text{ mV}$  ( $T_a = +25^\circ\text{C}$ )  
Accuracy  $\pm 30 \text{ mV}$  ( $T_a = -5^\circ\text{C to } +55^\circ\text{C}$ )
    - Overcharge release voltage n (n = 1 to 6): 2.300 V to 4.500 V<sup>\*1</sup> Accuracy  $\pm 50 \text{ mV}$
    - Overdischarge detection voltage n (n = 1 to 6): 1.500 V to 3.000 V (100 mV step)<sup>\*2, \*3</sup> Accuracy  $\pm 80 \text{ mV}$
    - Overdischarge release voltage n (n = 1 to 6): 1.500 V to 3.300 V<sup>\*4</sup> Accuracy  $\pm 100 \text{ mV}$
  - Self-test results to confirm overcharge and overdischarge detection operations can be output from OUT2 pin.
    - Delay time shortening during self-test: Available, unavailable
  - 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  $\mu\text{A max.}$  ( $T_a = +25^\circ\text{C}$ )
  - Lead-free (Sn 100%), halogen-free
  - AEC-Q100 qualified<sup>\*5</sup>
  - The following documents are available when customers perform verifications for "Hardware Component Qualification" in order to meet "Functional Safety Requirements".<sup>\*5, \*6</sup>
    - "Hardware Safety Analysis Report"
    - "Hardware Integration and Testing Report"
    - "Qualification Kit"
- \*1. 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.)  
 \*2. Set the voltage difference between the overcharge detection voltage and overdischarge detection voltage to 2.5 V or lower.  
 \*3. 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.  
 \*4. 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.)  
 \*5. Contact our sales representatives for details.  
 \*6. A Non-Disclosure Agreement is necessary when providing the documents.



## S-19190 Series

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

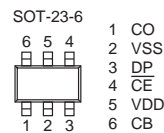
### Features

- High-accuracy voltage detection circuit  
Cell balancing detection voltage: 2.0 V to 4.6 V (5 mV step) Accuracy  $\pm 12$  mV ( $2.0 \text{ V} \leq V_{BU} \leq 2.4 \text{ V}$ )  
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 V<sup>\*1</sup> Accuracy  $\pm 24$  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  $\pm 12$  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 V<sup>\*2</sup> Accuracy  $\pm 24$  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  $\Omega$  typ. between the CB pin and the VSS pin
- Current consumption: 2.0  $\mu\text{A}$  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 qualified<sup>\*3</sup>

\*1. 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.)

\*2. 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.)

\*3. Contact our sales office for details.



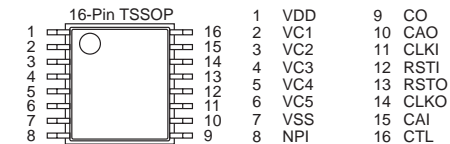
## S-8235A Series

**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  $\pm 20$  mV ( $T_a = +25^\circ\text{C}$ )  
Accuracy  $\pm 30$  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  $\pm 50$  mV  
0.0 mV to –50 mV Accuracy  $\pm 25$  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  $V_{CU} = 1.0$  V for each cell: 10  $\mu\text{A}$  max. ( $T_a = +25^\circ\text{C}$ )  
At 2.3 V for each cell: 8  $\mu\text{A}$  max. ( $T_a = +25^\circ\text{C}$ )
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified<sup>\*1</sup>

\*1. Contact our sales office for details.

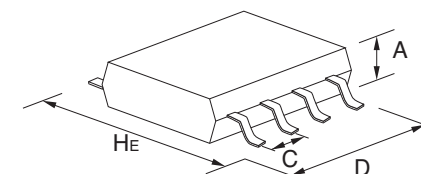


## Package List

| Package Type        | Pin Count | Package Name      | Package Size (mm) |      |          | Pitch (mm) |
|---------------------|-----------|-------------------|-------------------|------|----------|------------|
|                     |           |                   | H <sub>E</sub>    | 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 <sub>E</sub>    | 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<br>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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