

Low Quiescent Current, Programmable Delay Time, Supervisory Circuit

NCP308, NCV308

The NCP308 series is one of the onsemi Supervisory circuit IC families. It is optimized to monitor system voltages from 0.405 V to 5.5 V, asserting an active low open-drain $\overline{\text{RESET}}$ output, together with Manual Reset ($\overline{\text{MR}}$) Input. The part comes with both fixed and externally adjustable versions.

Features

- Wide Supply Voltage Range 1.6 to 5.5 V
- Very Low Quiescent Current 1.6 μA
- Fixed Threshold Voltage Versions for Standard Voltage Rails Including 0.9 V, 1.2 V, 1.25 V, 1.5 V, 1.8 V, 1.9 V, 2.5 V, 2.8 V, 3.0 V, 3.3 V, 5.0 V
- Adjustable Version with Low Threshold Voltage 0.405 V (min)
- High Threshold Voltage Accuracy: 0.31% typ
- Support Manual Reset Input ($\overline{\text{MR}}$)
- Open-Drain $\overline{\text{RESET}}$ Output (Push-pull Output upon Request)
- Flexible Delay Time Programmability: 1.25 ms to 10 s
- Temperature Range: -40°C to $+125^{\circ}\text{C}$
- Small TSOP-6 and WDFN6 2 x 2 mm, Pb-Free packages
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These are Pb-Free Devices

Typical Applications

- DSP or Microcontroller Applications
- Notebook/Desktop Computers
- PDAs/Hand-Held Products
- Portable/Battery-Powered Products
- FPGA/ASIC Applications

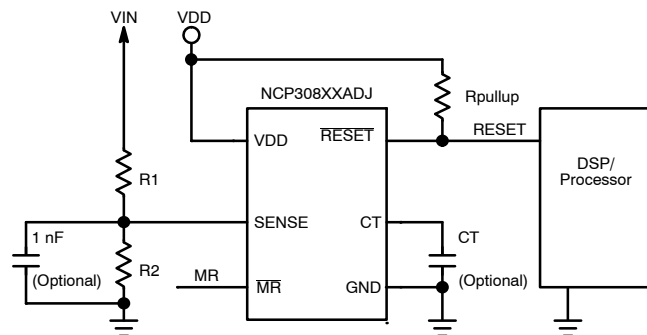


Figure 1. Typical Application Circuit for Adjustable Versions

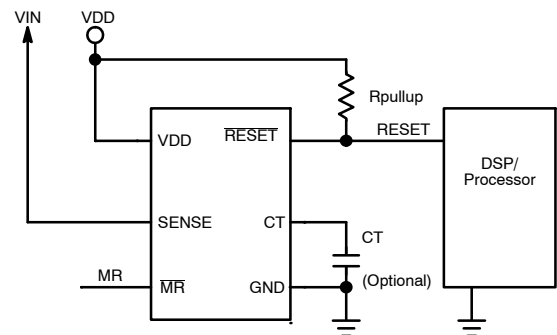
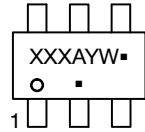


Figure 2. Typical Application Circuit for Fixed Versions

MARKING DIAGRAMS



TSOP-6
CASE 318G



WDFN6
CASE 511BR



XXX, XX= Specific Device Code

A =Assembly Location

Y = Year

W = Work Week

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the ordering information section on page 9 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 9.

NCP308, NCV308

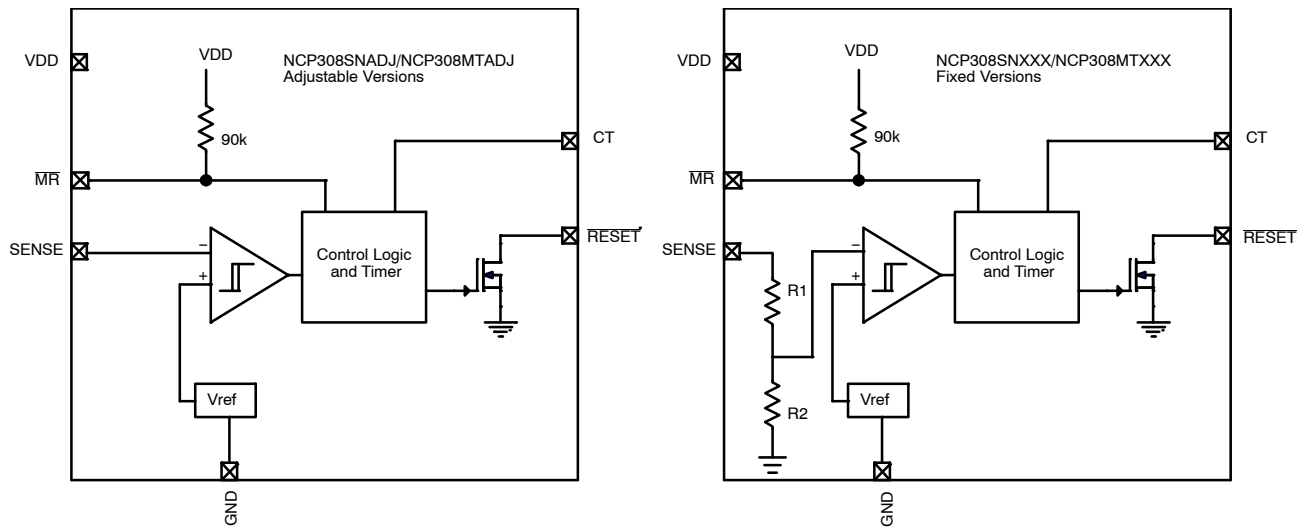


Figure 3. Functional Block Diagrams of Adjustable and Fixed Versions

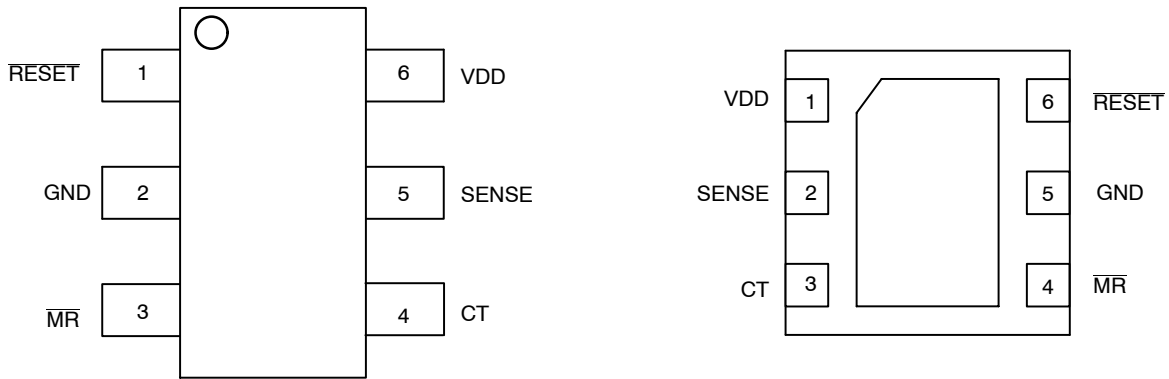


Figure 4. Pin Connections Diagram (Top View)

Table 1. PIN OUT DESCRIPTION

| Name | Pin Number | | Description |
|-----------------|------------|-------------|--|
| | TSOP-6 | WDFN6 | |
| VDD | 6 | 1 | Supply Voltage. A 0.1 μ F ceramic capacitor placed close to this pin is helpful for transient and parasitic. |
| SENSE | 5 | 2 | Sense Input, this is the voltage to be monitored. If the voltage at this terminal drops below the threshold voltage V_{IT} , then RESET is asserted. SENSE does not necessary monitor VDD, it can monitor any voltage lower than VDD. |
| CT | 4 | 3 | Reset Delay Time Setting Pin. Connecting this pin to VDD through a 40 k Ω to 200 k Ω resistor or leaving it open results in fixed reset delay times. Connecting this pin to a ground referenced capacitor (≥ 100 pF) gives a user-programmable reset delay time. See the <i>Setting Reset Delay Time</i> section for more information. |
| \overline{MR} | 3 | 4 | Manual Reset input, \overline{MR} low asserts RESET. \overline{MR} is internally tied to VDD by a 90 k Ω pull-up Resistor. |
| RESET | 1 | 6 | RESET Output, is an Active low open drain N-Channel MOSFET output, it is driven to a low impedance state when RESET is asserted (either the SENSE input is lower than the threshold voltage (V_{IT}) or the \overline{MR} pin is set to a logic low). RESET will keep low (asserted) for the reset delay time after both SENSE is above V_{IT} and \overline{MR} is set to a logic high. A pull-up resistor from 10k Ω to 1M Ω should be used on this pin. See Figure 5 for behavior of RESET depends on VDD, SENSE and \overline{MR} conditions. |
| GND | 2 | 5 | Ground terminal. Should be connected to PCB ground reference |
| EXP PAD | - | Exposed Pad | Exposed pad, under WDFN6 package, connect it to ground plane for better thermal dissipation. |

NCP308, NCV308

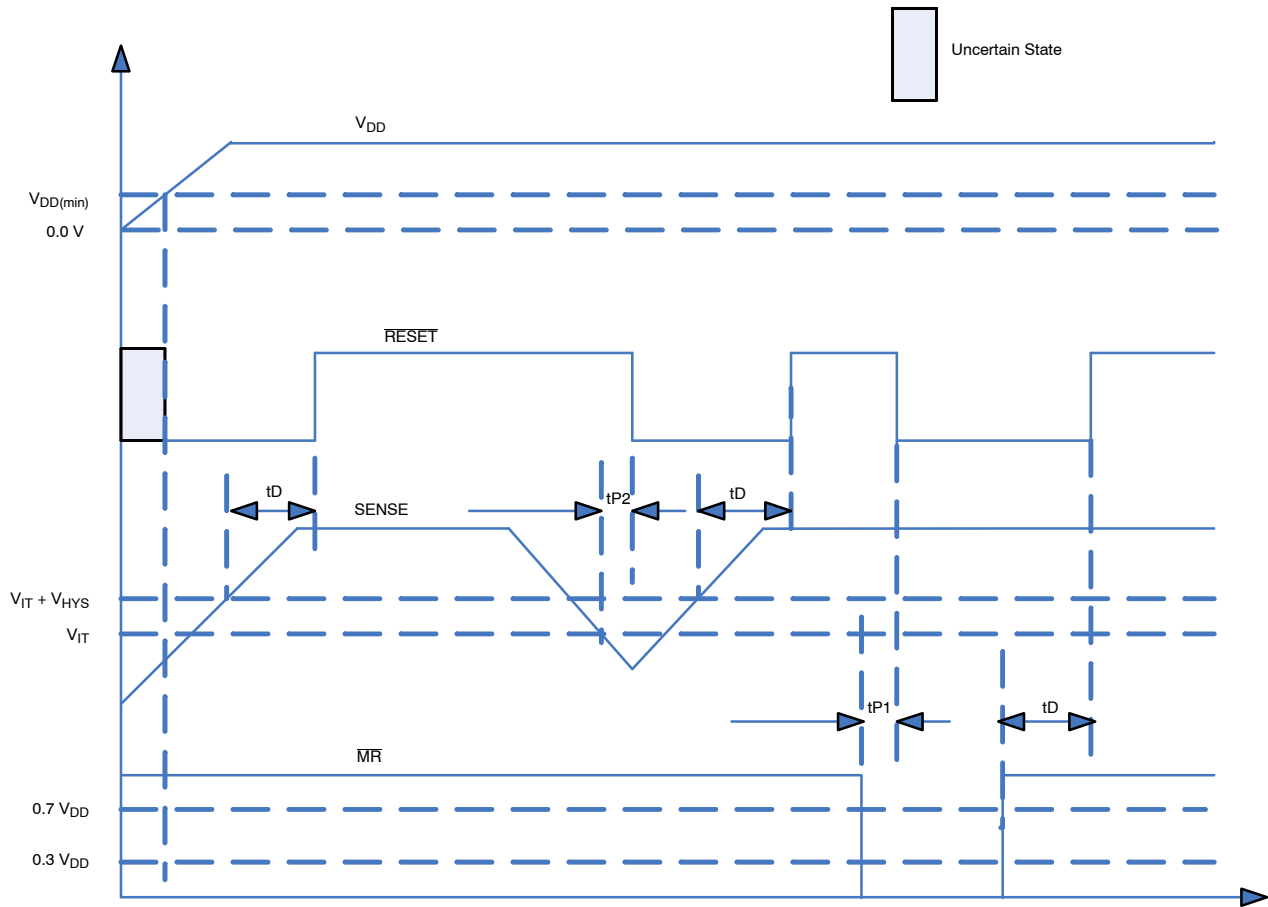


Figure 5. Timing Diagram Showing MR and SENSE Reset Timing

Table 2. TRUTH TABLE

| MR | SENSE > V _{IT} | RESET |
|----|-------------------------|-------|
| L | N | L |
| L | Y | L |
| H | N | L |
| H | Y | H |

NCP308, NCV308

Table 3. MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|-----------------|---------------------------------------|---------------|
| Input voltage range, V_{DD} | V_{DD} | -0.3 to + 6.0 | V |
| CT voltage range V_{CT} , \overline{RESET} , \overline{MR} Current through CT pin | I_{CT} | -0.3 to $V_{DD} + 0.3 \leq 6.0$ 10 | V mA |
| SENSE pin voltage | | -0.3 to + 8.0 | V |
| \overline{RESET} pin current | | 5 | mA |
| Thermal Resistance Junction-to-Air TSOP-6 WDFN6 | $R_{\theta JA}$ | 305 220 | $^{\circ}C/W$ |
| Human Body Model (HBM) ESD Rating (Note 1) | ESD HBM | 2000 | V |
| Machine Model (MM) ESD Rating (Note 1) | ESD MM | 100 | V |
| Charged Device Model (CDM) ESD Rating (Note 1) | ESD CDM | 500 | V |
| Latch up Current: (Note 2) All pins, except digital pins Digital pins (\overline{MR}) | I_{LU} | ± 100 ± 10 | mA |
| Storage Temperature Range | T_{STG} | -65 to + 150 | $^{\circ}C$ |
| Maximum Junction Temperature | T_J | -40 to +150 | $^{\circ}C$ |
| Moisture Sensitivity (Note 3) | MSL | Level 1 | |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. This device series contains ESD protection and passes the following tests:
 Human Body Model (HBM) +/-2.0 kV per JEDEC standard: JESD22-A114
 Machine Model (MM) +/-100 V per JEDEC standard: JESD22-A115
 Charged Device Model (CDM) 500 V per JEDEC standard: JESD22-C101.
2. Latch up Current per JEDEC standard: JESD78 class II.
3. Moisture Sensitivity Level (MSL): 1 per IPC/JEDEC standard: J-STD-020A.

NCP308, NCV308

Table 4. ELECTRICAL CHARACTERISTICS $1.6\text{ V} \leq V_{DD} \leq 5.5\text{ V}$, $R_{pullup} = 100\text{ k}\Omega$, $C_{LRESET} = 50\text{ pF}$, over operating temperature range ($T_J = -40^\circ\text{C}$ to $+125^\circ\text{C}$), unless otherwise specified. Typical values are at $T_J = +25^\circ\text{C}$.

| Symbol | Parameter | | Conditions | Min | Typ | Max | Unit |
|----------------------|---|---|---|--------------|---------------------------|--------------|------------------|
| V_{DD} | Supply Voltage Range | | $-40^\circ\text{C} < T_J < +125^\circ\text{C}$ | 1.6 | | 5.5 | V |
| $V_{DD(\text{min})}$ | Minimum V_{DD} Guaranteed RESET Output Valid (Note 4) | | | | 0.5 | 0.8 | V |
| I_{DD} | Supply Current (Current into VDD pin) | | $V_{DD} = 3.3\text{V}$, RESET not asserted MR, RESET, CT open | | 1.6 | 5.0 | μA |
| | | | $V_{DD} = 5.5\text{V}$, RESET not asserted MR, RESET, CT open | | 1.6 | 6.0 | |
| V_{OL} | Low-level output voltage of RESET | | $1.3\text{V} \leq V_{DD} < 1.6\text{V}$, $I_{OL} = 0.4\text{ mA}$ | | | 0.3 | V |
| | | | $1.6\text{V} \leq V_{DD} \leq 5.5\text{V}$, $I_{OL} = 1.0\text{ mA}$ | | | 0.4 | |
| $V_{IT\%}$ | Negative going SENSE threshold voltage accuracy | | | -1.75 | ± 0.75 | +1.75 | % |
| | | | $T_J = +25^\circ\text{C}$ | -0.31 | - | 0.31 | |
| | | | $-20^\circ\text{C} < T_J < +85^\circ\text{C}$ | -1.0 | ± 0.5 | +1.0 | |
| V_{HYS} | Hysteresis on V_{IT} | $1.6\text{V} \leq V_{DD} \leq 4.2\text{V}$ | | | 1.0 | 3.0 | $\%V_{IT}$ |
| | | $4.2\text{V} \leq V_{DD} \leq 5.5\text{V}$ | | | 1.75 | 3.75 | |
| R_{MR} | MR Internal pull-up resistance | | | | 90 | | $\text{k}\Omega$ |
| I_{SENSE} | Input current at SENSE pin | NCP308XXADJ | $V_{SENSE} = V_{IT}$ | | 10 | | nA |
| | | Fixed versions | $V_{SENSE} = 5.5\text{ V}$ | | 110 | | |
| I_{OH} | RESET leakage Current | | $V_{RESET} = 5.5\text{ V}$, RESET not asserted | | | 300 | nA |
| C_{IN} | Input capacitance, any pin | CT pin | $V_{IN} = 0\text{ V to } V_{DD}$ | | 5 | | pF |
| | | Other pins | $V_{IN} = 0\text{ V to } 5.5\text{ V}$ | | 5 | | |
| V_{IL} | MR logic low input | | | 0 | | $0.3 V_{DD}$ | V |
| V_{IH} | MR logic high input | | | $0.7 V_{DD}$ | | V_{DD} | V |
| t_w | Input pulse width to assert RESET | SENSE | $V_{IH} = 1.05 V_{IT}$, $V_{IL} = 0.95 V_{IT}$ | | 20 | | μs |
| | | MR | $V_{IH} = 0.7 V_{DD}$, $V_{IL} = 0.3 V_{DD}$ | | 150 | | ns |
| t_D | Reset delay time | $C_T = \text{Open}$ $C_T = V_{DD}$ $C_T = 100\text{ pF}$ $C_T = 180\text{ nF}$ | (Guaranteed by design and characterization) | | 20 300 1.25 1200 | | ms |
| t_{P1} | Propagation delay from MR | MR to RESET | $V_{IH} = 0.7 V_{DD}$, $V_{IL} = 0.3 V_{DD}$ | | 150 | | ns |
| t_{P2} | Propagation delay from SENSE | SENSE to RESET | $V_{IH} = 1.05 V_{IT}$, $V_{IL} = 0.95 V_{IT}$ | | 20 | | μs |

4. The lowest supply voltage (V_{DD}) at which RESET becomes active.
5. NCP308XX: XX = MT (WDFN6 package) or SN (TSOP-6 package).

TYPICAL OPERATING CHARACTERISTICS

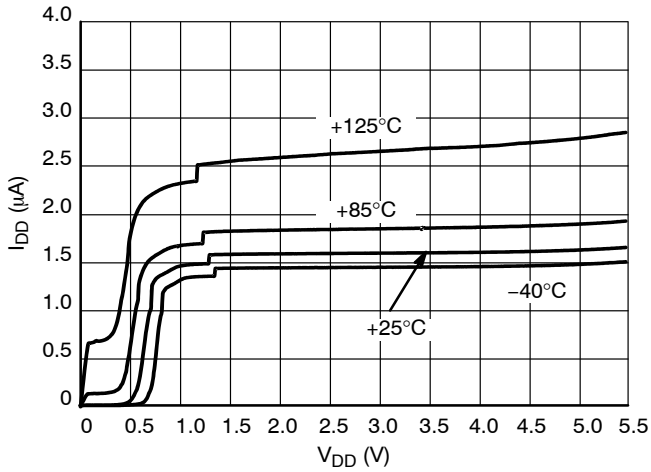


Figure 6. Supply Current vs. Input Voltage

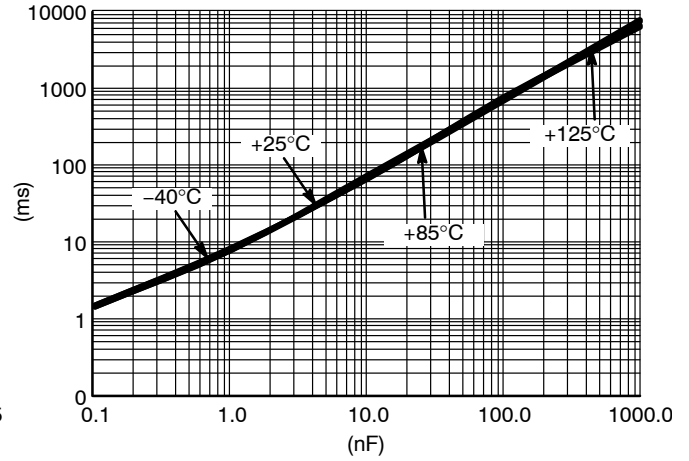


Figure 7. RESET Timeout Period vs. CT

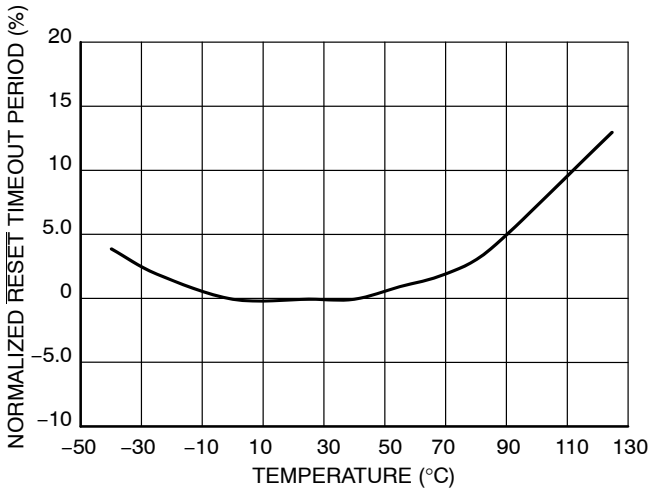


Figure 8. Normalized RESET Timeout Period vs. Temperature

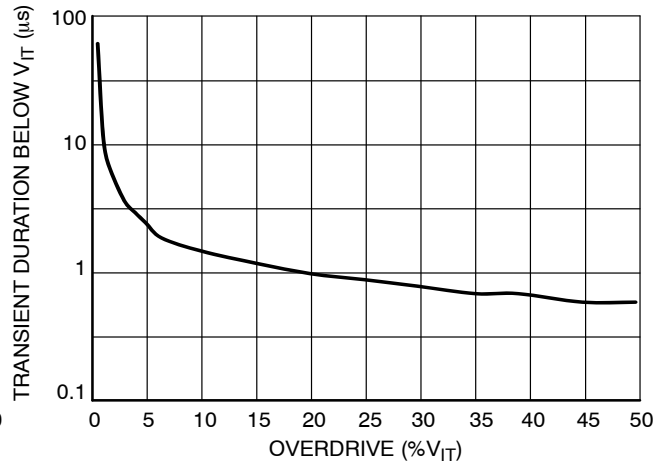


Figure 9. Maximum Transient Duration at Sense vs. Sense Threshold Overdrive Voltage

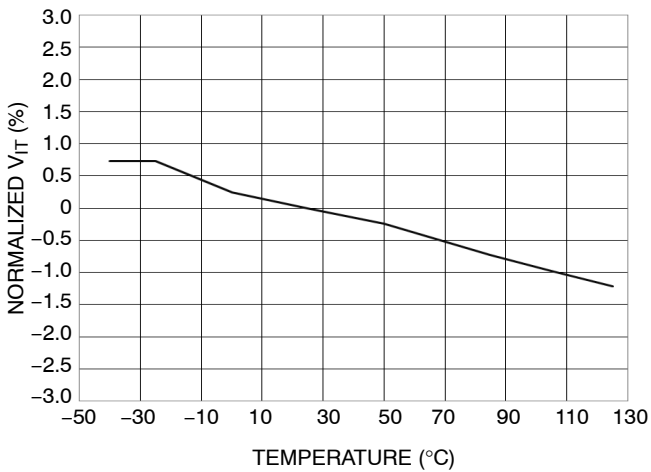


Figure 10. Normalized Sense Threshold Voltage (V_{IT}) vs. Temperature

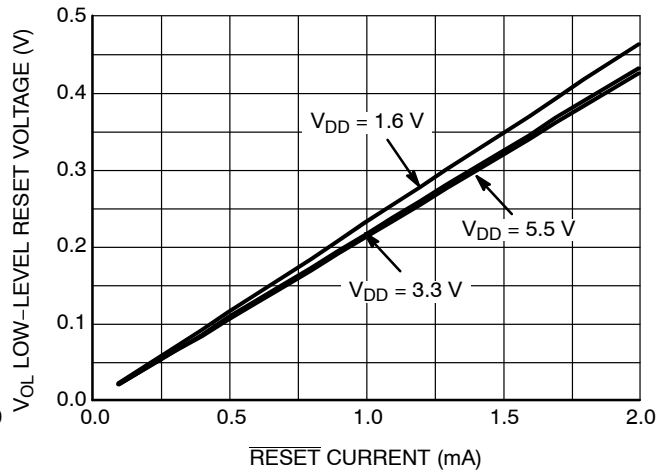


Figure 11. Low-Level RESET Voltage vs. RESET Current

DETAILED DESCRIPTION

The NCP308 microprocessor supervisory product family is designed to assert a $\overline{\text{RESET}}$ signal when either the SENSE pin voltage drops below V_{IT} or the Manual Reset input ($\overline{\text{MR}}$) is driven low. The $\overline{\text{RESET}}$ output remains asserted for a programmable delay time after both $\overline{\text{MR}}$ and SENSE voltages return above the respective thresholds. A broad range of voltage threshold and reset delay time options are available, allowing NCP308 series to be used in a wide range of applications.

Reset threshold voltages can be factory-set from 0.82 V to 3.3 V or from 4.4 V to 5.0 V, while the NCP308XXADJ can be used for any voltage above 0.405 V using an external resistor divider.

Flexible delay time can be easily got with CT pin according to Table 5:

Table 5. DELAY TIME SETTING TABLE

| CT pin Configuration | Delay Time (tD) |
|---|--|
| CT = VDD | 300 ms (fixed) |
| CT = Open | 20 ms (fixed) |
| Connecting a capacitor between pin CT and GND (Capacitor CT value > 100 pF) | 1.25 ms ~ 10 s, depends on capacitor value (Refer to the Setting Reset Delay Time Section) |

Output

The $\overline{\text{RESET}}$ output is typically connected to the $\overline{\text{RESET}}$ control pin of a microprocessor. For Open-Drain output versions, a pull-up resistor must be used to hold this line high when $\overline{\text{RESET}}$ is not asserted. The $\overline{\text{RESET}}$ output is active once V_{DD} is over $V_{DD}(\text{min})$, this voltage is much lower than most microprocessors' functional voltage range. $\overline{\text{RESET}}$ remains high as long as SENSE is above its threshold (V_{IT}) and the Manual Reset input ($\overline{\text{MR}}$) is logic high. If either SENSE falls below V_{IT} or $\overline{\text{MR}}$ is driven low, $\overline{\text{RESET}}$ is asserted.

Once $\overline{\text{MR}}$ is again logic high and SENSE is above ($V_{IT} + V_{HYS}$), the $\overline{\text{RESET}}$ pin goes to a high impedance state after delay time (tD). The open-drain structure of $\overline{\text{RESET}}$ is capable to allow the reset signal for the microprocessor to have a voltage higher than V_{DD} (up to 5.5 V). The pull-up resistor should be no smaller than 10 k Ω as a result of the finite impedance of the $\overline{\text{RESET}}$ line.

SENSE Input

The SENSE input should be connected to the monitored voltage directly. If the voltage on this pin drops below V_{IT} , then $\overline{\text{RESET}}$ is asserted. The comparator has a built-in hysteresis to prevent erratic reset operation. It is good practice to put a 1 nF to 10 nF bypass capacitor on the SENSE input to reduce its sensitivity to transients and layout parasitic.

The NCP308XXADJ can be used to monitor any voltage rail down to 0.405 V by the circuit shown in Figure 12. The new V_{IT}' can be derived from resistor divider network of R1 and R2 by:

$$V_{IT}' = \left(\frac{R1}{R2} + 1 \right) \times V_{IT} \quad (\text{eq. 1})$$

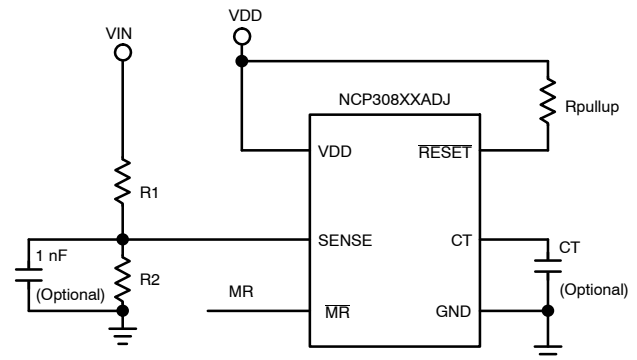


Figure 12. Using NCP308XXADJ to Monitor a User-Defined Threshold Voltage

Manual Reset Input ($\overline{\text{MR}}$)

The Manual Reset input ($\overline{\text{MR}}$) allows a processor or other logic circuits to initiate a reset. A logic low on $\overline{\text{MR}}$ causes $\overline{\text{RESET}}$ to assert. After $\overline{\text{MR}}$ returns to a logic high and SENSE is above its reset threshold, $\overline{\text{RESET}}$ is de-asserted after the delay time set by CT pin. $\overline{\text{MR}}$ is internally tied to V_{DD} by a 90 k Ω resistor so this pin can be left unconnected if $\overline{\text{MR}}$ will not be used.

Figure 13 shows how $\overline{\text{MR}}$ can be used to monitor multiple system voltages (e.g. I/O supply voltage of some DSP/processors should be setup before core voltage, and DSP/processor can only start after both I/O and core voltages setup).

NCP308, NCV308

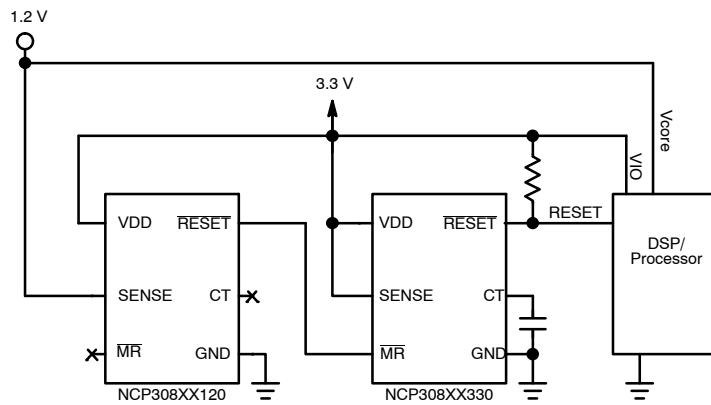


Figure 13. Using \overline{MR} to Monitor Multiple System Voltages

Setting Reset Delay Time

The NCP308 has three options for setting the reset delay time as shown in Table 5. Figure 14 shows the configuration for a fixed 300 ms typical delay time by tying CT to V_{DD}; a resistor from 40 k Ω to 200 k Ω must be used. Figure 15 shows a fixed 20 ms delay time by leaving the CT pin unconnected.

Figure 16 shows a user-defined program time between 1.25 ms and 10 s by connecting a capacitor between CT pin and ground.

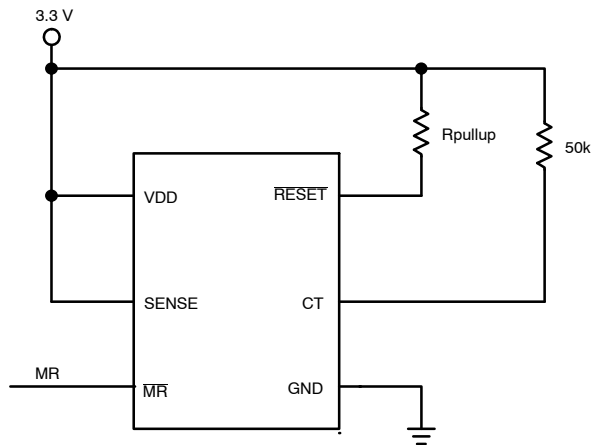


Figure 14. Delay Time Fixed to 300 ms when CT Connected to V_{DD} by Resistor

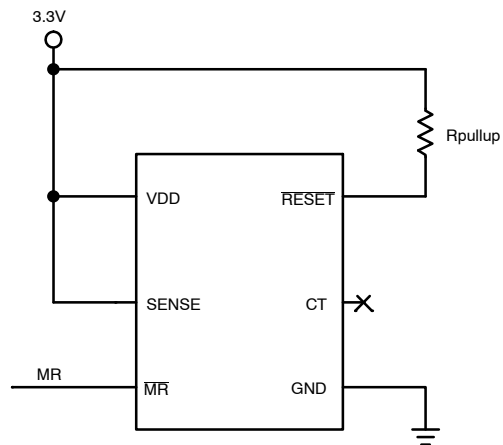


Figure 15. Delay Time Fixed to 20 ms when CT is Open

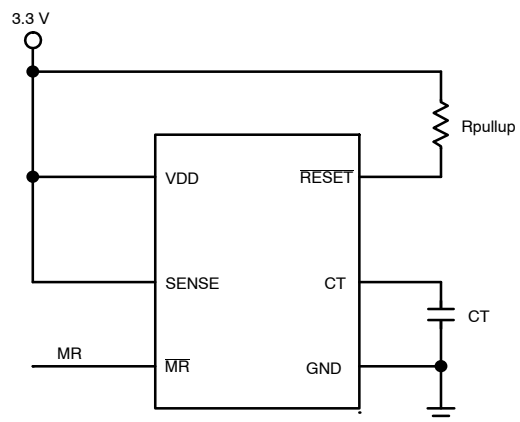


Figure 16. Delay Time Set by Capacitor

The capacitor CT should be ≥ 100 pF for NCP308 to recognize that the capacitor is present. The capacitor value for a given delay time can be calculated using the following equation:

NCP308, NCV308

$$CT(nF) = (tD(s) - 0.5 \times 10^{-3}(s)) \times 175 \quad (\text{eq. 2})$$

Parasitic capacitances of CT pin should be considered to avoid reset delay time deviation or error.

threshold overdrive, as shown in the Maximum Transient Duration at Sense vs. Sense Threshold Overdrive Voltage graph (Figure 9) in Typical Operating Characteristics section.

Immunity to Sense Pin Voltage Transients

NCP308 is relatively immune to short negative transients on SENSE pin. Sensitivity to transients is dependent on

ORDERING INFORMATION

| Device | Threshold Voltage (V_{IT}) | Nominal Monitored Voltage | Marking | Package | Shipping† |
|-----------------|--------------------------------|---------------------------|---------|---------------------|--------------------|
| NCP308SNADJT1G* | 0.405 V | Adjustable Version | VDJ | TSOP-6 (Pb-Free) | 3000 / Tape & Reel |
| NCP308SN330T1G* | 3.07 V | 3.3 V | 33A | | |
| NCP308MTADJTBG | 0.405 V | Adjustable Version | AA | WDFN6 (Pb-Free) | |
| NCP308MT090TBG | 0.84 V | 0.9 V | AC | | |
| NCP308MT120TBG | 1.12 V | 1.2 V | AD | | |
| NCP308MT125TBG | 1.16 V | 1.25 V | AE | | |
| NCP308MT150TBG | 1.40 V | 1.5 V | AF | | |
| NCP308MT180TBG | 1.67 V | 1.8 V | AG | | |
| NCP308MT190TBG | 1.77 V | 1.9 V | AH | | |
| NCP308MT250TBG | 2.33 V | 2.5 V | AJ | | |
| NCP308MT280TBG | 2.61 V | 2.8 V | AK | | |
| NCP308MT300TBG | 2.79 V | 3.0 V | AL | | |
| NCP308MT330TBG | 3.07 V | 3.3 V | AM | | |
| NCP308MT500TBG | 4.65 V | 5.0 V | AN | | |

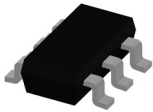
DISCONTINUED (Note 6)

| | | | | | |
|----------------|---------|--------------------|-----|---------------------|--------------------|
| NCP308SNADJT1G | 0.405 V | Adjustable Version | ADJ | TSOP-6 (Pb-Free) | 3000 / Tape & Reel |
| NCP308SN090T1G | 0.84 V | 0.9 V | 090 | | |
| NCP308SN120T1G | 1.12 V | 1.2 V | 120 | | |
| NCP308SN125T1G | 1.16 V | 1.25 V | 125 | | |
| NCP308SN150T1G | 1.40 V | 1.5 V | 150 | | |
| NCP308SN180T1G | 1.67 V | 1.8 V | 180 | | |
| NCP308SN190T1G | 1.77 V | 1.9 V | 190 | | |
| NCP308SN250T1G | 2.33 V | 2.5 V | 250 | | |
| NCP308SN280T1G | 2.61 V | 2.8 V | 280 | | |
| NCP308SN300T1G | 2.79 V | 3.0 V | 300 | | |
| NCP308SN330T1G | 3.07 V | 3.3 V | 330 | | |
| NCP308SN500T1G | 4.65 V | 5.0 V | 500 | | |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

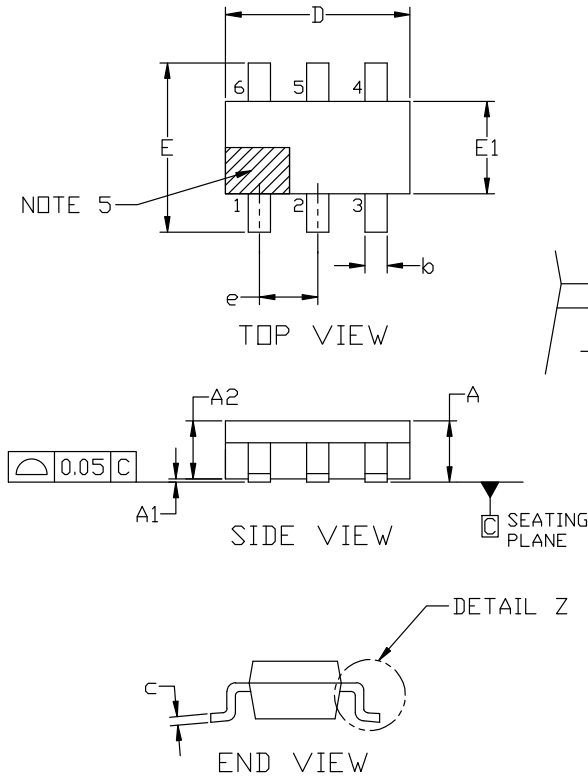
*NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

6. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.



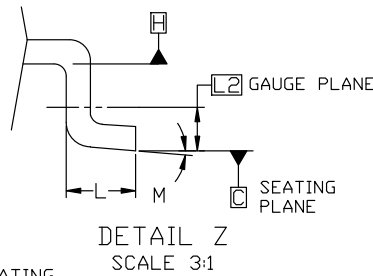
TSOP-6 3.00x1.50x0.90, 0.95P
CASE 318G
ISSUE W

DATE 26 FEB 2024

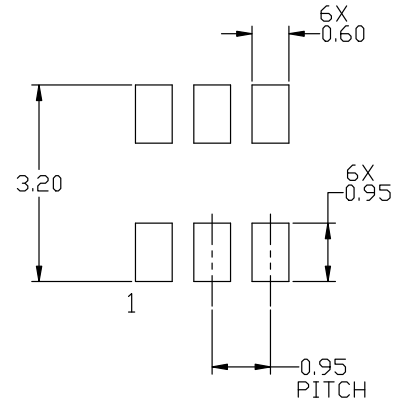


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN 1 INDICATOR MUST BE LOCATED IN THE INDICATED ZONE



| MILLIMETERS | | | |
|-------------|----------|------|------|
| DIM | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.01 | 0.06 | 0.10 |
| A2 | 0.80 | 0.90 | 1.00 |
| b | 0.25 | 0.38 | 0.50 |
| c | 0.10 | 0.18 | 0.26 |
| D | 2.90 | 3.00 | 3.10 |
| E | 2.50 | 2.75 | 3.00 |
| E1 | 1.30 | 1.50 | 1.70 |
| e | 0.85 | 0.95 | 1.05 |
| L | 0.20 | 0.40 | 0.60 |
| L2 | 0.25 BSC | | |
| M | 0° | --- | 10° |



RECOMMENDED MOUNTING FOOTPRINT

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference manual, SOLDERRM/D.

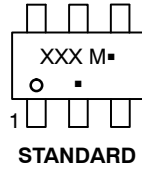
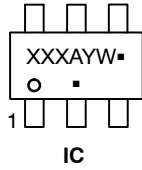
| | | |
|-------------------------|-------------------------------------|--|
| DOCUMENT NUMBER: | 98ASB14888C | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | TSOP-6 3.00x1.50x0.90, 0.95P | PAGE 1 OF 2 |

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

TSOP-6 3.00x1.50x0.90, 0.95P
CASE 318G
ISSUE W

DATE 26 FEB 2024

**GENERIC
MARKING DIAGRAM***



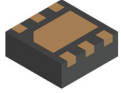
| | |
|----------------------------|----------------------------|
| XXX = Specific Device Code | XXX = Specific Device Code |
| A = Assembly Location | M = Date Code |
| Y = Year | ▪ = Pb-Free Package |
| W = Work Week | |
| ▪ = Pb-Free Package | |

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

- | | | | | | |
|--|--|---|---|---|--|
| STYLE 1: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN | STYLE 2: PIN 1. EMITTER 2 2. BASE 1 3. COLLECTOR 1 4. EMITTER 1 5. BASE 2 6. COLLECTOR 2 | STYLE 3: PIN 1. ENABLE 2. N/C 3. R BOOST 4. Vz 5. V in 6. V out | STYLE 4: PIN 1. N/C 2. V in 3. NOT USED 4. GROUND 5. ENABLE 6. LOAD | STYLE 5: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2 | STYLE 6: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR |
| STYLE 7: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. N/C 5. COLLECTOR 6. EMITTER | STYLE 8: PIN 1. Vbus 2. D(in) 3. D(in)+ 4. D(out)+ 5. D(out) 6. GND | STYLE 9: PIN 1. LOW VOLTAGE GATE 2. DRAIN 3. SOURCE 4. DRAIN 5. DRAIN 6. HIGH VOLTAGE GATE | STYLE 10: PIN 1. D(OUT)+ 2. GND 3. D(OUT)- 4. D(IN)- 5. VBUS 6. D(IN)+ | STYLE 11: PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1/GATE 2 | STYLE 12: PIN 1. I/O 2. GROUND 3. I/O 4. I/O 5. VCC 6. I/O |
| STYLE 13: PIN 1. GATE 1 2. SOURCE 2 3. GATE 2 4. DRAIN 2 5. SOURCE 1 6. DRAIN 1 | STYLE 14: PIN 1. ANODE 2. SOURCE 3. GATE 4. CATHODE/DRAIN 5. CATHODE/DRAIN 6. CATHODE/DRAIN | STYLE 15: PIN 1. ANODE 2. SOURCE 3. GATE 4. DRAIN 5. N/C 6. CATHODE | STYLE 16: PIN 1. ANODE/CATHODE 2. BASE 3. EMITTER 4. COLLECTOR 5. ANODE 6. CATHODE | STYLE 17: PIN 1. EMITTER 2. BASE 3. ANODE/CATHODE 4. ANODE 5. CATHODE 6. COLLECTOR | |

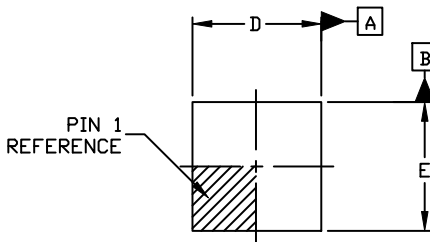
| | | |
|-------------------------|-------------------------------------|---|
| DOCUMENT NUMBER: | 98ASB14888C | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | TSOP-6 3.00x1.50x0.90, 0.95P | PAGE 2 OF 2 |

onsemi and **ONSEMI** are trademarks of Semiconductor Components Industries, LLC dba **onsemi** or its subsidiaries in the United States and/or other countries. **onsemi** reserves the right to make changes without further notice to any products herein. **onsemi** makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. **onsemi** does not convey any license under its patent rights nor the rights of others.

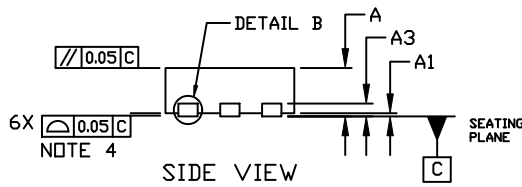


**WDFN6 2x2, 0.65P
CASE 511BR
ISSUE C**

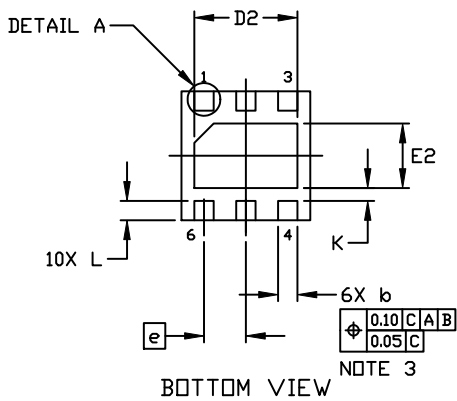
DATE 01 DEC 2021



TOP VIEW



SIDE VIEW



BOTTOM VIEW

**GENERIC
MARKING DIAGRAM***

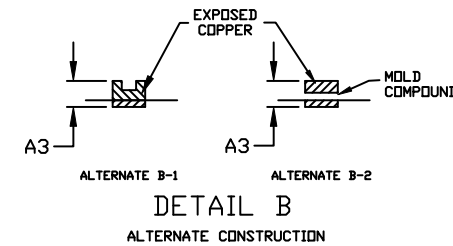


XX = Specific Device Code
M = Date Code

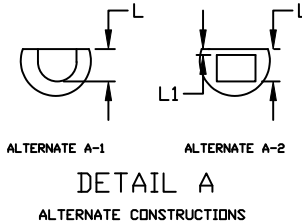
*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "μ", may or may not be present. Some products may not follow the Generic Marking.

NOTES:

1. DIMENSION AND TOLERANCING PER ASME Y14.5, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

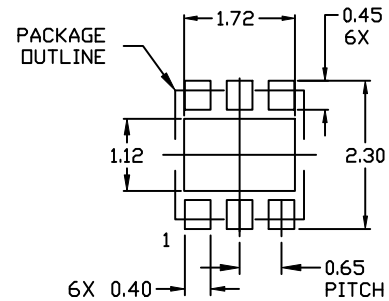


DETAIL B
ALTERNATE CONSTRUCTION



DETAIL A
ALTERNATE CONSTRUCTIONS

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | --- | 0.05 |
| A3 | 0.20 REF | | |
| b | 0.25 | 0.30 | 0.35 |
| D | 1.90 | 2.00 | 2.10 |
| D2 | 1.50 | 1.60 | 1.70 |
| E | 1.90 | 2.00 | 2.10 |
| E2 | 0.90 | 1.00 | 1.10 |
| e | 0.65 BSC | | |
| K | 0.20 REF | | |
| L | 0.20 | 0.30 | 0.40 |
| L1 | --- | --- | 0.15 |



RECOMMENDED
MOUNTING FOOTPRINT

For additional information on our Pb-Free strategy and soldering details, please download the DN Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

| | | |
|-------------------------|-------------------------|--|
| DOCUMENT NUMBER: | 98AON55829E | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | WDFN6 2X2, 0.65P | PAGE 1 OF 1 |

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales