

# NCP694

## 1A CMOS Low-Dropout Voltage Regulator

The NCP694 series of fixed output super low dropout linear regulators are designed for portable battery powered applications with high output current requirement up to 1 A and  $-3$  mV typical load regulation at 1 A. Each device contains a voltage reference unit, an error amplifier, a PMOS power transistor, resistors for setting output voltage, a current limit circuits for overcurrent and thermal-shutdown. A standby mode with ultra low supply current can be realized with the chip enable function.

The device is housed in the SOT-89-5 and HSON-6 packages. Standard voltage versions are 0.8 V, 1.0 V, 1.2 V, 2.5 V, 3.3 V for fixed version and adjustable output voltage down to 1.0 V.

### Features

- Maximum Operating Voltage of 6.0 V
- Minimum Output Voltage Down to 0.8 V for Fix Version and 1.0 V for Adjustable Version
- Load Regulation  $-3$  mV at 1 A Output Current
- Low Dropout
- Build-in Auto Discharge Function for D Version
- Standby Mode With Low Consumption
- These are Pb-Free Devices

### Typical Applications

- Battery Powered Instruments
- Hand-Held Instruments
- Camcorders and Cameras
- Portable communication equipments



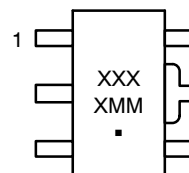
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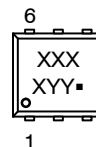
### MARKING DIAGRAMS



**SOT-89-5  
CASE 528AB**



**HSON-6  
CASE 506AE**



XXXX = Specific Device Code  
MM, YY = Lot Number  
G or ■ = Pb-Free Package

For actual marking Pb-Free indicator, "G" or micro-dot "■" may or may not be provided.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 15 of this data sheet.

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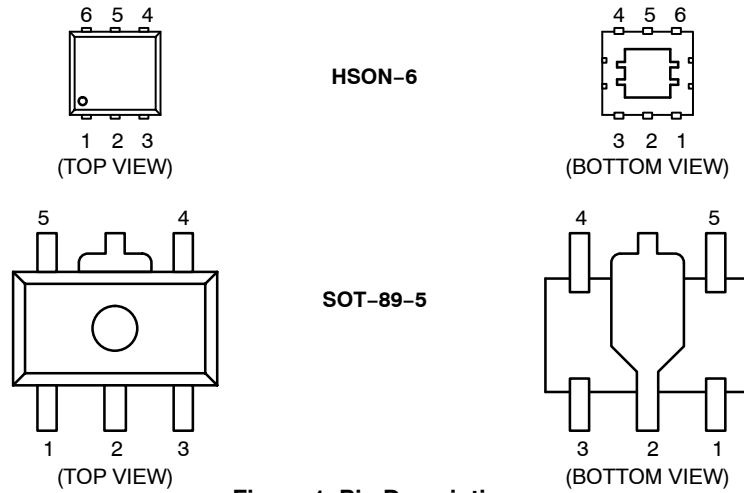


Figure 1. Pin Description

## PIN FUNCTION DESCRIPTION FOR SOT-89-5 PACKAGE

| Pin No. | Pin Name  | Description                                                                                                                                                                                  |
|---------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | ADJ/NC    | Adjust pin for NCP694DADJHT1G and NCP694HADJHT1G / No connection                                                                                                                             |
| 2       | GND       | Power supply ground                                                                                                                                                                          |
| 3       | CE        | This input is used to place the device into low-power standby. When this input is pulled low, the device is disabled. If this function is not used, Enable should be connected to $V_{in}$ . |
| 4       | $V_{in}$  | Positive power supply input voltage.                                                                                                                                                         |
| 5       | $V_{out}$ | Regulated output voltage.                                                                                                                                                                    |

## PIN FUNCTION DESCRIPTION FOR HSON-6 PACKAGE

| Pin No. | Pin Name  | Description                                                                                                                                                                                  |
|---------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | $V_{out}$ | Regulated output voltage                                                                                                                                                                     |
| 2       | $V_{out}$ | Regulated output voltage                                                                                                                                                                     |
| 3       | ADJ / NC  | Adjust pin for NCP694DSANADJT1G and NCP694HSANADJT1G / No connection                                                                                                                         |
| 4       | GND       | Power supply ground                                                                                                                                                                          |
| 5       | CE        | This input is used to place the device into low power standby. When this input is pulled low, the device is disabled. If this function is not used, Enable should be connected to $V_{in}$ . |
| 6       | $V_{in}$  | Positive power supply input voltage                                                                                                                                                          |

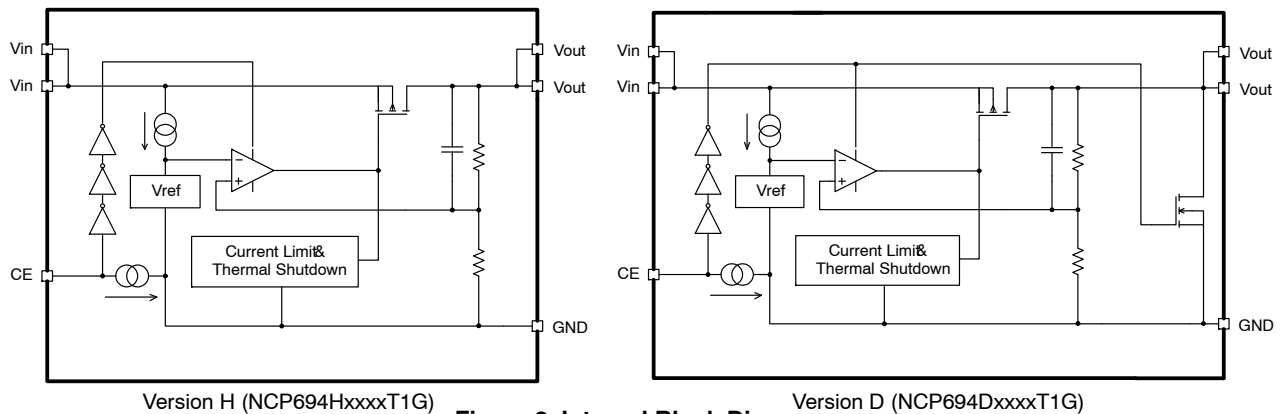


Figure 2. Internal Block Diagram

# NCP694

## MAXIMUM RATINGS

| Rating                         | Symbol    | Value                  | Unit |
|--------------------------------|-----------|------------------------|------|
| Input Voltage                  | $V_{in}$  | 6.5                    | V    |
| Enable Voltage                 | $V_{CE}$  | -0.3 to $V_{in}$       | V    |
| Output Voltage                 | $V_{out}$ | -0.3 to $V_{in} + 0.3$ | V    |
| Power Dissipation SOT-89-5     | $P_D$     | 900                    | mW   |
| Power Dissipation HSON-6       | $P_D$     | 900                    | mW   |
| Operating Junction Temperature | $T_J$     | +150                   | °C   |
| Operating Ambient Temperature  | $T_A$     | -40 to +85             | °C   |
| Storage Temperature            | $T_{stg}$ | -55 to +125            | °C   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. This device series contains ESD protection and exceeds the following tests:  
Human Body Model 2000 V per JEDEC  
Machine Model Method 200 V

## THERMAL CHARACTERISTICS

| Rating                       | Symbol          | Test Conditions                            | Typical Value | Unit |
|------------------------------|-----------------|--------------------------------------------|---------------|------|
| Junction-to-Ambient SOT-89-5 | $R_{\theta JA}$ | 1 oz Copper Thickness, 100 mm <sup>2</sup> | 111           | °C/W |
| Power Dissipation SOT-89-5   | $P_D$           |                                            | 900           | mW   |
| Junction-to-Ambient HSON-6   | $R_{\theta JA}$ | 1 oz Copper Thickness, 100 mm <sup>2</sup> | 111           | °C/W |
| Power Dissipation HSON-6     | $P_D$           |                                            | 900           | mW   |

NOTE: Single component mounted on an 80 x 80 x 1.5 mm FR4 PCB with stated copper head spreading area. Using the following boundary conditions as stated in EIA/JESD 51-1, 2, 3, 7, 12.

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**ELECTRICAL CHARACTERISTICS FOR FIX VERSION** ( $V_{in} = V_{out(nom.)} + 1.0\text{ V}$ ,  $V_{CE} = V_{in}$ ,  $C_{in} = 4.7\text{ }\mu\text{F}$ ,  $C_{out} = 4.7\text{ }\mu\text{F}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise noted)

| Characteristic                                                                                                                                         | Symbol             | Min                                       | Typ                                  | Max                                       | Unit                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------|--------------------------------------|-------------------------------------------|-----------------------|
| Output Voltage ( $T_A = 25^\circ\text{C}$ , $I_{out} = 100\text{ mA}$ , $V_{in} - V_{out} = 1\text{ V}$ )<br>0.8 V<br>1.0 V<br>1.2 V<br>2.5 V<br>3.3 V | $V_{out}$          | 0.770<br>0.970<br>1.170<br>2.450<br>3.234 | 0.8<br>1.0<br>1.2<br>2.5<br>3.3      | 0.830<br>1.030<br>1.030<br>2.550<br>3.366 | V                     |
| Output Current ( $V_{in} - V_{out} = 1\text{ V}$ )                                                                                                     | $I_{out}$          |                                           | 1                                    |                                           | A                     |
| Input voltage                                                                                                                                          | $V_{in}$           | 1.4                                       |                                      | 6.0                                       | V                     |
| Line Regulation ( $I_{out} = 100\text{ mA}$ )                                                                                                          | $Reg_{line}$       | –                                         | 0.05                                 | 0.2                                       | %/V                   |
| Load Regulation ( $I_{out} = 1\text{ mA to }300\text{ mA}$ , $V_{in} = V_{out} + 2.0\text{ V}$ )                                                       | $Reg_{load03}$     | –15                                       | –2                                   | 15                                        | mV                    |
| Load Regulation ( $I_{out} = 1\text{ mA to }1\text{ A}$ , $V_{in} = V_{out} + 2.0\text{ V}$ )                                                          | $Reg_{load1}$      | –                                         | –3                                   | –                                         | mV                    |
| Supply Current ( $I_{out} = 0\text{ A}$ , $(V_{in} - V_{out}) = 1\text{ V}$ , $V_{CE} = V_{in}$ )                                                      | $I_{ss}$           |                                           | 60                                   | 100                                       | $\mu\text{A}$         |
| Standby Current ( $V_{CE} = 0\text{ V}$ , $V_{in} = 6.0\text{ V}$ )                                                                                    | $I_{stby}$         |                                           | 0.1                                  | 1.0                                       | $\mu\text{A}$         |
| Short Current Limit ( $V_{out} = 0\text{ V}$ )                                                                                                         | $I_{sh}$           |                                           | 250                                  |                                           | mA                    |
| Output Voltage Temperature Coefficient                                                                                                                 | $T_c$              | –                                         | $\pm 100$                            | –                                         | ppm/ $^\circ\text{C}$ |
| Enable Input Threshold Voltage<br>(Voltage Increasing, Output Turns On, Logic High)<br>(Voltage Decreasing, Output Turns Off, Logic Low)               | $V_{thCE}$         | 1.0<br>0                                  | –<br>–                               | 6<br>0.4                                  | V                     |
| Enable Pull-down Current                                                                                                                               |                    |                                           | 100                                  | 220                                       | nA                    |
| Drop Output Voltage ( $T_A = 25^\circ\text{C}$ , $I_{out} = 300\text{ mA}$ )<br>0.8 V Output voltage $V_{out}$ (V)<br>1.0 V<br>1.2 V<br>2.5 V<br>3.3 V | $V_{in} - V_{out}$ |                                           | 0.33<br>0.22<br>0.18<br>0.10<br>0.05 | 0.570<br>0.470<br>0.320<br>0.150<br>0.100 | V                     |
| Drop Output Voltage ( $T_A = 25^\circ\text{C}$ , $I_{out} = 1\text{ A}$ )<br>0.8 V Output voltage $V_{out}$ (V)<br>1.0 V<br>1.2 V<br>2.5 V<br>3.3 V    | $V_{in} - V_{out}$ |                                           | 0.72<br>0.64<br>0.56<br>0.32<br>0.18 |                                           | V                     |
| Ripple Rejection (Ripple 200 mV <sub>pp</sub> , $I_{out} = 100\text{ mA}$ , $f = 1\text{ kHz}$ )                                                       | PSRR               |                                           | 70                                   |                                           | dB                    |
| Output Noise (BW = 10 Hz to 100 kHz, $I_{out} = 1\text{ mA}$ )                                                                                         | $V_{noise}$        |                                           | 30                                   |                                           | $\mu\text{V}_{rms}$   |
| Thermal Shutdown Temperature/Hysteresis                                                                                                                | $T_{shd}/Hyst$     |                                           | 150/30                               |                                           | $^\circ\text{C}$      |
| $R_{DS(on)}$ of additional output transistor (D version only)                                                                                          | $R_{DS(on)}$       |                                           | 30                                   |                                           | $\Omega$              |

- Maximum package power dissipation limits must be observed.
- Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.

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**ELECTRICAL CHARACTERISTIC FOR ADJUSTABLE VERSION** ( $V_{in} = V_{out} + 1\text{ V}$ ,  $V_{CE} = V_{in}$ ,  $C_{in} = C_{out} = 4.7\text{ }\mu\text{F}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise noted)

| Characteristic                                                                                                                             | Symbol                | Min    | Typ        | Max      | Unit                  |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------|------------|----------|-----------------------|
| Input Voltage                                                                                                                              | $V_{in}$              | 1.4    |            | 6        | V                     |
| Supply Current ( $V_{out} = V_{ADJ}$ , $V_{in} = 2\text{ V}$ , $V_{CE} = V_{in}$ )                                                         | $I_{SS}$              |        | 60         | 100      | $\mu\text{A}$         |
| Standby Current ( $V_{in} = 6.0\text{ V}$ , $V_{CE} = 0\text{ V}$ )                                                                        | $I_{standby}$         |        | 0.1        | 1        | $\mu\text{A}$         |
| Reference Voltage For Adjustable Voltage Regulator ( $V_{out} = V_{ADJ}$ , $V_{in} = 2.0\text{ V}$ , $I_{out} = 100\text{ mA}$ )           | $V_{ref}$             | 0.97   | 1          | 1.03     | V                     |
| Output Voltage Range                                                                                                                       | $V_{out\text{range}}$ | 1      |            | $V_{in}$ | V                     |
| Output Current ( $V_{out} = V_{ADJ}$ , $V_{in} = 2.0\text{ V}$ )                                                                           | $I_{out}$             | 1      |            |          | A                     |
| Load Regulation ( $V_{in} = 1.4\text{ V}$ , $1\text{ mA} < I_{out} < 300\text{ mA}$ , $V_{out} = V_{ADJ}$ )                                | $V_{out}/I_{out}$     | -15    | -2         | 15       | mV                    |
| Load Regulation ( $V_{in} = 1.7\text{ V}$ , $1\text{ mA} < I_{out} < 1\text{ A}$ , $V_{out} = V_{ADJ}$ )                                   | $V_{out}/I_{out}$     |        | -3         |          | mV                    |
| Dropout Voltage ( $V_{out} = V_{ADJ}$ , $I_{out} = 300\text{ mA}$ )                                                                        | $V_{drop300}$         |        | 0.18       | 0.32     | V                     |
| Dropout Voltage ( $V_{out} = V_{ADJ}$ , $I_{out} = 1\text{ A}$ )                                                                           | $V_{drop1}$           |        | 0.56       |          | V                     |
| Line regulation ( $V_{out} = V_{ADJ}$ , $I_{out} = 100\text{ mA}$ , $1.5\text{ V} < V_{in} < 6.0\text{ V}$ )                               | $V_{out}/V_{in}$      |        | 0.05       | 0.2      | %V                    |
| PSRR ( $f = 1\text{ kHz}$ , $V_{out} = V_{ADJ}$ , $V_{in} = 2.5\text{ V}$ , $I_{out} = 100\text{ mA}$ , Input Ripple $0.5\text{ V}_{pp}$ ) | PSRR                  |        | 70         |          | dB                    |
| Output Voltage Temperature Coefficient ( $I_{out} = 100\text{ mA}$ , $-40^\circ\text{C} < T_J < 85^\circ\text{C}$ )                        | $V_{out}/T_J$         |        | $\pm 100$  |          | ppm/ $^\circ\text{C}$ |
| Short Current Limit ( $V_{out} = V_{ADJ} = 0$ )                                                                                            | $I_{lim}$             |        | 250        |          | mA                    |
| Enable Pull-down Current                                                                                                                   | $I_{CE}$              |        | 100        | 220      | nA                    |
| Enable Input Threshold Voltage<br>(Voltage Increasing, Output Turns On, Logic High)<br>(Voltage Decreasing, Output Turns Off, Logic Low)   | $V_{thCE}$            | 1<br>0 | -<br>-     | 6<br>0.4 | V                     |
| Thermal Shutdown Temperature/Hysteresis                                                                                                    | $T_{shdn}/$<br>Hyst   |        | 150/<br>30 |          | $^\circ\text{C}$      |
| $R_{DS(on)}$ of additional output transistor (D version only)                                                                              | $R_{DS(on)}$          |        | 30         |          | $\Omega$              |

## APPLICATIONS INFORMATION

A typical application circuit for the NCP694 series is shown in Figure 5, Typical Application Schematic.

### Input Decoupling (C1)

A 4.7  $\mu\text{F}$  capacitor either ceramic or tantalum is recommended and should be connected as close as possible to the pins of NCP694 device. Higher values and lower ESR will improve the overall line transient response.

### Output Decoupling (C2)

The minimum decoupling value is 4.7  $\mu\text{F}$  and can be augmented to fulfill stringent load transient requirements. The regulator accepts ceramic chip capacitors as well as tantalum devices. If a tantalum capacitor is used, and its ESR is large, the loop oscillation may result. Because of this, select C2 carefully considering its frequency characteristics. Larger values improve noise rejection and load regulation transient response.

### Enable Operation

The enable pin CE will turn on or off the regulator. These limits of threshold are covered in the electrical specification section of this data sheet. If the enable is not used then the pin should be connected to  $V_{in}$ . The D version devices (NCP694DxxxxT1G) have additional circuitry in order to reach the turn-off speed faster than normal type. When the mode is into standby with CE signal, auto discharge transistor turns on.

### Hints

Please be sure the  $V_{in}$  and GND lines are sufficiently wide. If their impedance is high, noise pickup or unstable operation may result.

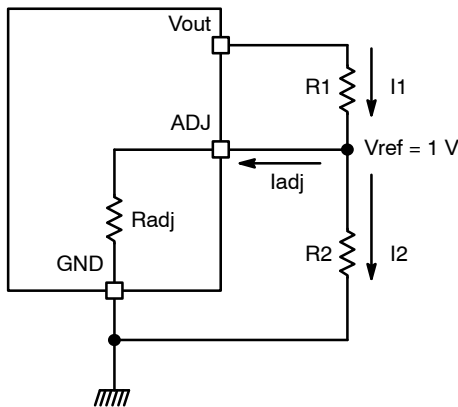


Figure 3. Output Voltage Setting

Set external components, especially the output capacitor, as close as possible to the circuit, and make leads as short as possible.

### Thermal

As power across the NCP694 increases, it might become necessary to provide some thermal relief. The maximum power dissipation supported by the device is dependent upon board design and layout. Mounting pad configuration on the PCB, the board material, and also the ambient temperature effect the rate of temperature rise for the part. This is stating that when the NCP694 has good thermal conductivity through the PCB, the junction temperature will be relatively low with high power dissipation applications.

### Output Voltage Setting of Adjustable Version.

An external two resistors are required for setting desired output voltage as shows Figure 3. Output Voltage Setting. The equation for the output voltage is mentioned in equation below.

$$\begin{aligned}
 V_{out} &= V_{ref} + R1 \cdot I1 \\
 &= V_{ref} + R1 \cdot (I_{adj} + I2) \\
 &= V_{ref} + R1 \cdot (V_{ref}/R_{adj}) + R1 \cdot (V_{ref}/R2) \quad (\text{eq. 1}) \\
 &= V_{ref} \cdot \left(1 + (R1/R_{adj}) + (R1/R2)\right) \\
 &= 1.0 \cdot \left(1 + (R1/R_{adj}) + (R1/R2)\right)
 \end{aligned}$$

For better accuracy, choosing  $R2 \ll R_{adj}$  reduces the error given by ADJ pin consumption. The typical resistance  $R_{adj}$  is showed in Figure 4. ADJ Pin Resistance

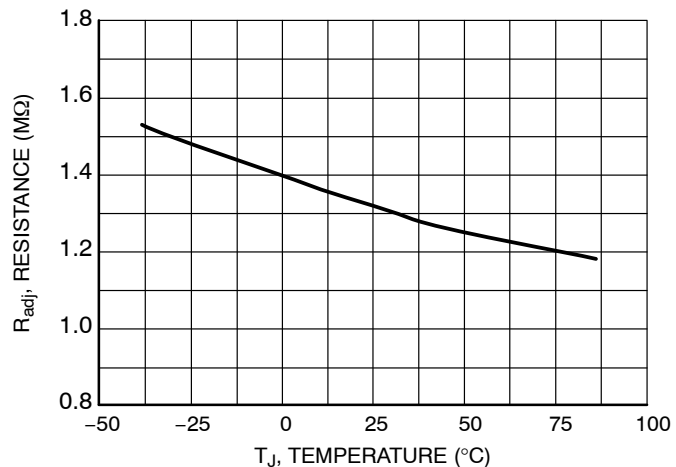


Figure 4. ADJ Pin Resistance vs. Temperature

## NCP694

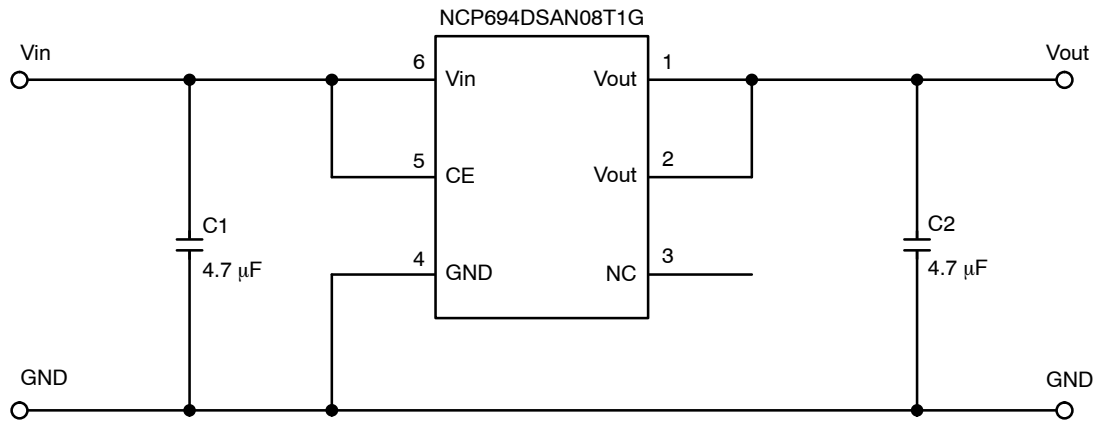


Figure 5. Typical Application Schematic

TYPICAL CHARACTERISTICS

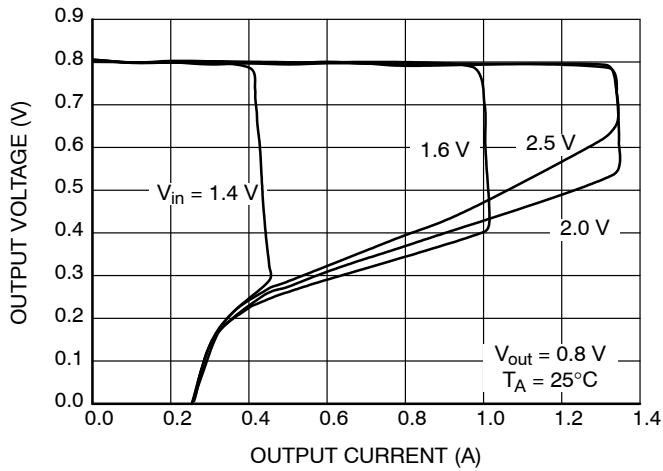


Figure 6. Output Voltage vs. Output Current

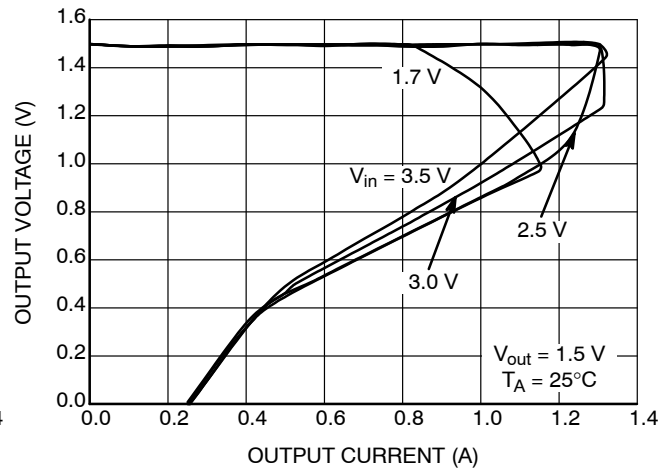


Figure 7. Output Voltage vs. Output Current

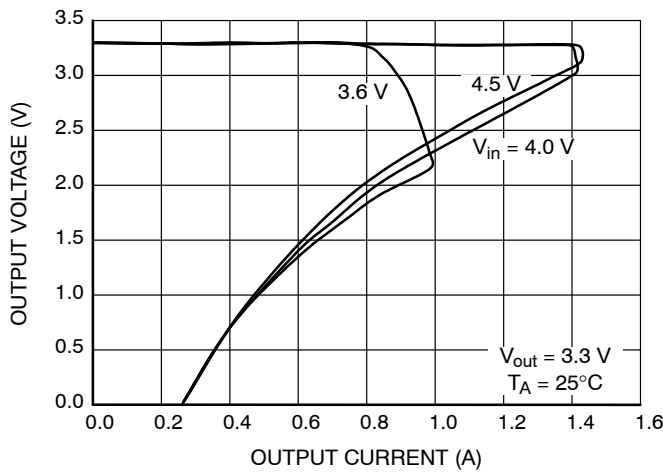


Figure 8. Output Voltage vs. Output Current

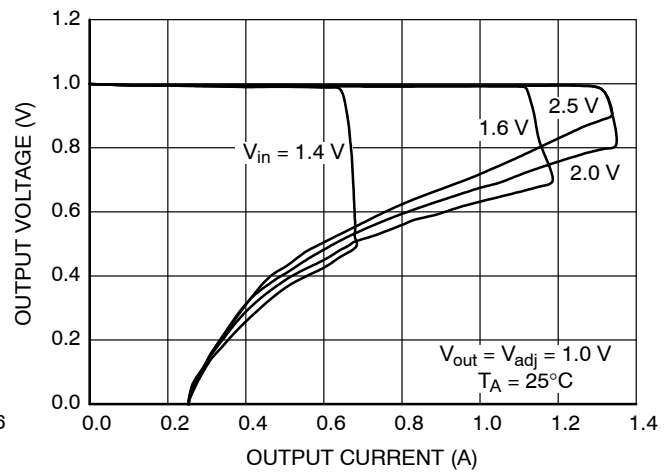


Figure 9. Output Voltage vs. Output Current for Adjustable Output

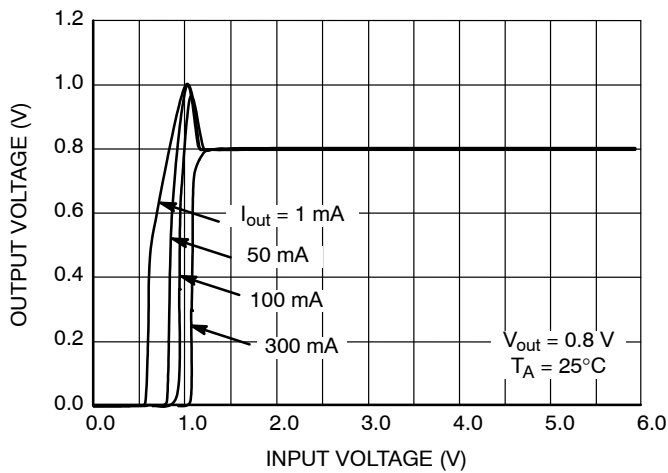


Figure 10. Output Voltage vs. Input Voltage

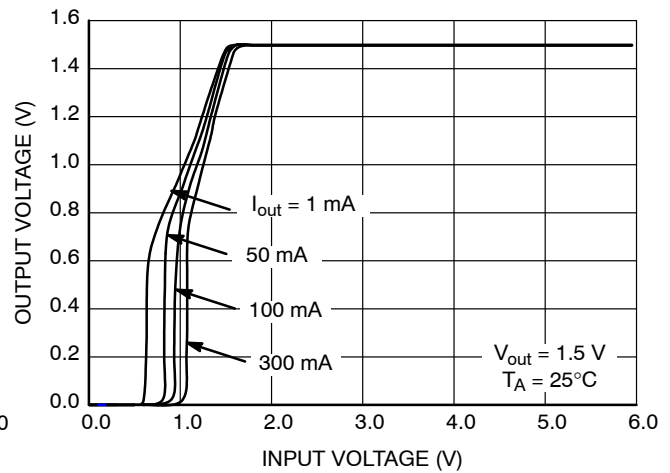


Figure 11. Output Voltage vs. Input Voltage

TYPICAL CHARACTERISTICS

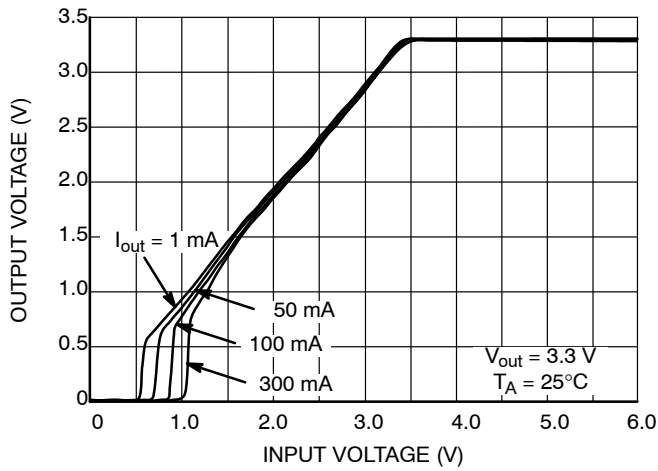


Figure 12. Output Voltage vs. Input Voltage

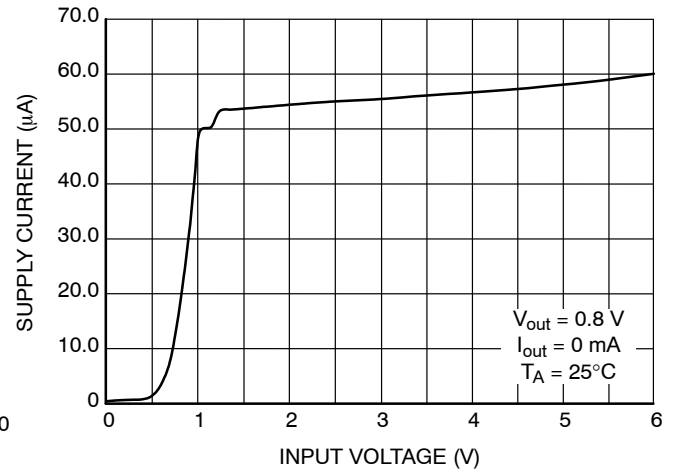


Figure 13. Supply Current vs. Input Voltage

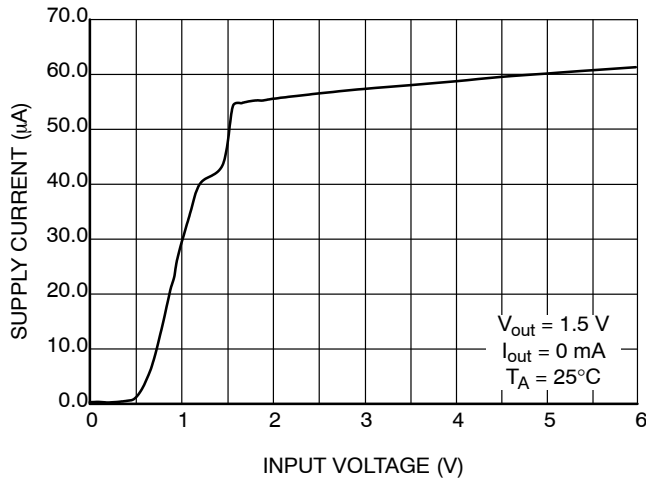


Figure 14. Supply Current vs. Input Voltage

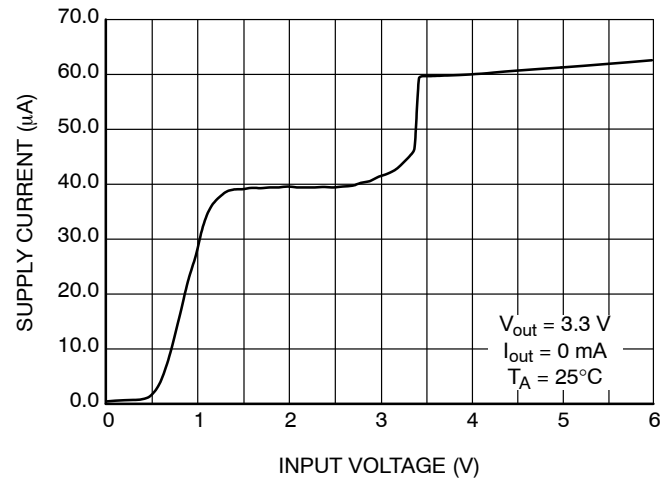


Figure 15. Supply Current vs. Input Voltage

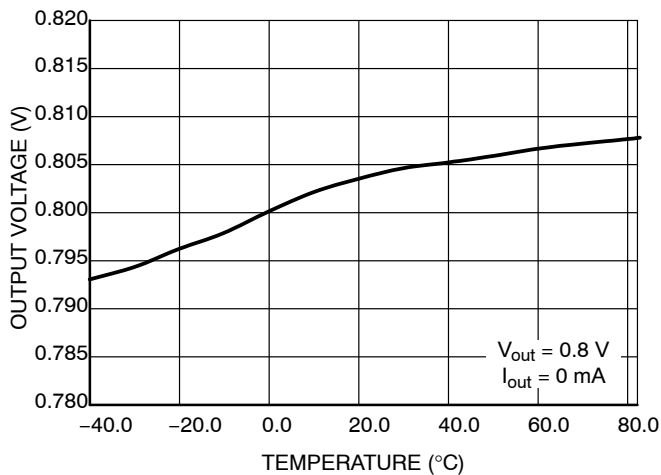


Figure 16. Output Voltage vs. Temperature

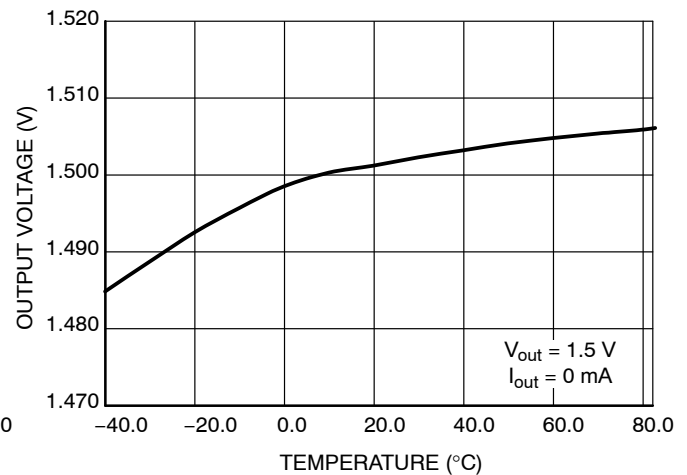


Figure 17. Output Voltage vs. Temperature

TYPICAL CHARACTERISTICS

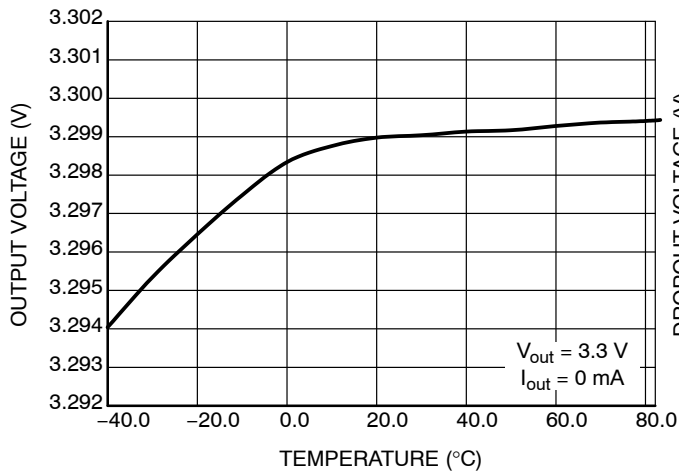


Figure 18. Output Voltage vs. Temperature

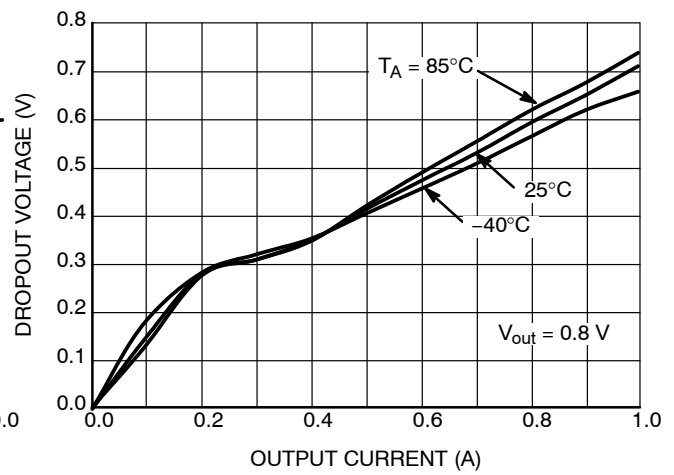


Figure 19. Dropout Voltage vs. Output Current

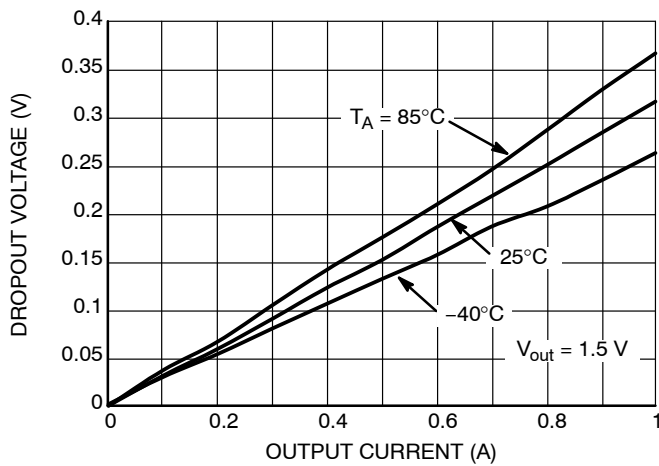


Figure 20. Dropout Voltage vs. Output Current

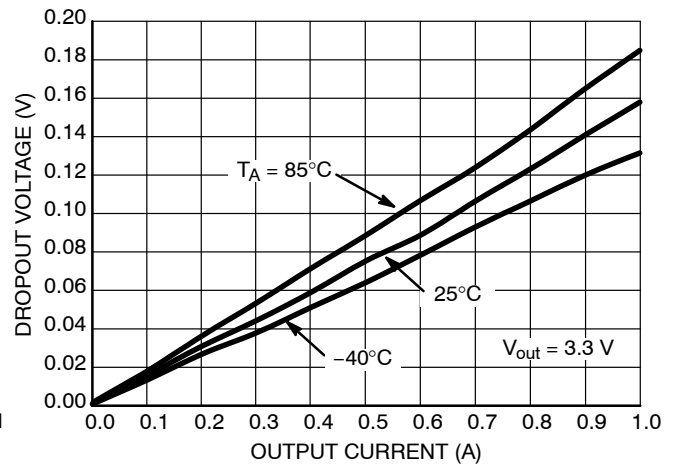


Figure 21. Dropout Voltage vs. Output Current

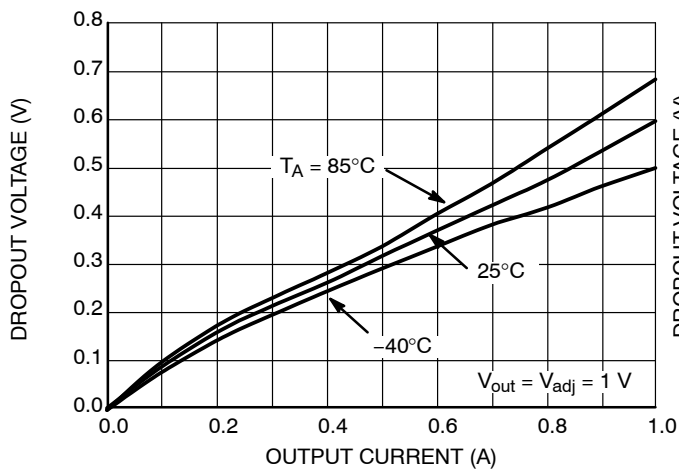


Figure 22. Dropout Voltage vs. Output Current for Adjustable Output

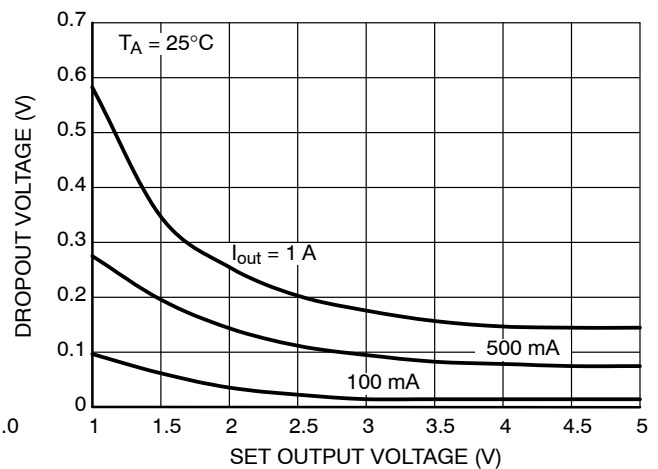
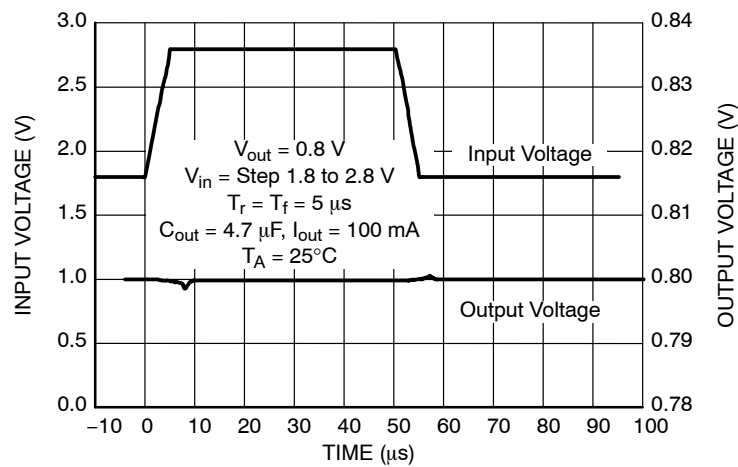
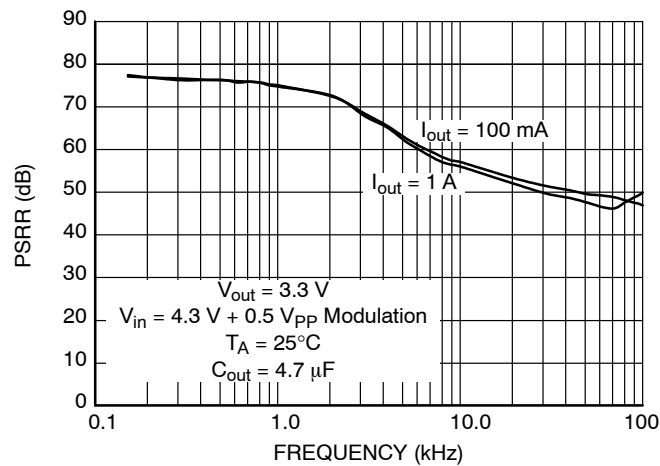
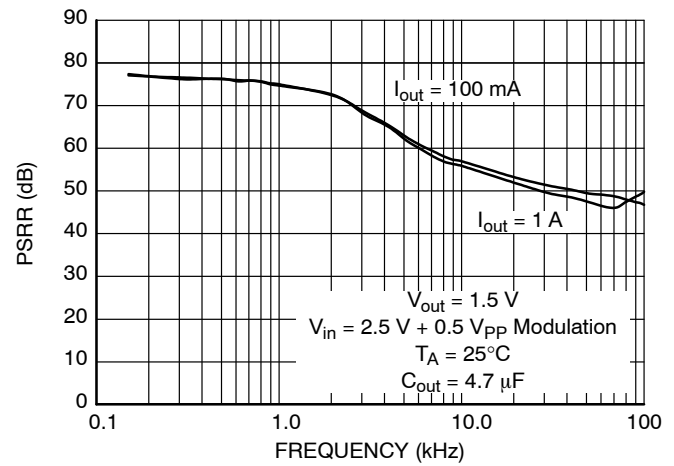
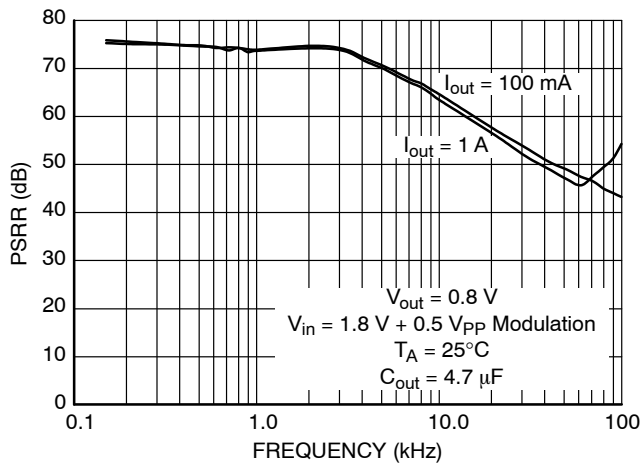


Figure 23. Dropout Voltage vs. Set Output Voltage

TYPICAL CHARACTERISTICS



# NCP694

## TYPICAL CHARACTERISTICS

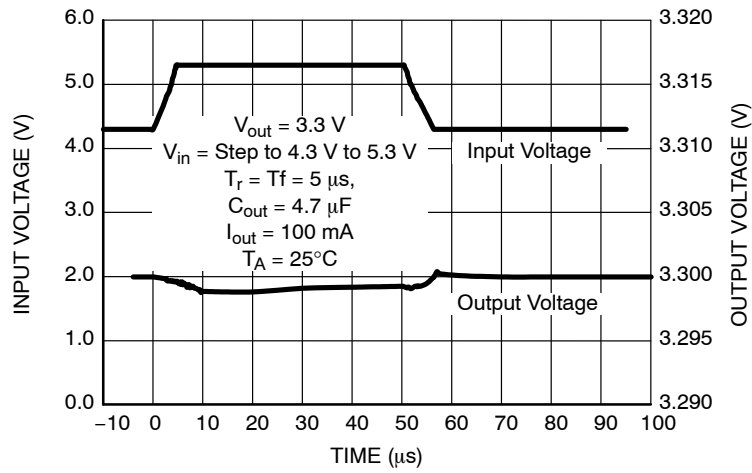


Figure 28. Input Transient Response

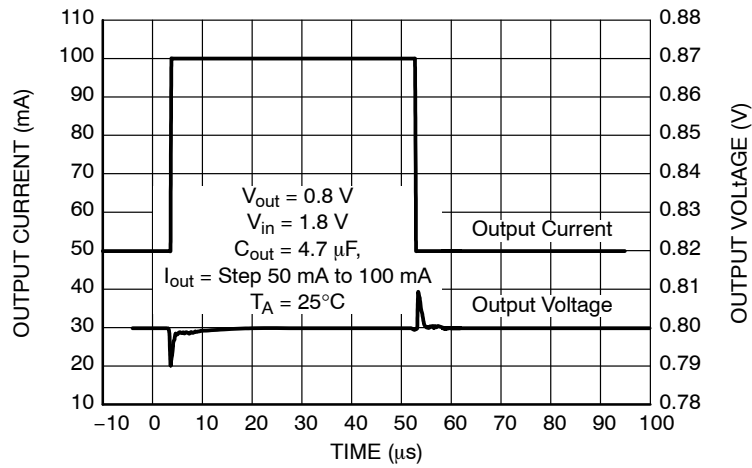


Figure 29. Load Transient Response

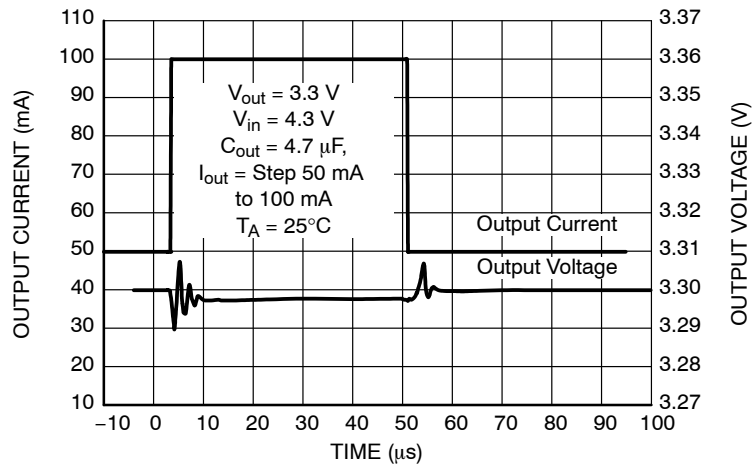


Figure 30. Load Transient Response

# NCP694

## TYPICAL CHARACTERISTICS

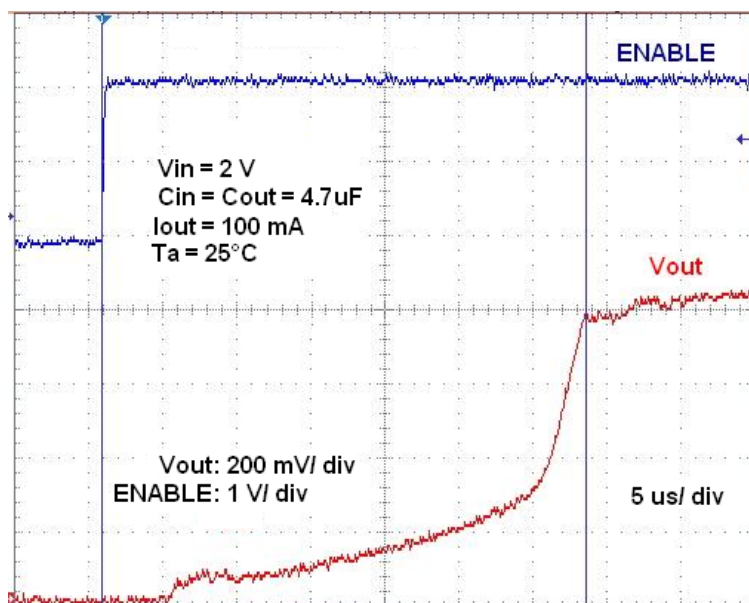


Figure 31. Output Voltage vs. CE Pin Turn-On NCP694Dx08xx

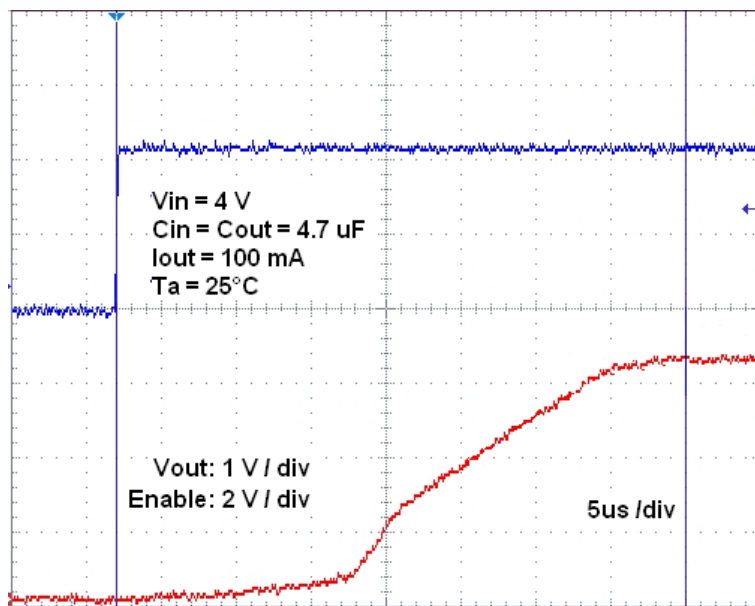


Figure 32. Output Voltage vs. CE Pin Turn-On NCP694Dx33xx

# NCP694

## TYPICAL CHARACTERISTICS

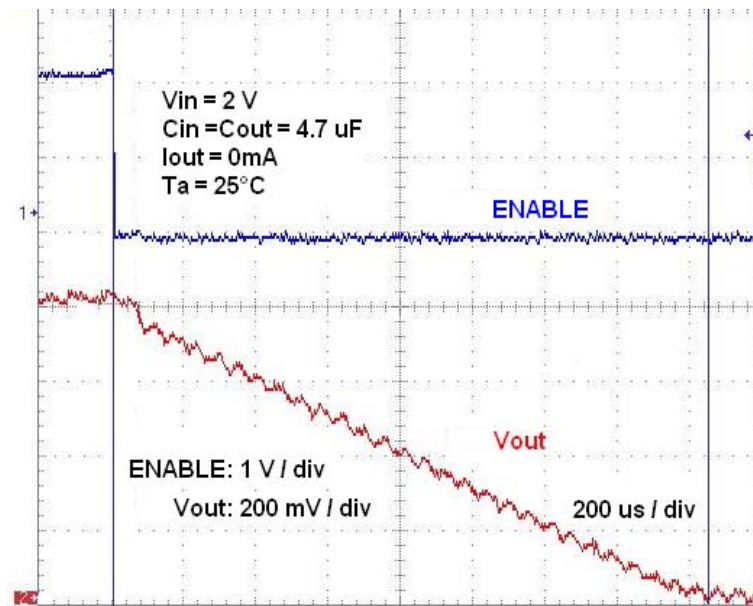


Figure 33. Output Voltage vs. CE Pin Turn-Off NCP694H08xxxx

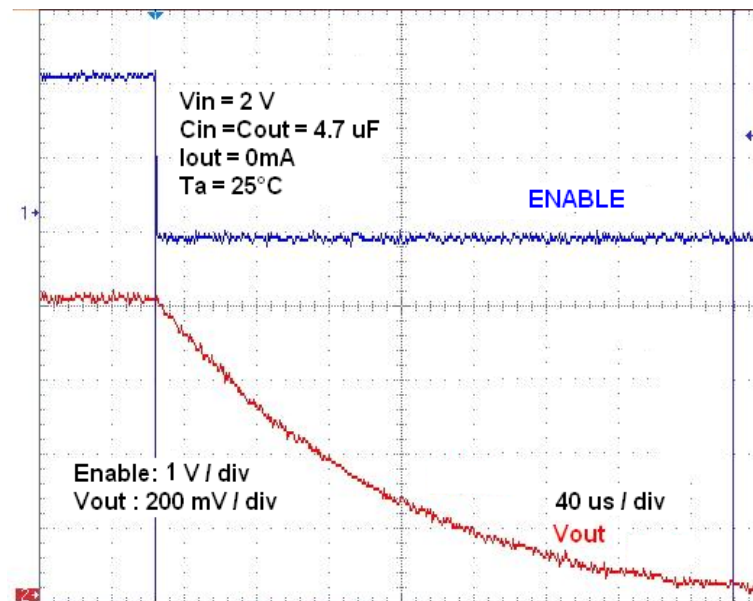


Figure 34. Output Voltage vs. CE Pin Turn-Off NCP694D08xxxx

# NCP694

## ORDERING INFORMATION

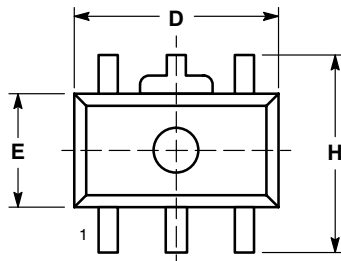
| Device           | Nominal Output Voltage | Description                  | Marking | Package            | Shipping <sup>†</sup> |
|------------------|------------------------|------------------------------|---------|--------------------|-----------------------|
| NCP694HADJHT1G   | adj.                   | Enable High                  | L 0 0 B | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694H08HT1G    | 0.8 V                  | Enable High                  | L 0 8 B | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694H10HT1G    | 1.0 V                  | Enable High                  | L 1 0 B | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694H12HT1G    | 1.2 V                  | Enable High                  | L 1 2 B | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694H25HT1G    | 2.5 V                  | Enable High                  | L 2 5 B | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694H33HT1G    | 3.3 V                  | Enable High                  | L 3 3 B | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694DADJHT1G   | adj.                   | Enable High – Auto discharge | L 0 0 D | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694D08HT1G    | 0.8 V                  | Enable High – Auto discharge | L 0 8 D | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694D10HT1G    | 1.0 V                  | Enable High – Auto discharge | L 1 0 D | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694D12HT1G    | 1.2 V                  | Enable High – Auto discharge | L 1 2 D | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694D25HT1G    | 2.5V                   | Enable High – Auto discharge | L 2 5 D | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694D33HT1G    | 3.3 V                  | Enable High – Auto discharge | L 3 3 D | SOT-89-5 (Pb-Free) | 1000 / Tape & Reel    |
| NCP694HSANADJT1G | adj.                   | Enable High                  | H 0 0 B | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694HSAN08T1G  | 0.8 V                  | Enable High                  | H 0 8 B | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694HSAN10T1G  | 1.0 V                  | Enable High                  | H 1 0 B | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694HSAN12T1G  | 1.2 V                  | Enable High                  | H 1 2 B | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694HSAN25T1G  | 2.5 V                  | Enable High                  | H 2 5 B | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694HSAN33T1G  | 3.3 V                  | Enable High                  | H 3 3 B | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694DSANADJT1G | adj.                   | Enable High – Auto discharge | H 0 0 D | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694DSAN08T1G  | 0.8 V                  | Enable High – Auto discharge | H 0 8 D | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694DSAN10T1G  | 1.0 V                  | Enable High – Auto discharge | H 1 0 D | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694DSAN12T1G  | 1.2 V                  | Enable High – Auto discharge | H 1 2 D | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694DSAN25T1G  | 2.5 V                  | Enable High – Auto discharge | H 2 5 D | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |
| NCP694DSAN33T1G  | 3.3 V                  | Enable High – Auto discharge | H 3 3 D | HSO-6 (Pb-Free)    | 3000 / Tape & Reel    |

<sup>†</sup>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.

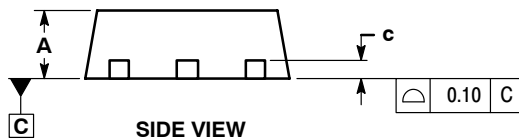
# NCP694

## PACKAGE DIMENSIONS

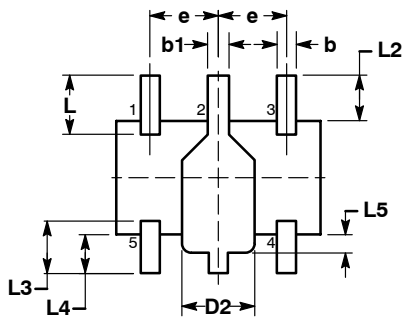
**SOT-89, 5 LEAD**  
CASE 528AB-01  
ISSUE O



TOP VIEW



SIDE VIEW



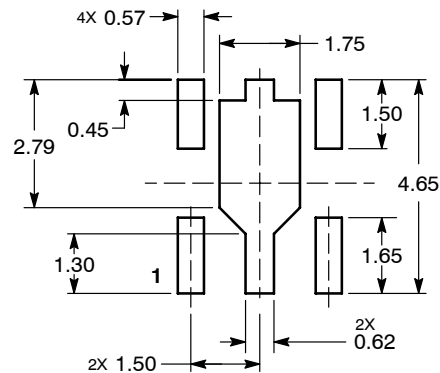
BOTTOM VIEW

### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. LEAD THICKNESS INCLUDES LEAD FINISH.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. DIMENSIONS L, L2, L3, L4, L5, AND H ARE MEASURED AT DATUM PLANE C.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 1.40        | 1.60 |
| b   | 0.32        | 0.52 |
| b1  | 0.37        | 0.57 |
| c   | 0.30        | 0.50 |
| D   | 4.40        | 4.60 |
| D2  | 1.40        | 1.80 |
| E   | 2.40        | 2.60 |
| e   | 1.40        | 1.60 |
| H   | 4.25        | 4.45 |
| L   | 1.10        | 1.50 |
| L2  | 0.80        | 1.20 |
| L3  | 0.95        | 1.35 |
| L4  | 0.65        | 1.05 |
| L5  | 0.20        | 0.60 |

### RECOMMENDED MOUNTING FOOTPRINT\*



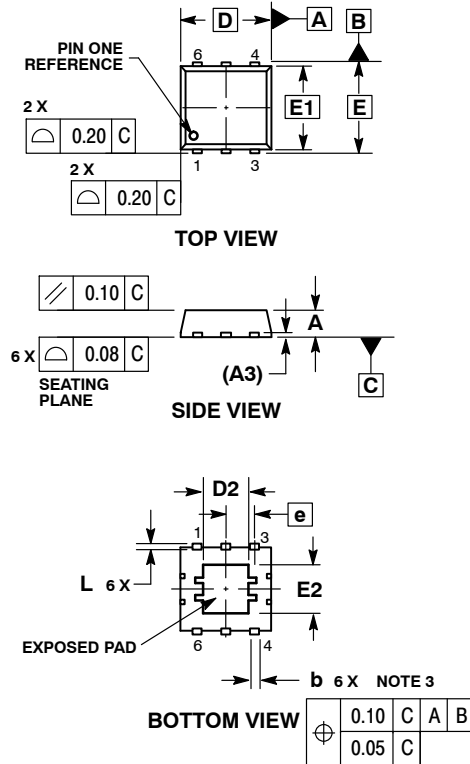
DIMENSIONS: MILLIMETERS

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

# NCP694

## PACKAGE DIMENSIONS

HSO-6  
CASE 506AE-01  
ISSUE A



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.10 AND 0.15 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.70        | 0.90 |
| A3  | 0.15        | REF  |
| b   | 0.20        | 0.40 |
| D   | 2.90        | BSC  |
| D2  | 1.40        | 1.60 |
| E   | 3.00        | BSC  |
| E1  | 2.80        | BSC  |
| E2  | 1.50        | 1.70 |
| e   | 0.95        | BSC  |
| L   | 0.15        | 0.25 |

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