

NCP584

Tri-Mode 200 mA CMOS LDO Regulator with Enable

The NCP584 series of low drop out regulators are designed for portable battery powered applications which require precise output voltage accuracy, low supply current, and high ripple rejection. These devices feature an enable function which lowers current consumption significantly and are offered in the SOT23-5 package.

This series of devices have three modes. Chip Enable (CE mode), Fast Transient Mode (FT mode), and Low Power Mode (LP mode). Both the FT and LP mode are utilized via the ECO pin.

Features

- Low Dropout Voltage of 300 mV at 200 mA, Output Voltage = 1.0 V
200 mV at 200 mA, Output Voltage = 1.5 V
140 mV at 200 mA, Output Voltage = 3.0 V
- Excellent Line and Load Regulation
- High Output Voltage Accuracy of $\pm 2\%$ ($\pm 3\%$ LP mode)
- Ultra-Low Supply Current of:
3.5 μA (LP mode, Output Voltage ≤ 1.5 V)
40 μA (FT mode)
- Excellent Power Supply Rejection Ratio
- Low Temperature Drift Coefficient on the Output Voltage
- Low Quiescent Current of 0.1 μA
- This is a Pb-Free Device*

Typical Applications

- Portable Equipment
- Hand-Held Instrumentation
- Camcorders and Cameras

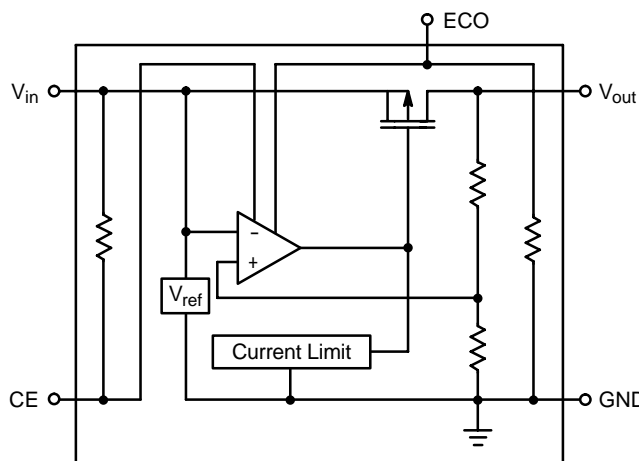


Figure 1. Simplified Block Diagram for Active Low

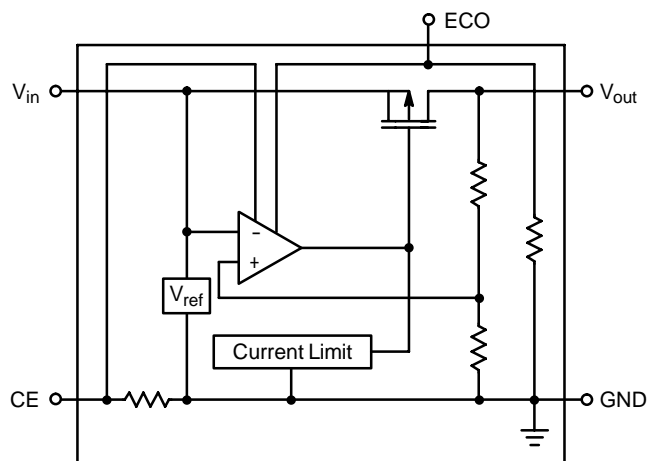


Figure 2. Simplified Block Diagram for Active High



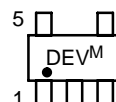
ON Semiconductor®

<http://onsemi.com>

MARKING DIAGRAM



SOT23-5
SN SUFFIX
CASE 1212



DEV = Device Code
M = Date Code

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 11 of this data sheet.

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

PIN FUNCTION DESCRIPTION

| SOT23–5 | Pin Name | Description |
|---------|------------------------------|-----------------------------|
| 1 | V _{in} | Power supply input voltage. |
| 2 | GND | Power supply ground. |
| 3 | $\overline{\text{CE}}$ or CE | Chip enable pin. |
| 4 | ECO | Mode alternative pin. |
| 5 | V _{out} | Regulated output voltage. |

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|------------------|------------------------------|------|
| Input Voltage | V _{in} | 6.5 | V |
| Input Voltage ($\overline{\text{CE}}$ or CE Pin) | V _{CE} | –0.3 to V _{in} +0.3 | V |
| Input Voltage (ECO Pin) | V _{ECO} | –0.3 to V _{in} +0.3 | V |
| Output Voltage | V _{out} | –0.3 to V _{in} +0.3 | V |
| Output Current | I _{out} | 250 | mA |
| Power Dissipation | P _D | 250 | mW |
| Operating Junction Temperature Range | T _J | –40 to +85 | °C |
| Storage Temperature Range | T _{stg} | +150 | °C |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

ELECTRICAL CHARACTERISTICS (V_{in} = V_{out} + 1.0 V, T_A = 25°C, unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|--|------------------------------|--|---------|
| Input Voltage | V _{in} | 1.4 | – | 6.0 | V |
| Output Voltage (1.0 μ A \leq I _{out} \leq 30 mA) V _{ECO} = V _{in} V _{ECO} = GND | V _{out} | V _{out} X 0.980 V _{out} X 0.970 | – – | V _{out} X 1.020 V _{out} X 1.030 | V |
| Line Regulation (I _{out} = 30 mA, V _{out} + 0.5 V \leq V _{in} \leq 6.0 V) FT Mode V _{ECO} = V _{in} LP Mode V _{ECO} = GND | Reg _{line} | – – | 0.05 0.10 | 0.20 0.30 | %/V |
| Load Regulation FT Mode (1.0 mA \leq I _{out} \leq 200 mA), V _{ECO} = V _{in} LP Mode (1.0 mA \leq I _{out} \leq 100 mA), V _{ECO} = GND | Reg _{load} | – – | 20 10 | 40 40 | mV |
| Dropout Voltage (I _{out} = 200 mA) 0.8 \leq V _{out} \leq 0.9 V 1.0 \leq V _{out} \leq 1.4 V 1.5 \leq V _{out} \leq 2.5 V 2.6 \leq V _{out} \leq 3.1 V | V _{DO} | – – – – | 0.40 0.30 0.20 0.10 | 0.70 0.50 0.30 0.20 | V |
| Power Supply Current (I _{out} = 0 mA) FT Mode, V _{ECO} = V _{in} LP Mode, V _{ECO} = GND V _{out} \leq 1.5 V V _{out} \leq 1.6 V | I _{supply} | – – – | 40 3.5 4.5 | 70 6.0 8.0 | μ A |
| Output Current (V _{in} – V _{out} = 0.5 V) V _{in} \geq 1.5 V, V _{out} \leq 1.0 V | I _{out} | 200 | – | – | mA |
| Quiescent Current (V _{CE} = V _{in}) | I _Q | – | 0.1 | 1.0 | μ A |
| Output Short Circuit Current (V _{out} = 0 V) | I _{lim} | – | 50 | – | mA |
| Enable Input Threshold Voltage High, ECO Input Voltage = High Low, ECO Input Voltage = Low | V _{thenh} V _{thengl} | 1.0 0 | – – | V _{in} 0.3 | V |

TYPICAL CHARACTERISTICS

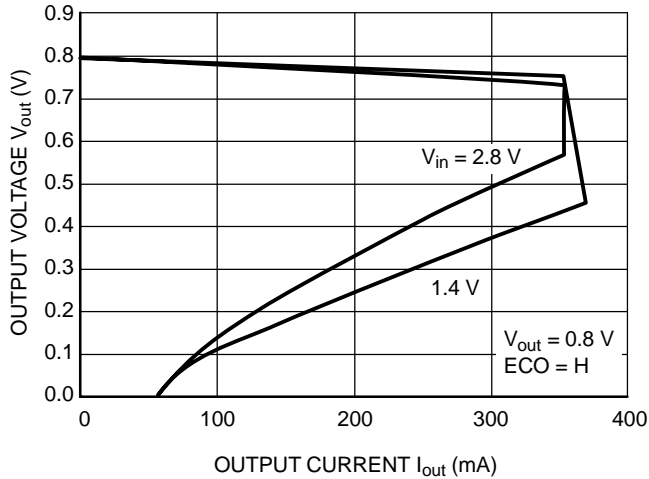


Figure 3. Output Voltage vs. Output Current

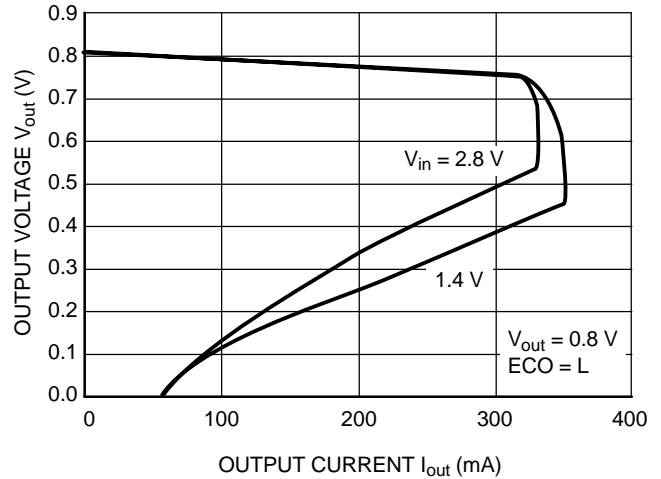


Figure 4. Output Voltage vs. Output Current

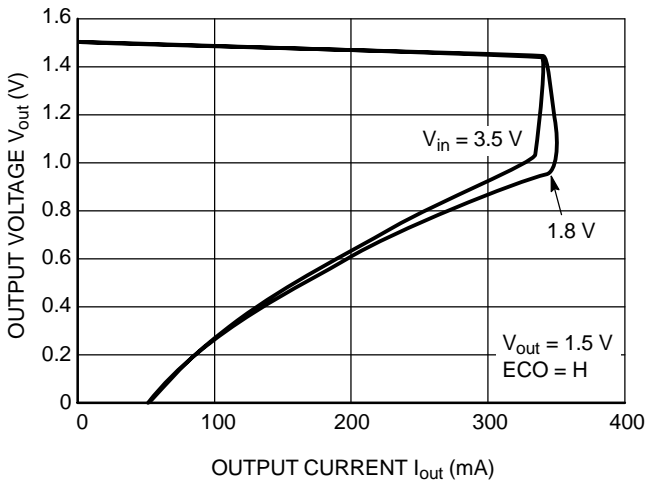


Figure 5. Output Voltage vs. Output Current

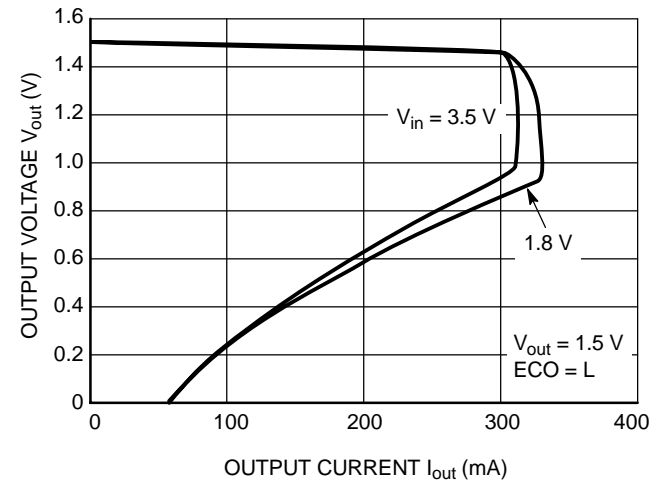


Figure 6. Output Voltage vs. Output Current

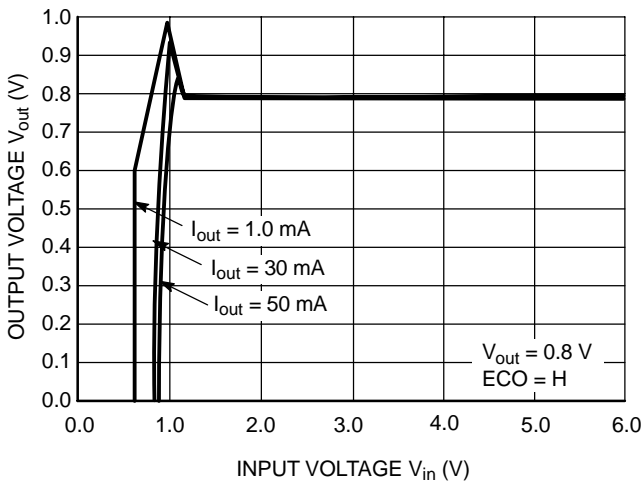


Figure 7. Output Voltage vs. Input Voltage

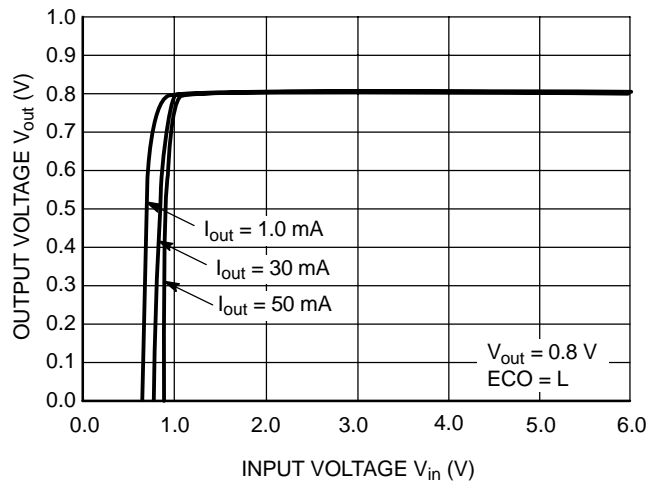


Figure 8. Output Voltage vs. Input Voltage

TYPICAL CHARACTERISTICS

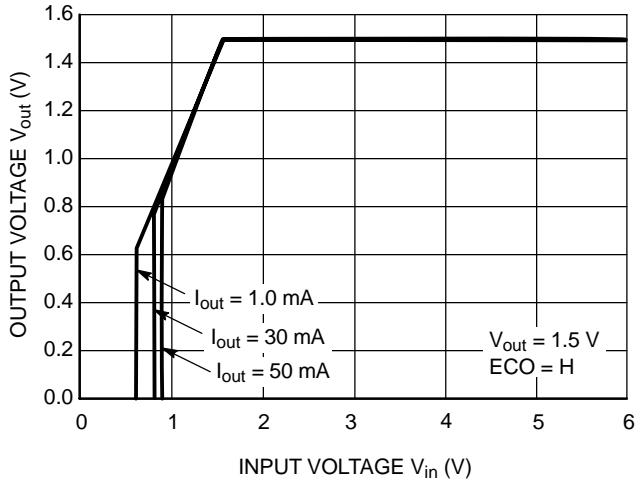


Figure 9. Output Voltage vs. Input Voltage

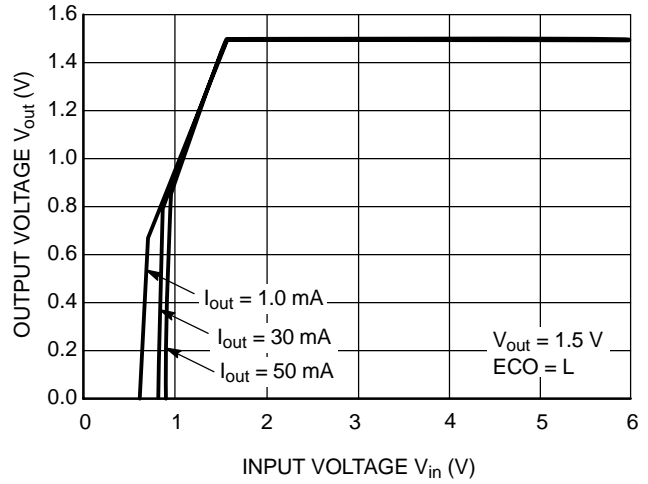


Figure 10. Output Voltage vs. Input Voltage

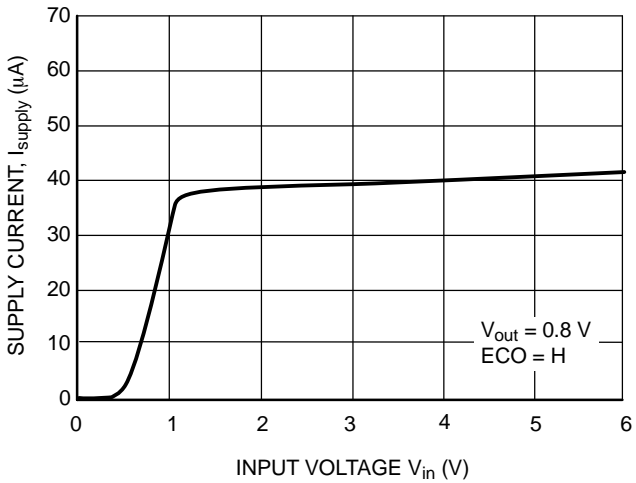


Figure 11. Power Supply Current vs. Input Voltage

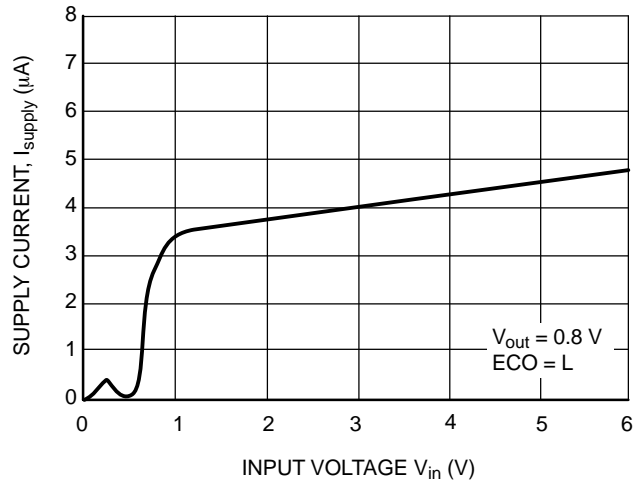


Figure 12. Power Supply Current vs. Input Voltage

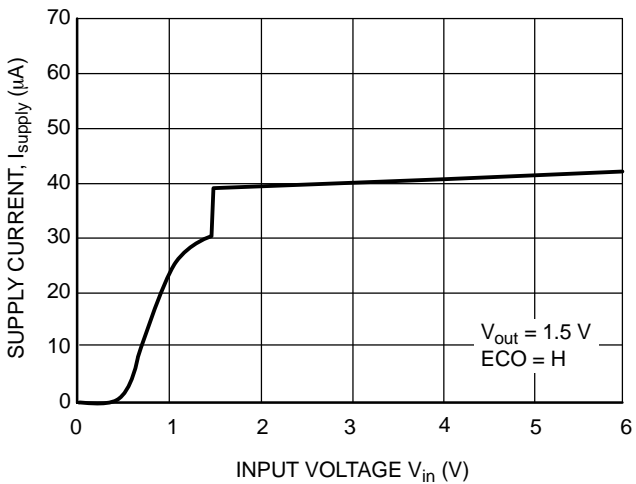


Figure 13. Power Supply Current vs. Input Voltage

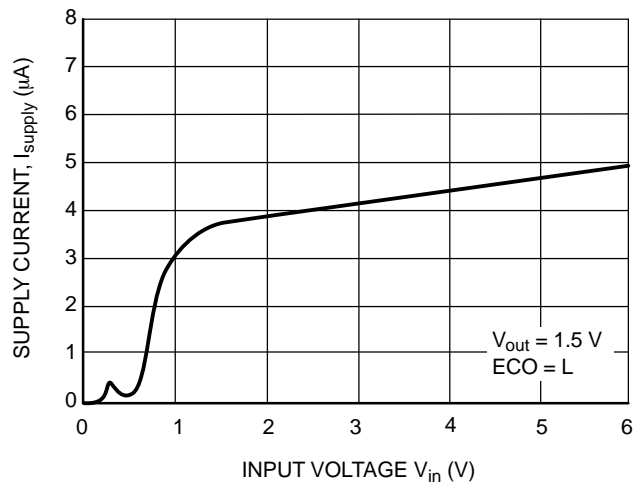


Figure 14. Power Supply Current vs. Input Voltage

TYPICAL CHARACTERISTICS

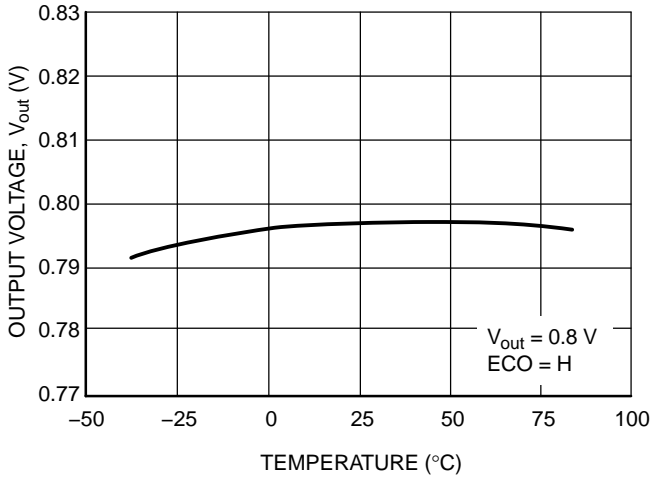


Figure 15. Output Voltage vs. Temperature

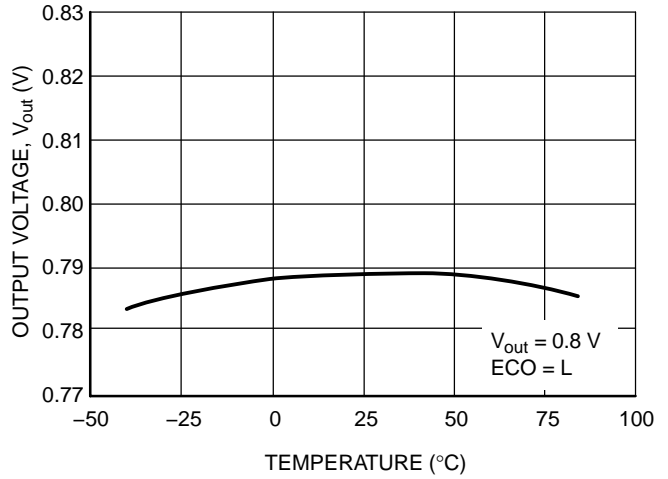


Figure 16. Output Voltage vs. Temperature

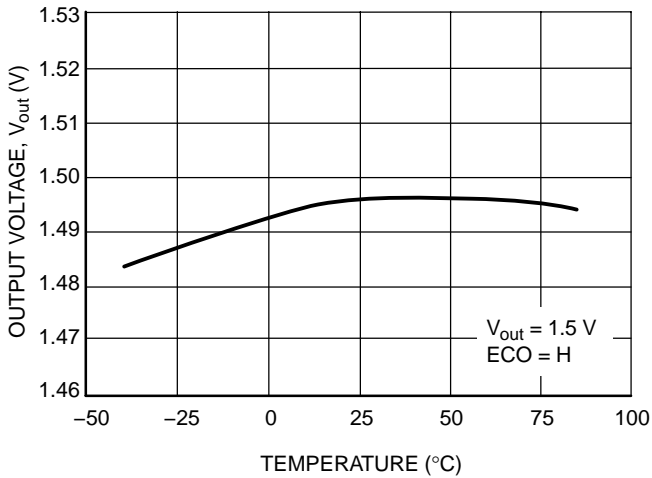


Figure 17. Output Voltage vs. Temperature

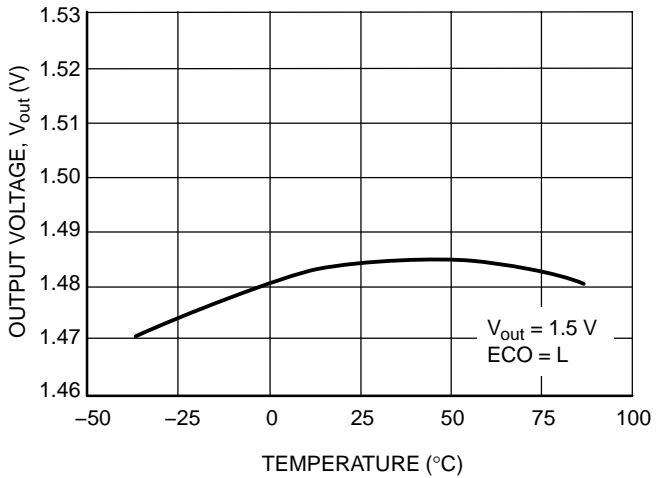


Figure 18. Output Voltage vs. Temperature

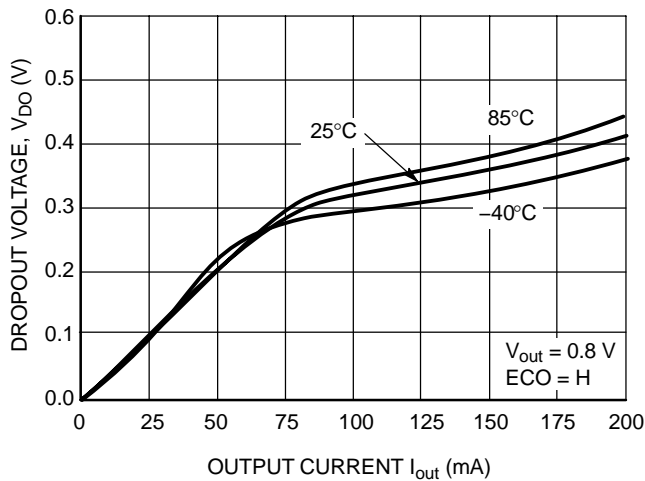


Figure 19. Dropout Voltage vs. Output Current

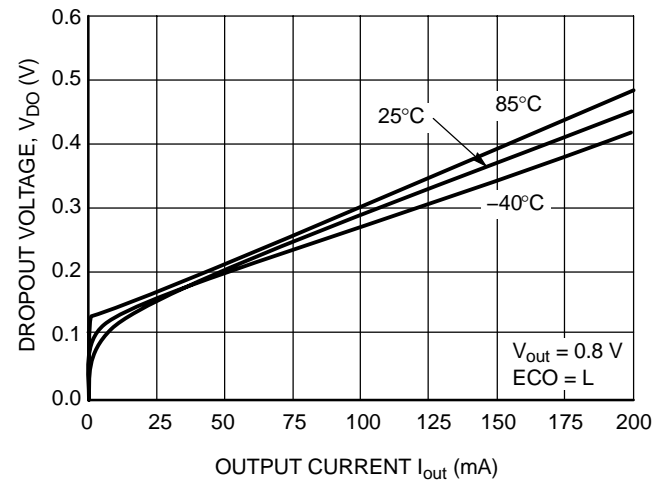


Figure 20. Dropout Voltage vs. Output Current

TYPICAL CHARACTERISTICS

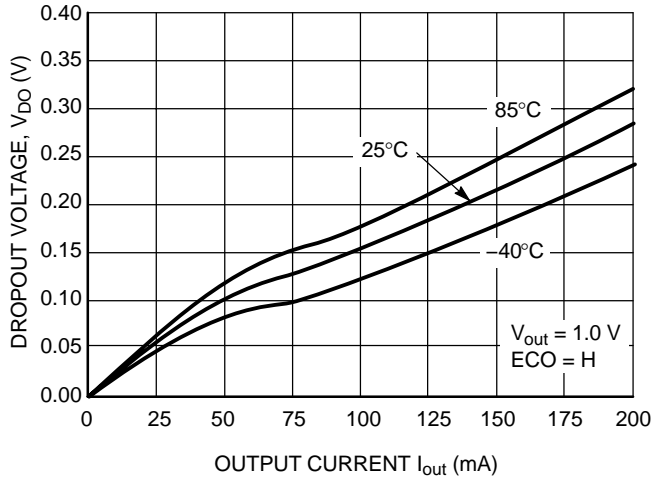


Figure 21. Dropout Voltage vs. Output Current

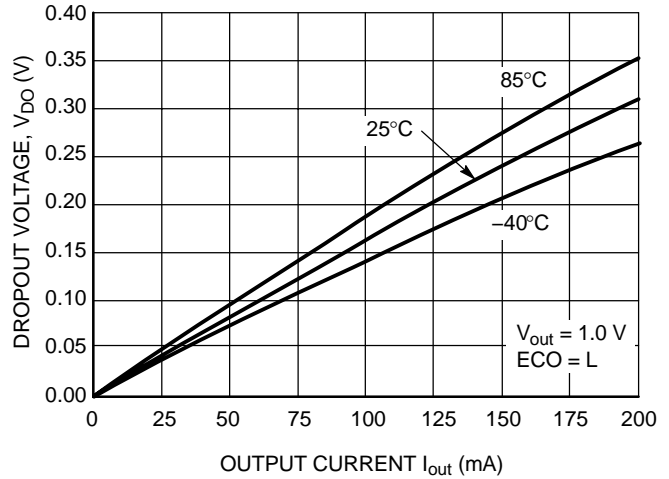


Figure 22. Dropout Voltage vs. Output Current

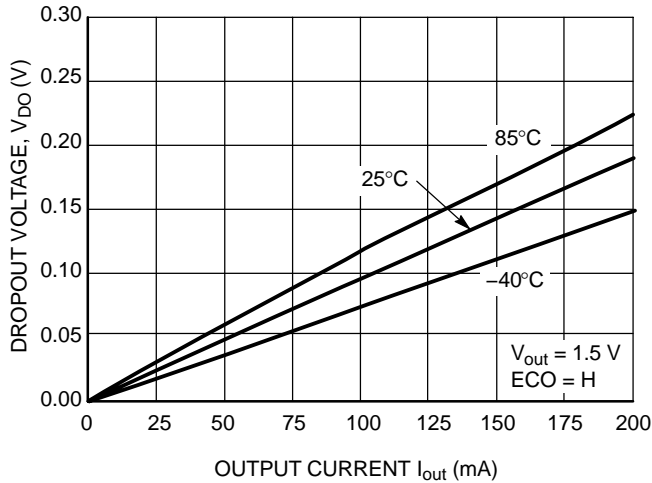


Figure 23. Dropout Voltage vs. Output Current

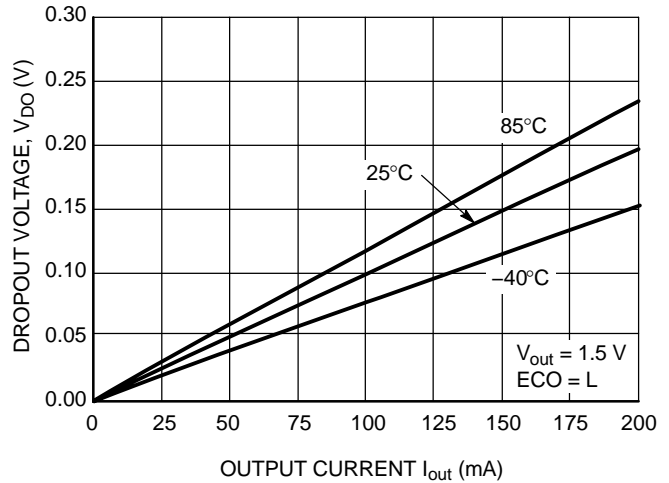


Figure 24. Dropout Voltage vs. Output Current

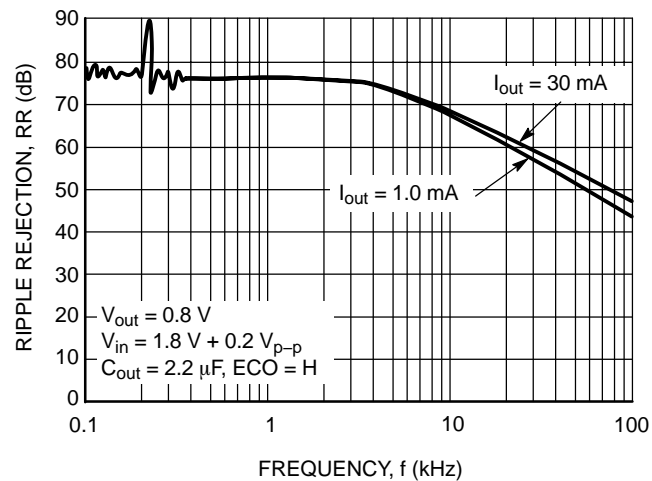


Figure 25. Ripple Rejection vs. Frequency

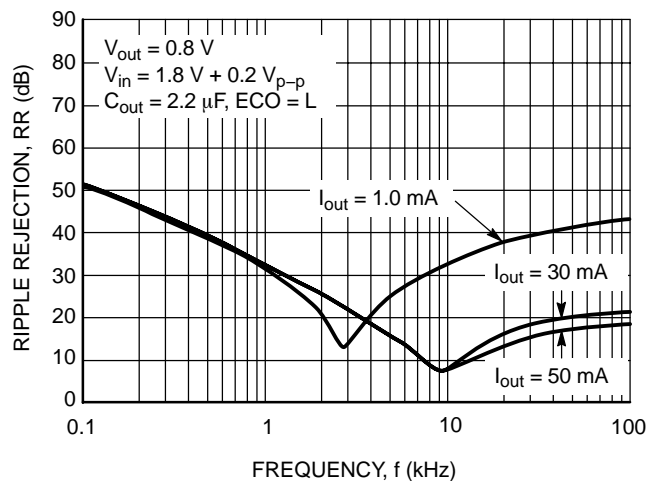


Figure 26. Ripple Rejection vs. Frequency

TYPICAL CHARACTERISTICS

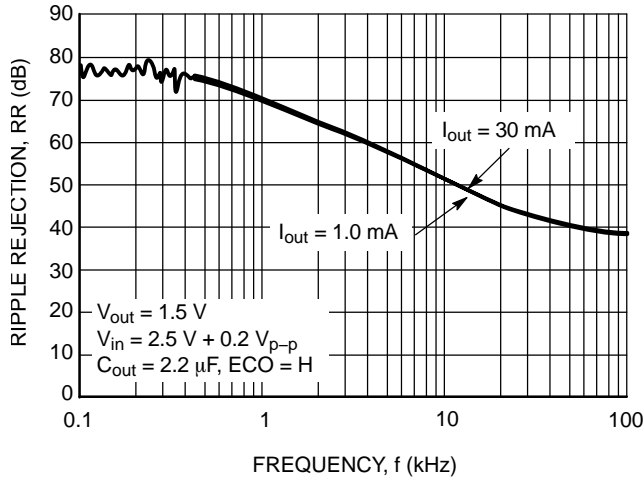


Figure 27. Ripple Rejection vs. Frequency

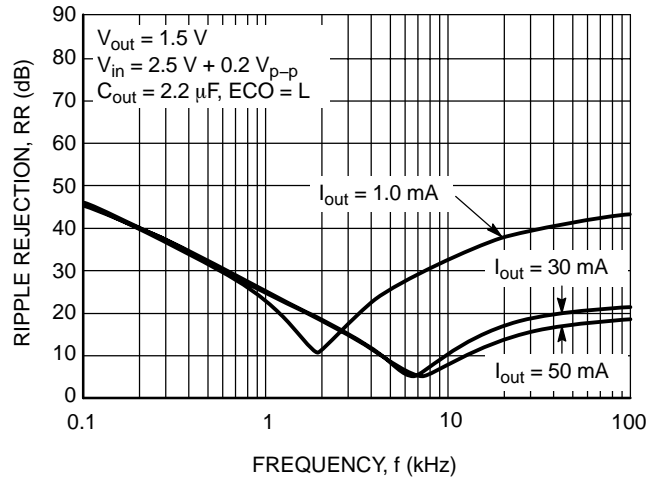


Figure 28. Ripple Rejection vs. Frequency

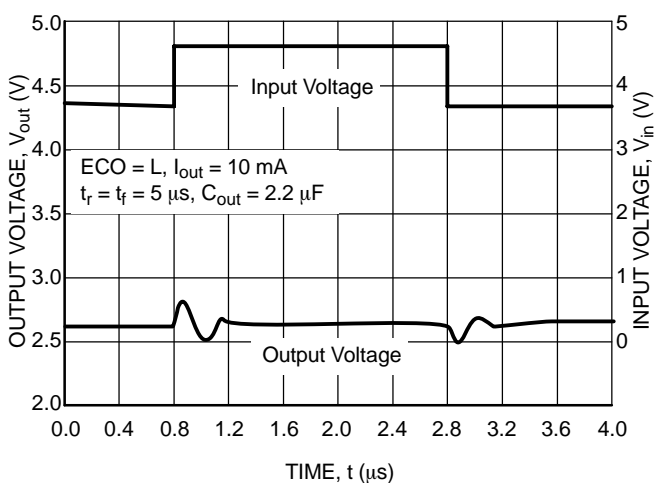
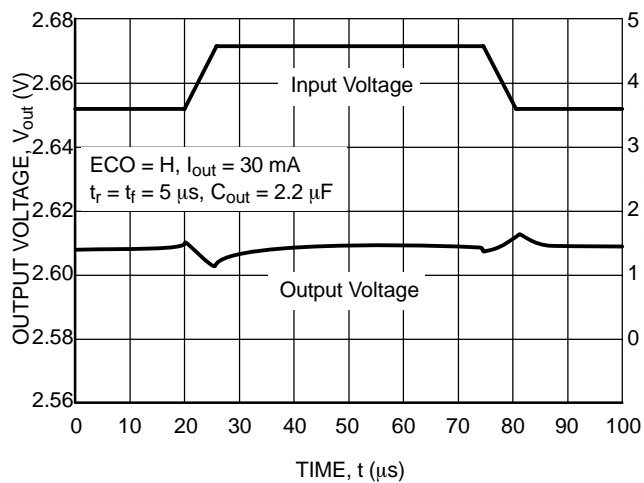
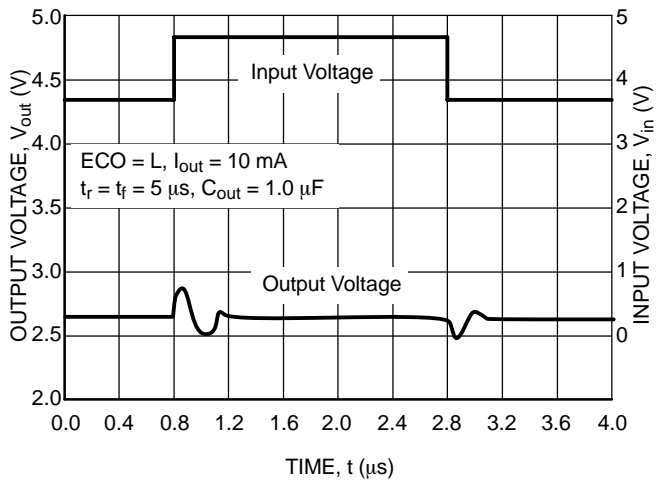
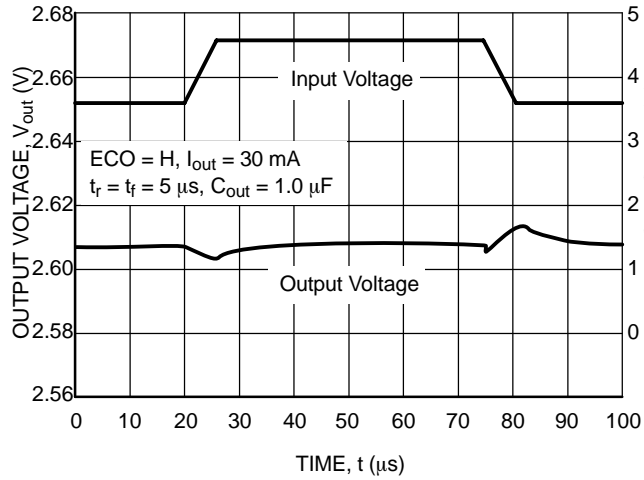


Figure 29. Input Transient Response ($V_{out} = 2.6 \text{ V}$)

TYPICAL CHARACTERISTICS

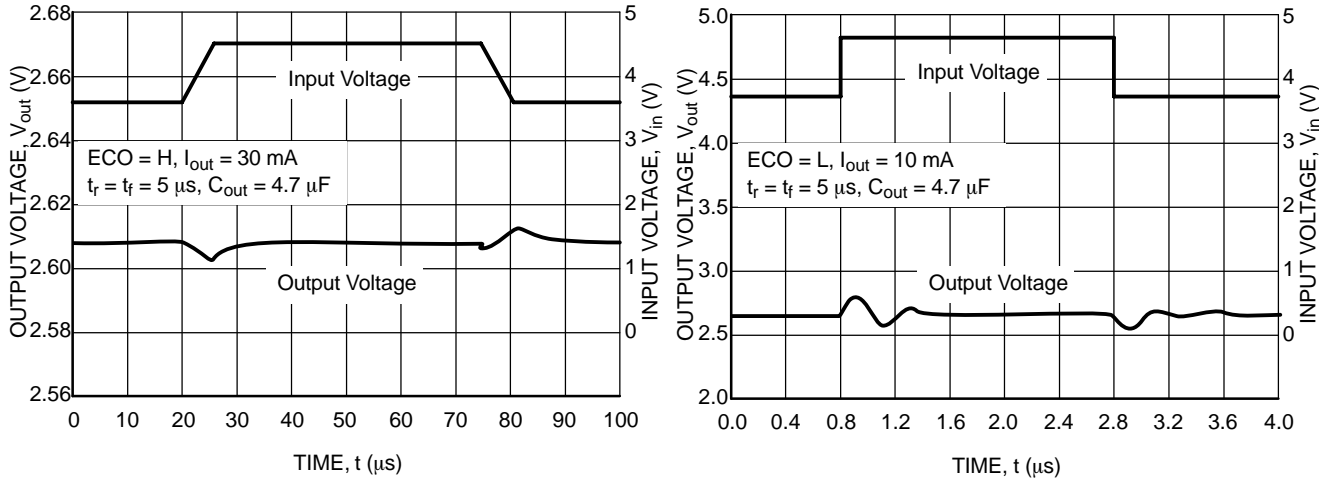


Figure 29. (continued) Input Transient Response ($V_{out} = 2.6\text{ V}$)

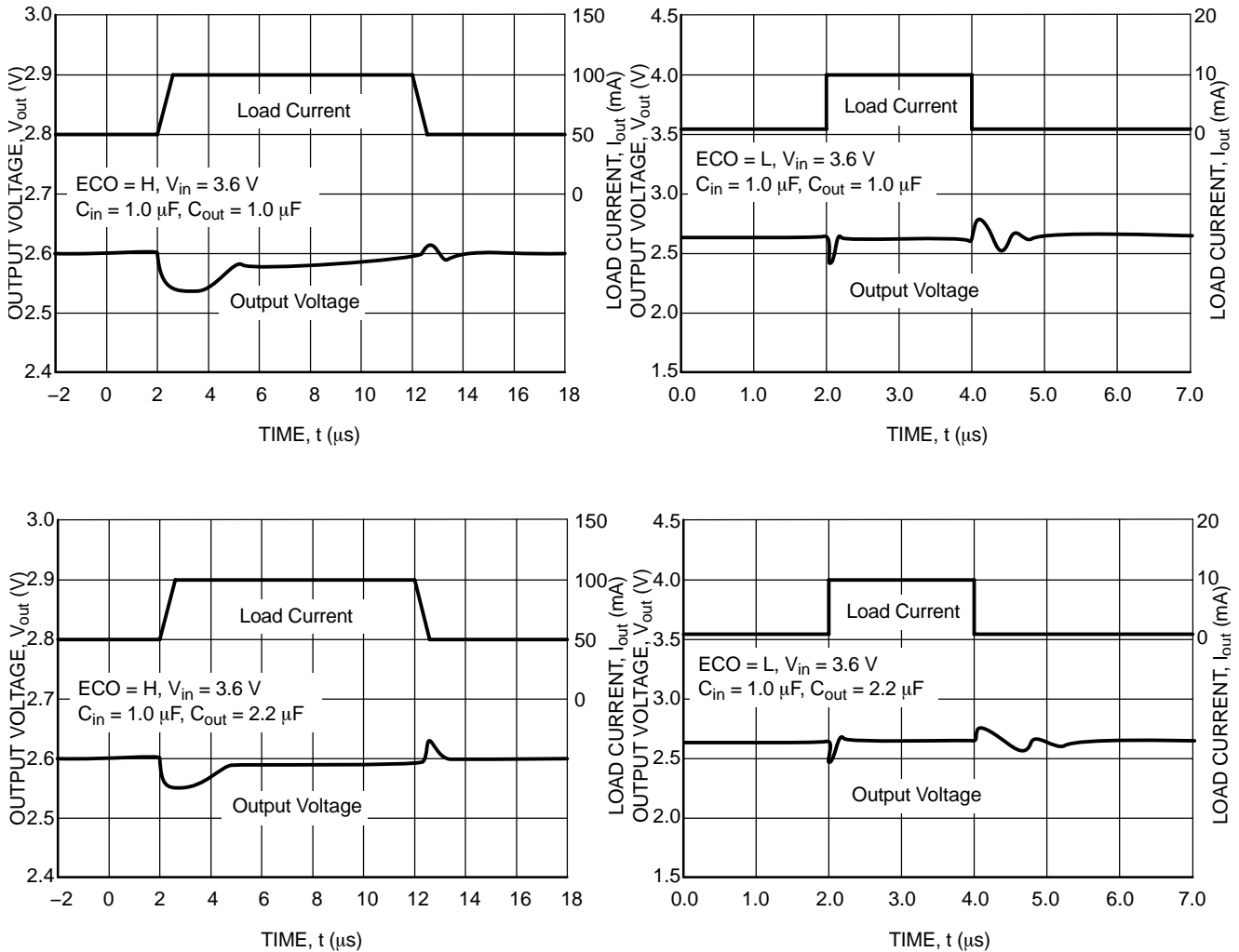


Figure 30. Load Transient Response ($V_{out} = 2.6\text{ V}$)

TYPICAL CHARACTERISTICS

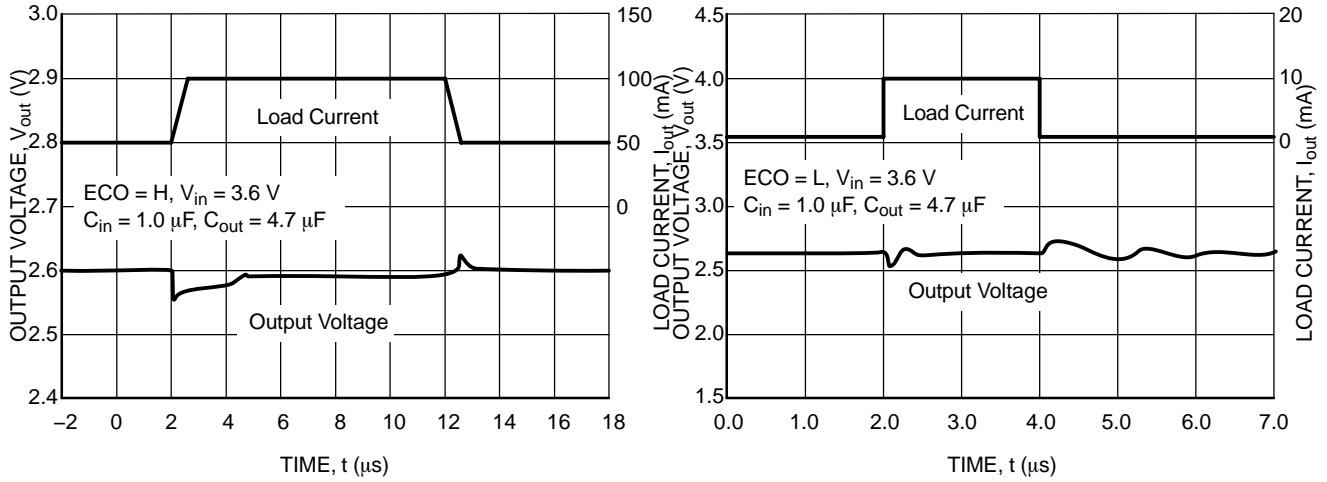


Figure 30. (continued) Load Transient Response ($V_{out} = 2.6$ V)

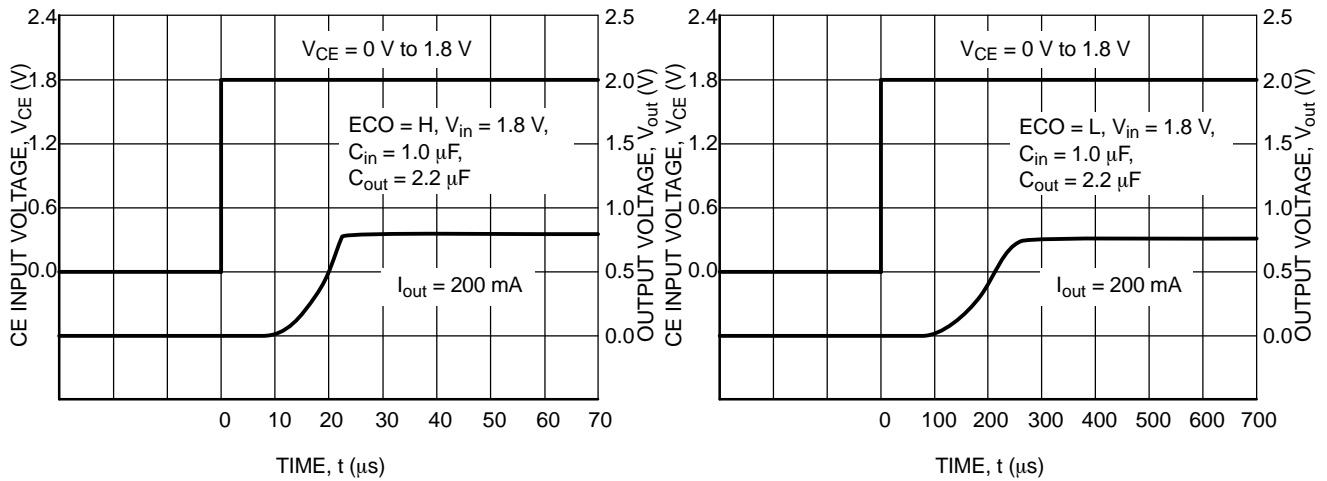


Figure 31. Turn-On/Off Speed with CE Pin ($V_{out} = 0.8$ V)

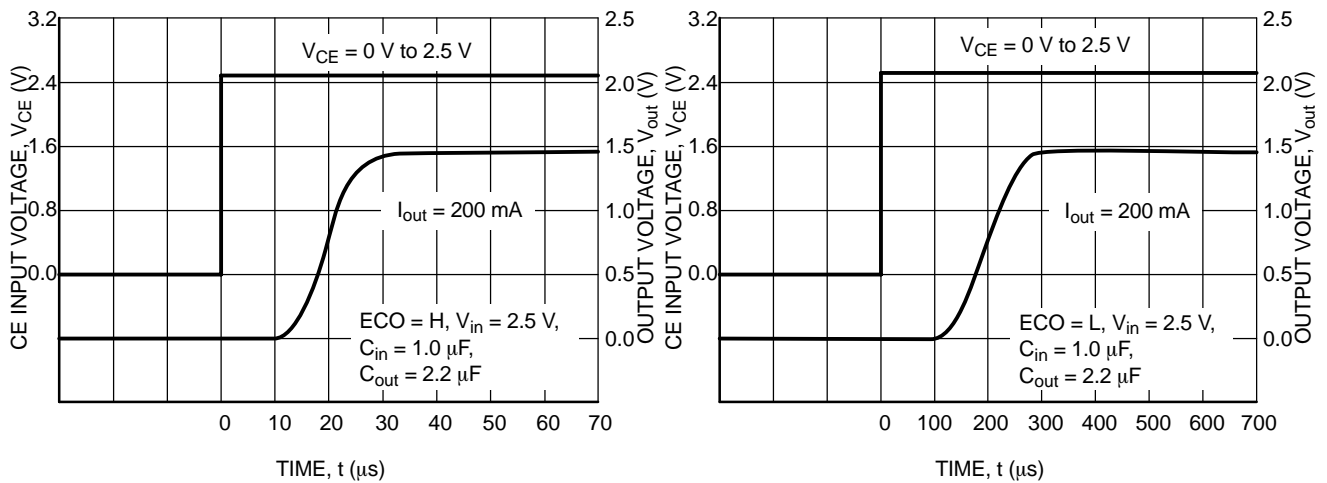


Figure 32. Turn-On/Off Speed with CE Pin ($V_{out} = 1.5$ V)

NCP584

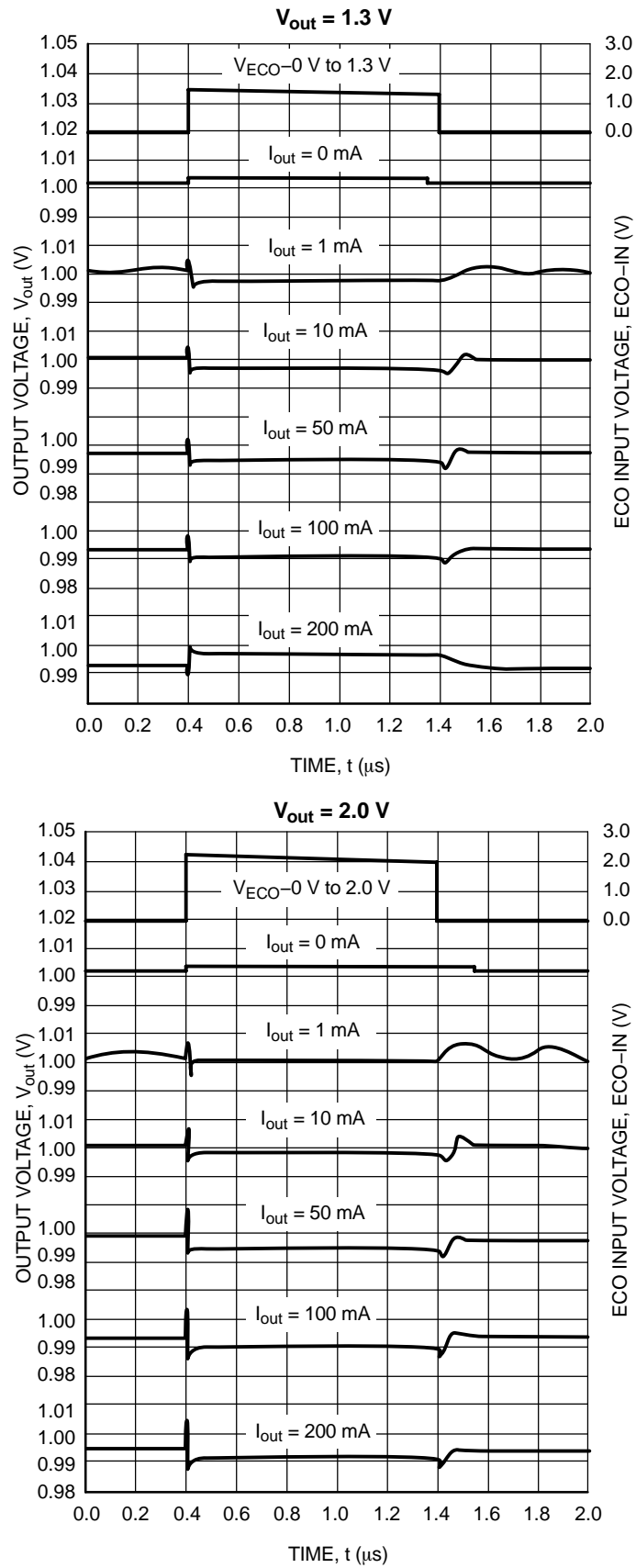


Figure 33. Output Voltage at Mode Alternative Point
($C_{in} = 1.0\text{ }\mu\text{F}$, $C_{out} = 2.2\text{ }\mu\text{F}$, 8.0 V , $V_{out} = 1.0\text{ V}$)

NCP584

APPLICATION INFORMATION

Input Decoupling

A 1.0 μF tantalum capacitor is the recommended value to be connected between V_{in} and GND. For PCB layout considerations, the traces of V_{in} and GND should be sufficiently wide in order to minimize noise and prevent unstable operation.

Output Decoupling

It is recommended to use a 2.2 μF or higher tantalum capacitor on the V_{out} pin. For better performance, select a capacitor with low Equivalent Series Resistance (ESR). For PCB layout considerations, place the output capacitor close to the output pin and keep the leads short as possible.

ORDERING INFORMATION

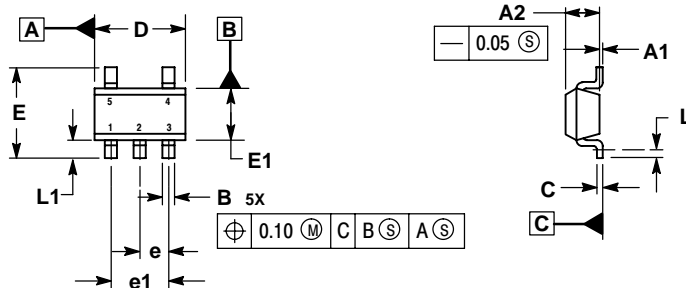
| Device | Output Type / Features | Nominal Output Voltage | Marking | Package | Shipping† |
|----------------|-----------------------------|------------------------|---------|-------------------|------------------|
| NCP584HSN09T1G | Active High, LP and FT Mode | 0.9 | 109 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP584HSN12T1G | Active High, LP and FT Mode | 1.2 | 112 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP584HSN15T1G | Active High, LP and FT Mode | 1.5 | 115 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP584HSN18T1G | Active High, LP and FT Mode | 1.8 | 118 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP584HSN26T1G | Active High, LP and FT Mode | 2.6 | 126 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP584HSN31T1G | Active High, LP and FT Mode | 3.1 | 131 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP584LSN09T1G | Active Low, LP and FT Mode | 0.9 | 009 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP584LSN12T1G | Active Low, LP and FT Mode | 1.2 | 012 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP584LSN18T1G | Active Low, LP and FT Mode | 1.8 | 018 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |

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

NCP584

PACKAGE DIMENSIONS


SOT23-5
SN SUFFIX
CASE 1212-01
ISSUE O



NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM C IS A SEATING PLANE.

| MILLIMETERS | | |
|-------------|----------|------|
| DIM | MIN | MAX |
| A1 | 0.00 | 0.10 |
| A2 | 1.00 | 1.30 |
| B | 0.30 | 0.50 |
| C | 0.10 | 0.25 |
| D | 2.80 | 3.00 |
| E | 2.50 | 3.10 |
| E1 | 1.50 | 1.80 |
| e | 0.95 BSC | |
| e1 | 1.90 BSC | |
| L | 0.20 | --- |
| L1 | 0.45 | 0.75 |

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