

NCP585

Tri-Mode 300 mA CMOS LDO Regulator with Enable

The NCP585 series of low dropout regulators are designed for portable battery powered applications which require precise output voltage accuracy, low quiescent current, and high ripple rejection. These devices feature an enable function which lowers current consumption significantly and are offered in the SOT23-5 and the HSON-6 packages, in fixed output voltages between 0.8 V and 3.3 V.

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

- Tri-mode Operation
- Low Dropout Voltage:
 - Typ 550 mV at 300 mA, Output Voltage = 0.9 V
 - Typ 480 mV at 300 mA, Output Voltage = 1.0 V
 - Typ 310 mV at 300 mA, Output Voltage = 1.5 V
- Excellent Line Regulation of 0.01%/V (0.05%/V LP Mode)
- Excellent Load Regulation of 15 mV (40 mV FT Mode)
- High Output Voltage Accuracy of $\pm 2\%$ ($\pm 3\%$ LP mode)
- Ultra-Low Iq Current of:
 - 3.5 μ A (LP mode, Output Voltage < 1.6 V)
 - 80 μ A (FT mode, Output Voltage < 1.8 V)
 - 60 μ A (FT mode, Output Voltage = 1.8 V)
- Very Low Shutdown Current of 0.1 μ A
- Excellent Power Supply Rejection Ratio of 70 dB at f = 1.0 kHz
- Low Temperature Drift Coefficient on the Output Voltage of ± 100 ppm/ $^{\circ}$ C
- Fold Back Protection Circuit
- Input Voltage up to 6.5 V
- These are Pb-Free Devices

Typical Applications

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



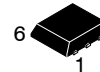
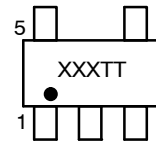
ON Semiconductor®

<http://onsemi.com>

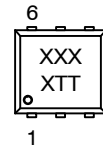
MARKING DIAGRAMS



SOT23-5
SN SUFFIX
CASE 1212



HSON-6
SAN SUFFIX
CASE 506AE



XXX = Specific Device Code
TT = Traceability Information

ORDERING INFORMATION

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

*Additional voltage options may be available between 0.8 V and 3.3 V in 100 mV steps.

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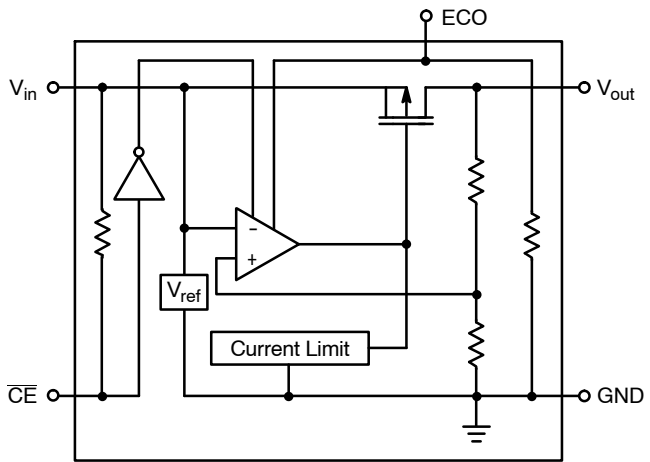


Figure 1. Simplified Block Diagram for Active Low

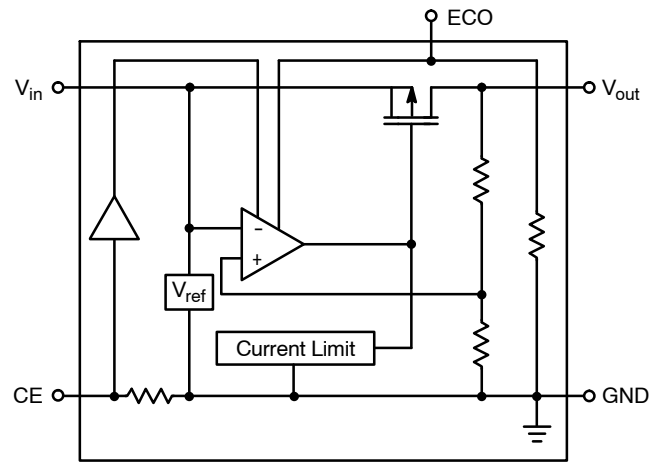


Figure 2. Simplified Block Diagram for Active High

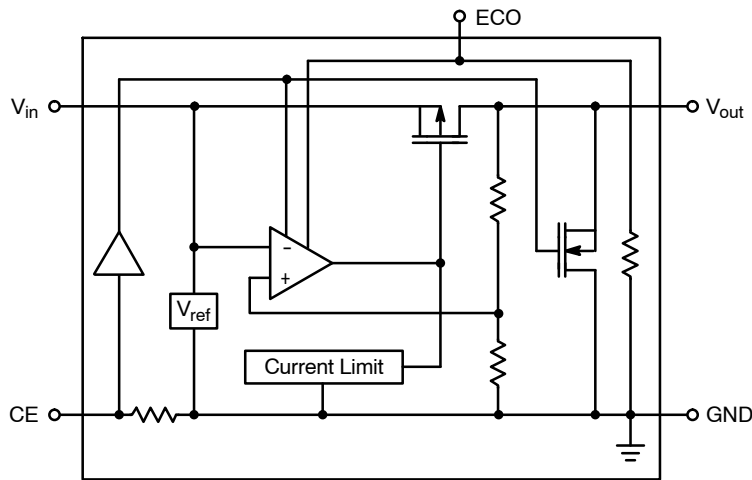


Figure 3. Simplified Block Diagram for Active High with Auto Discharge

PIN FUNCTION DESCRIPTION

| HSO-6 | SOT23-5 | Pin Name | Description |
|-------|---------|-----------------------|--|
| 1 | 1 | V_{in} | Power supply input voltage. |
| 2 | - | NC | No Connect. |
| 3 | 5 | V_{out} | Regulated output voltage. |
| 4 | 4 | ECO | Mode alternative pin. ($V_{ECO} = V_{in}$ for FT mode; $V_{ECO} = GND$ for LP mode) |
| 5 | 2 | GND | Power supply ground. |
| 6 | 3 | \overline{CE} or CE | Chip enable pin. |

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MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|--------------|------------------------|-------------|
| Input Voltage | V_{in} | 6.5 | V |
| Input Voltage (\overline{CE} or CE Pin) | V_{CE} | -0.3 to 6.5 | V |
| Input Voltage (ECO Pin) | V_{ECO} | -0.3 to 6.5 | V |
| Output Voltage | V_{out} | -0.3 to $V_{in} + 0.3$ | V |
| Output Current | I_{out} | 350 | mA |
| Power Dissipation | P_D | 250 400 | mW |
| SOT23-5 HSO-6 | | | |
| ESD Capability, Human Body Model, C = 100 pF, R = 1.5 k Ω | ESD_{HBM} | 2000 | V |
| ESD Capability, Machine Model, C = 200 pF, R = 0 Ω | ESD_{MM} | 150 | V |
| Operating Ambient Temperature Range | T_A | -40 to +85 | $^{\circ}C$ |
| Maximum Junction Temperature | $T_{J(max)}$ | 125 | $^{\circ}C$ |
| Storage Temperature Range | T_{stg} | -55 to +150 | $^{\circ}C$ |

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.

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

| Characteristic | Symbol | Min | Typ | Max | Unit | | |
|--|----------------------------------|--|---|--|---|--|---|
| Input Voltage | V_{in} | 1.4 | - | 6.0 | V | | |
| Output Voltage ($1.0 \mu A \leq I_{out} \leq 30$ mA) $V_{ECO} = V_{in}$ $V_{ECO} = GND$ | V_{out} | $V_{out} \times 0.980$ $V_{out} \times 0.970$ | - - | $V_{out} \times 1.020$ $V_{out} \times 1.030$ | 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} | - - | 0.01 0.05 | 0.15 0.20 | %/V | | |
| Load Regulation FT Mode (1.0 mA $\leq I_{out} \leq 300$ mA), $V_{ECO} = V_{in}$ LP Mode (1.0 mA $\leq I_{out} \leq 100$ mA), $V_{ECO} = GND$ | Reg_{load} | - - | 40 15 | 70 30 | mV | | |
| Dropout Voltage ($I_{out} = 300$ mA) $V_{out} = 0.9$ V 1.0 V $\leq V_{out} \leq 1.25$ V 1.5 V $\leq V_{out} \leq 2.5$ V 2.8 V $\leq V_{out} \leq 3.3$ V | V_{DO} | - - - - | ECO = H 0.55 0.48 0.31 0.23 | ECO = L 0.59 0.51 0.32 0.24 | ECO = H 0.78 0.70 0.45 0.35 | ECO = L 0.80 0.75 0.48 0.375 | V |
| Quiescent Current ($I_{out} = 0$ mA) FT Mode, $V_{ECO} = V_{in}$ $V_{out} < 1.8$ V $V_{out} \geq 1.8$ V LP Mode, $V_{ECO} = GND$ $V_{out} < 1.6$ V $V_{out} \geq 1.8$ V | I_q | - - - - | 80 60 3.5 4.5 | 111 90 8.0 9.0 | μA | | |
| Output Current ($V_{in} - V_{out} = 1.0$ V) | I_{out} | 300 | - | - | mA | | |
| Shutdown Current ($V_{CE} = V_{in}$) | I_{SD} | - | 0.1 | 1.0 | μA | | |
| Output Short Circuit Current ($V_{out} = 0$ V) | I_{lim} | - | 50 | - | mA | | |
| Enable Input Threshold Voltage - High - Low | $V_{th_{enh}}$ $V_{th_{enl}}$ | 1.0 0.0 | - - | V_{in} 0.3 | V | | |
| Output Noise Voltage (10 Hz - 100 kHz) | V_n | - | 30 | - | μV_{rms} | | |
| N-Channel On Resistance for Auto Discharge | R_{Low} | - | 60 | - | Ω | | |
| Ripple Rejection ($I_{out} = 50$ mA, $V_{out} = 0.9$ V, $V_{in} - V_{out} = 1.0$ V) $f = 120$ Hz $f = 1.0$ kHz $f = 10$ kHz | RR | - - - | 75 70 65 | - - - | dB | | |
| Output Voltage Temperature Coefficient ($I_{out} = 30$ mA, $-40^{\circ}C \leq T_A \leq 85^{\circ}C$) | $\Delta V_{out}/\Delta T$ | - | ± 100 | - | ppm/ $^{\circ}C$ | | |

TYPICAL CHARACTERISTICS

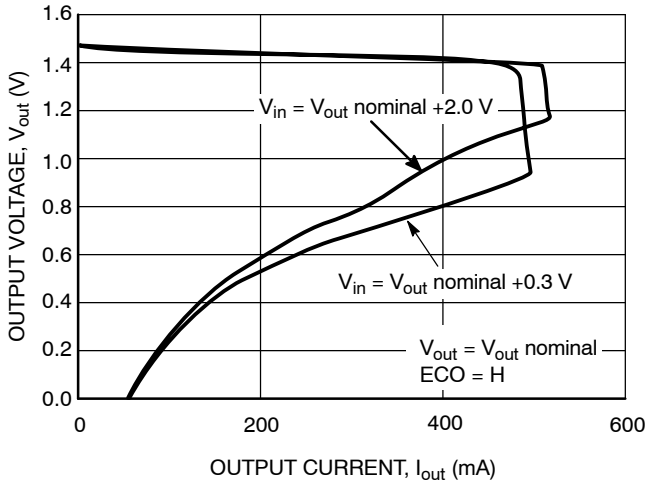


Figure 4. Output Voltage vs. Output Current

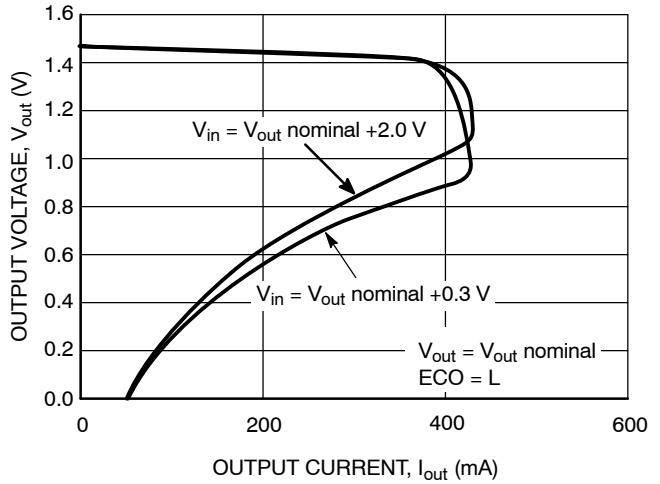


Figure 5. Output Voltage vs. Output Current

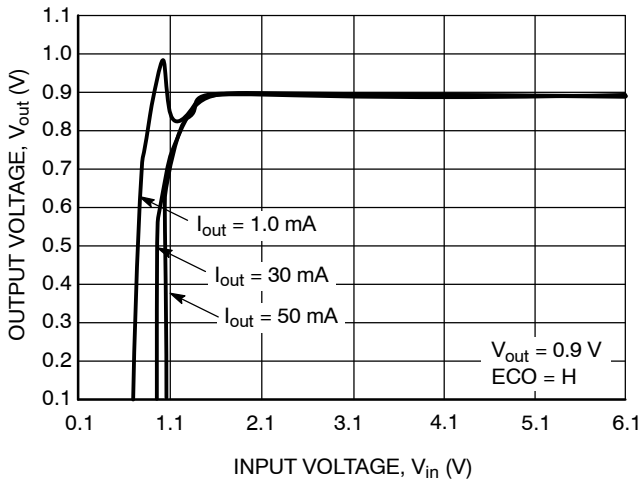


Figure 6. Output Voltage vs. Input Voltage

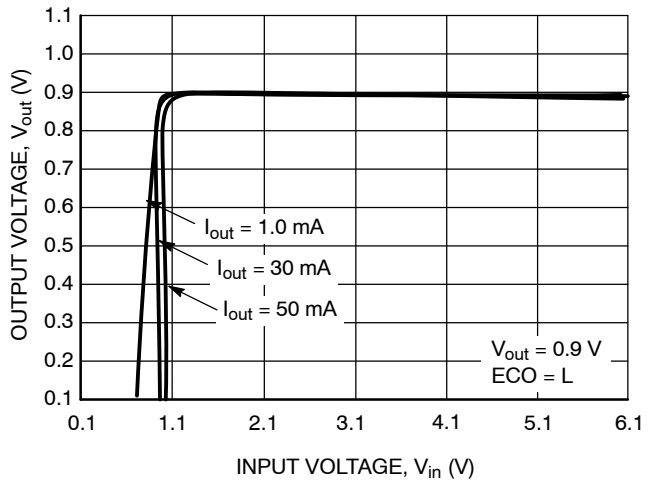


Figure 7. Output Voltage vs. Input Voltage

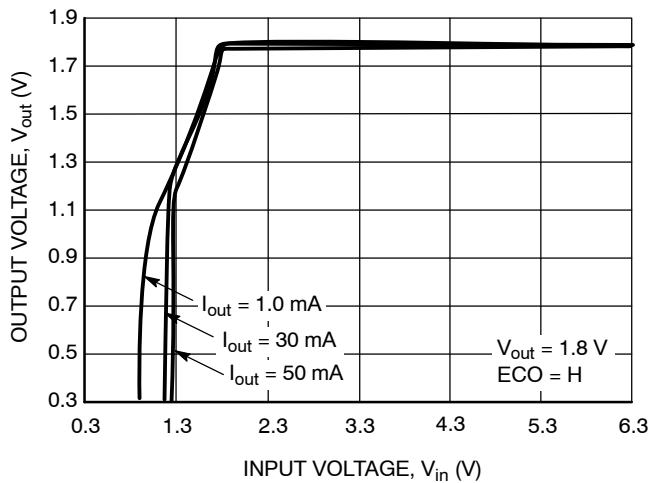


Figure 8. Output Voltage vs. Input Voltage

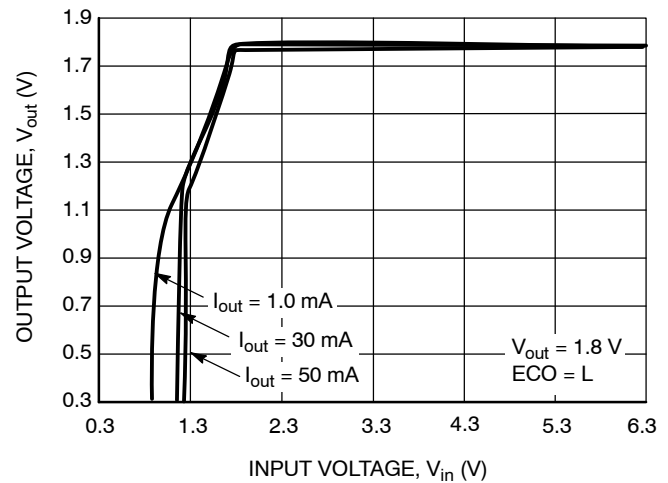


Figure 9. Output Voltage vs. Input Voltage

TYPICAL CHARACTERISTICS

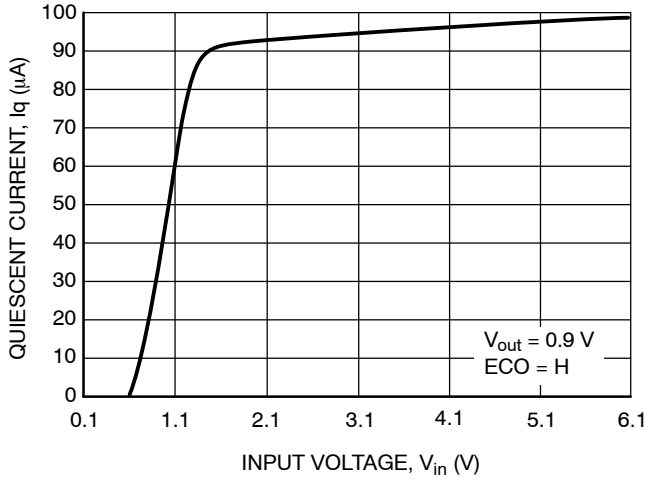


Figure 10. Quiescent Current vs. Input Voltage

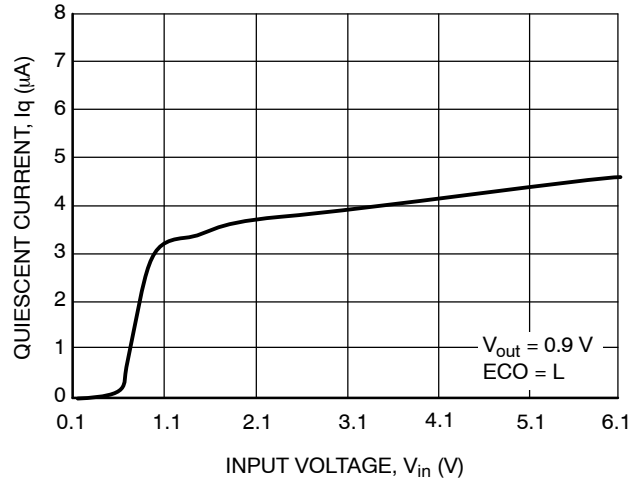


Figure 11. Quiescent Current vs. Input Voltage

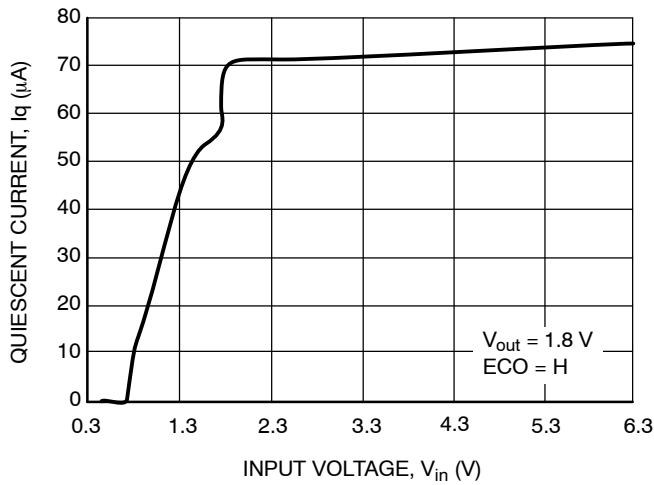


Figure 12. Quiescent Current vs. Input Voltage

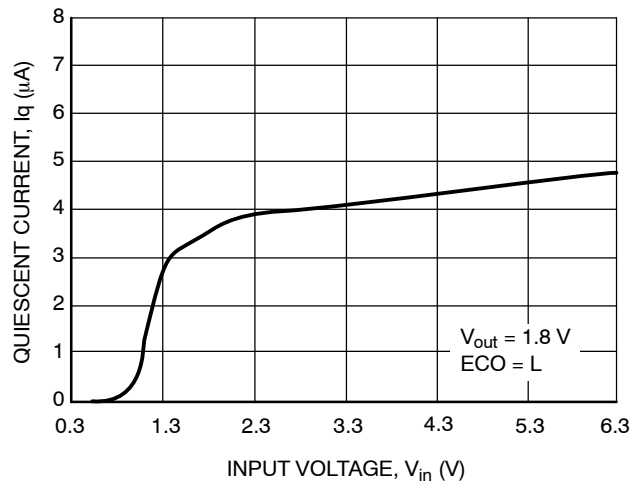


Figure 13. Quiescent Current vs. Input Voltage

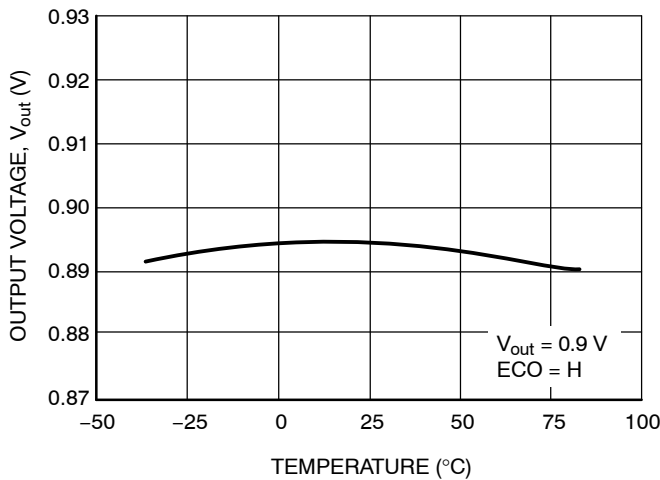


Figure 14. Output Voltage vs. Temperature

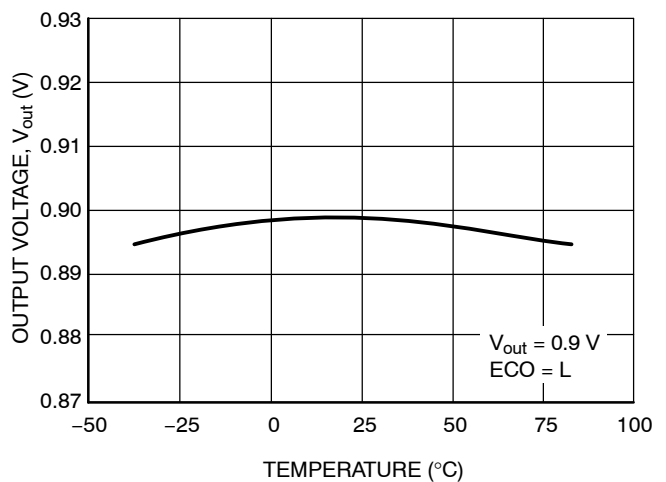


Figure 15. Output Voltage vs. Temperature

TYPICAL CHARACTERISTICS

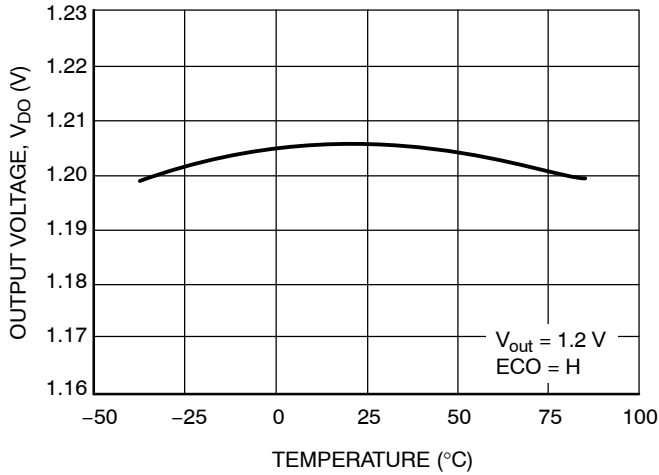


Figure 16. Output Voltage vs. Temperature

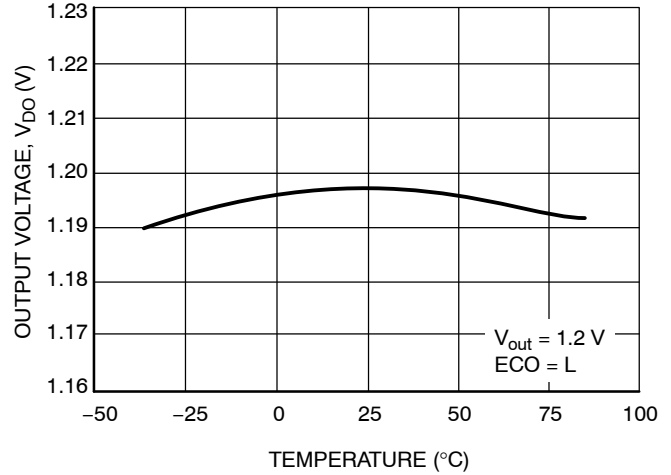


Figure 17. Output Voltage vs. Temperature

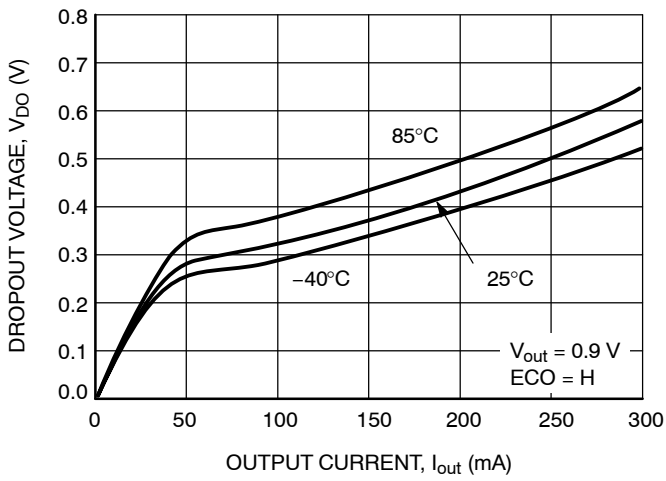


Figure 18. Dropout Voltage vs. Output Current

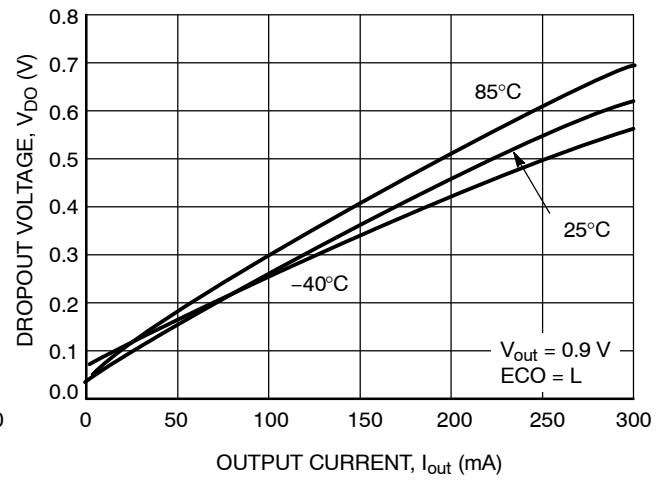


Figure 19. Dropout Voltage vs. Output Current

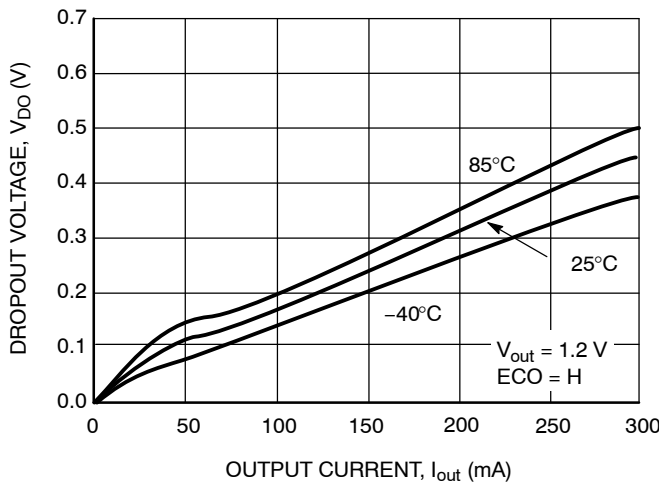


Figure 20. Dropout Voltage vs. Output Current

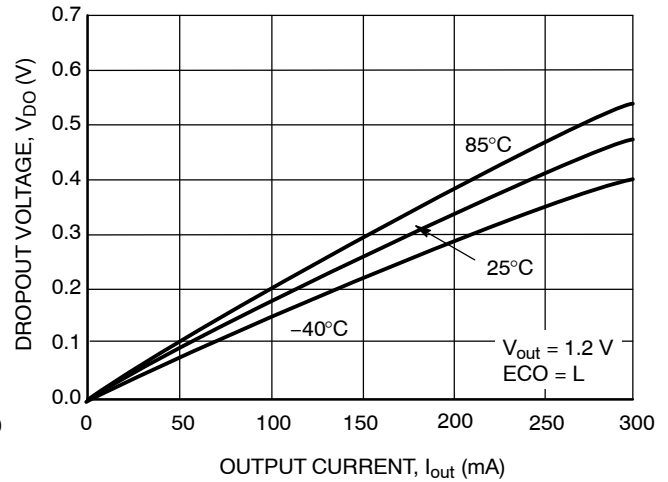


Figure 21. Dropout Voltage vs. Output Current

TYPICAL CHARACTERISTICS

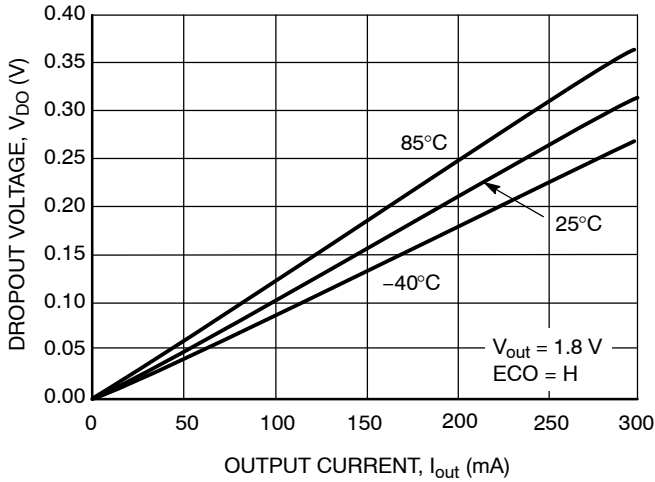


Figure 22. Dropout Voltage vs. Output Current

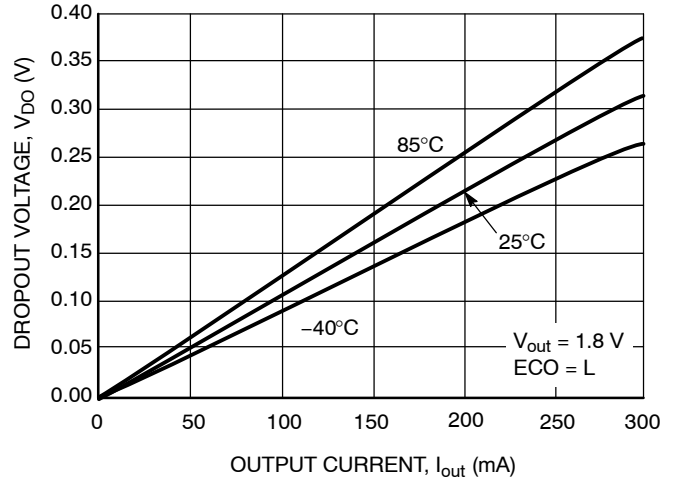


Figure 23. Dropout Voltage vs. Output Current

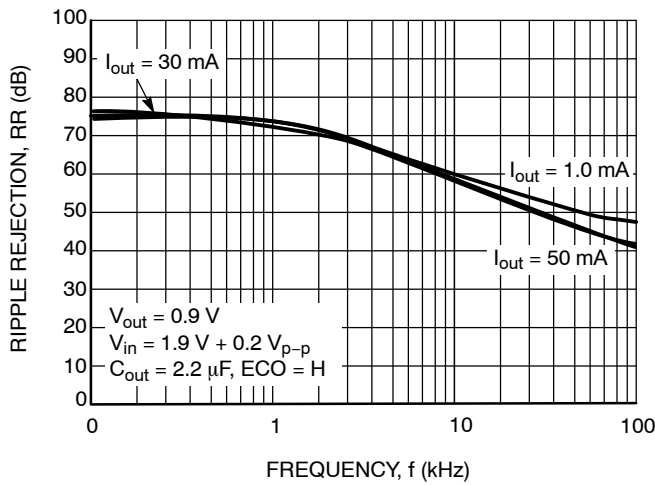


Figure 24. Ripple Rejection vs. Frequency

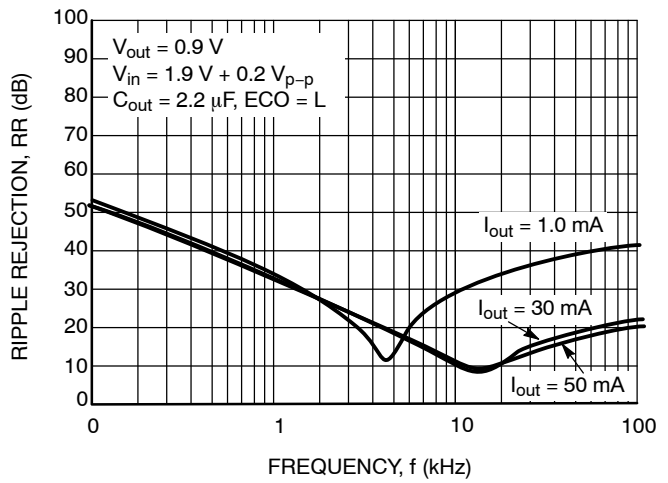


Figure 25. Ripple Rejection vs. Frequency

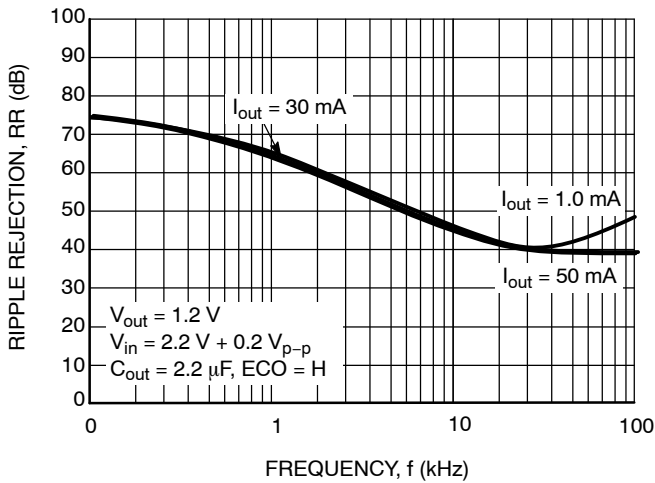


Figure 26. Ripple Rejection vs. Frequency

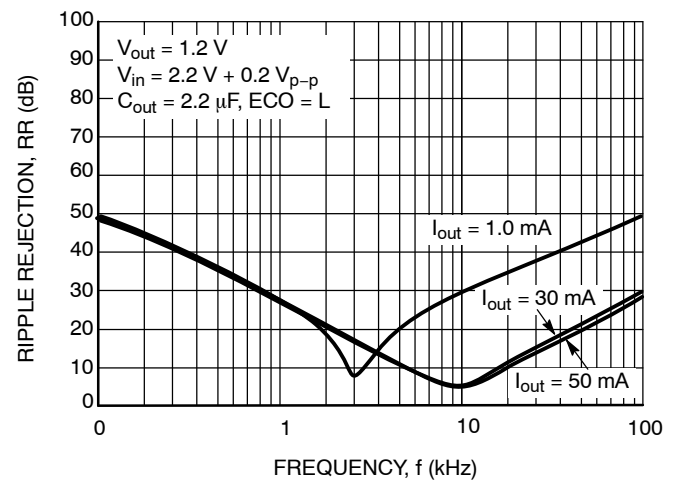


Figure 27. Ripple Rejection vs. Frequency

TYPICAL CHARACTERISTICS

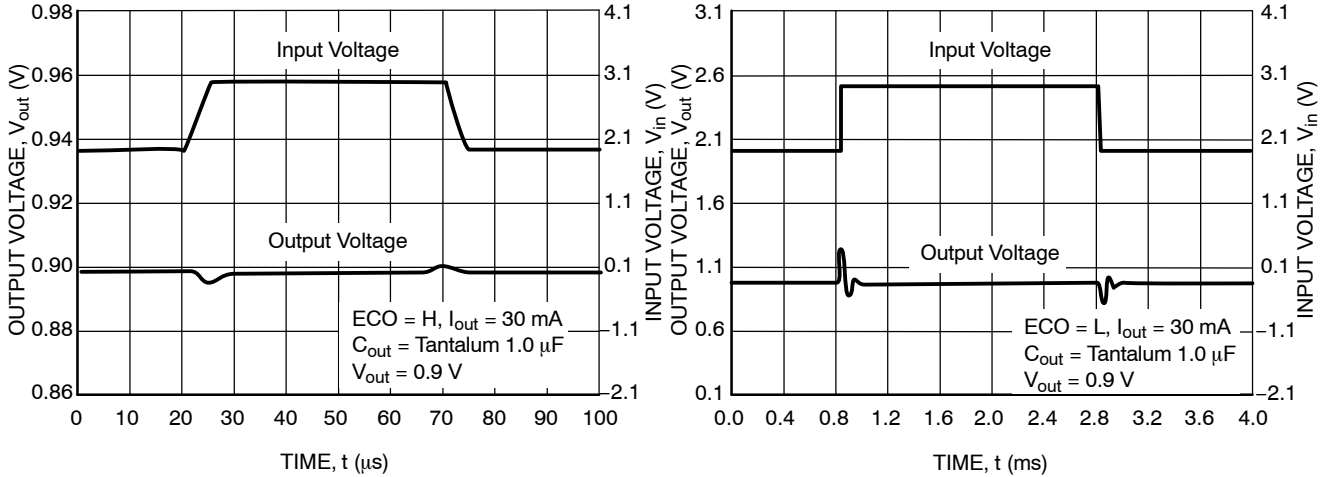


Figure 28. Input Transient Response

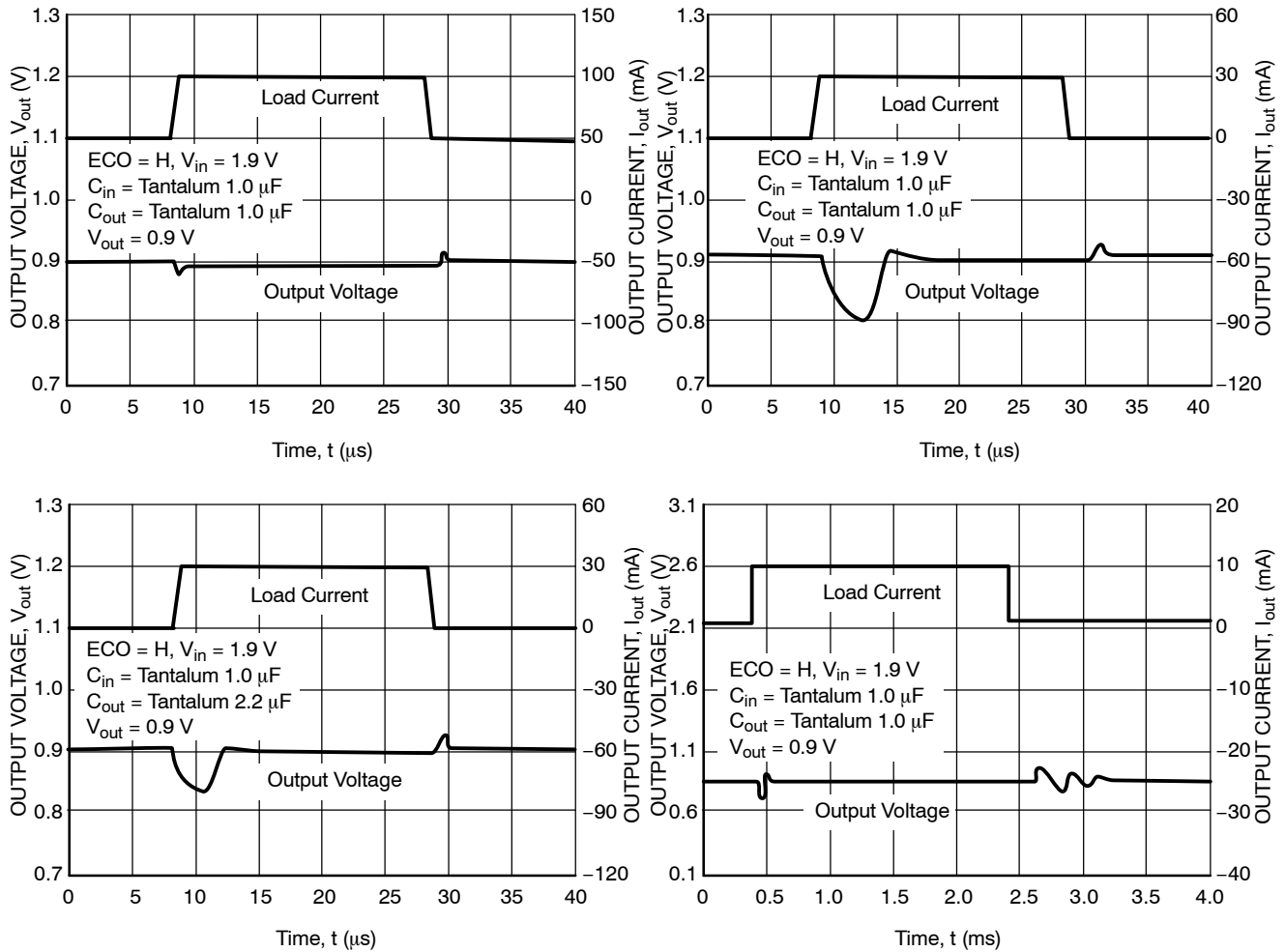


Figure 29. Load Transient Response

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TYPICAL CHARACTERISTICS

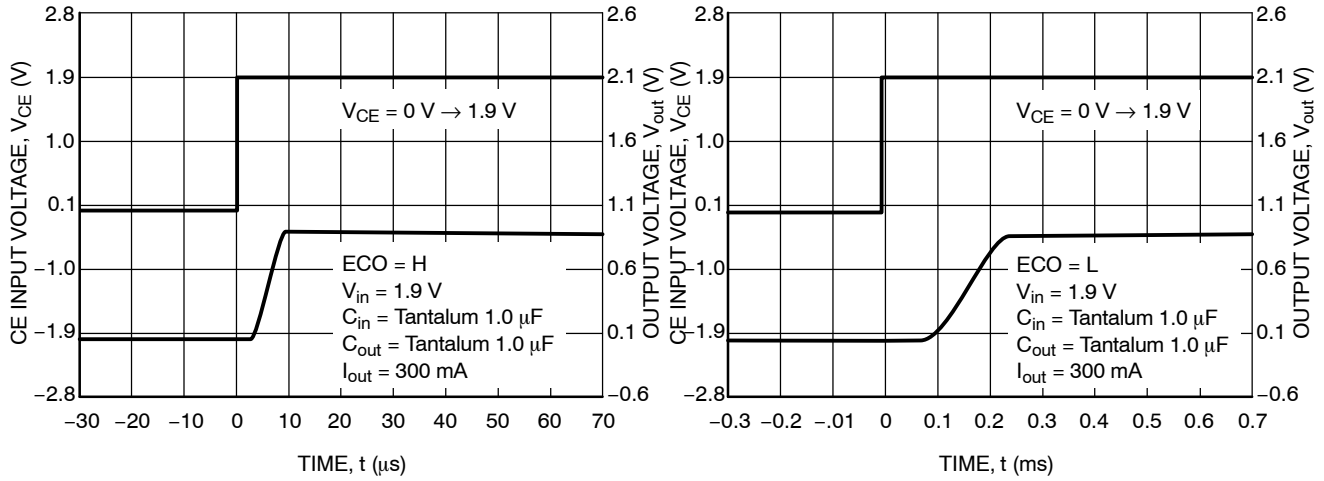


Figure 30. Turn-On Speed with CE Pin, $V_{out} = 0.8\text{ V}$

$V_{in} = 1.9\text{ V}$, $C_{in} = \text{Tantalum } 1.0\ \mu\text{F}$, $C_{out} = \text{Tantalum } 1.0\ \mu\text{F}$, $V_{out} = 0.9\text{ V}$

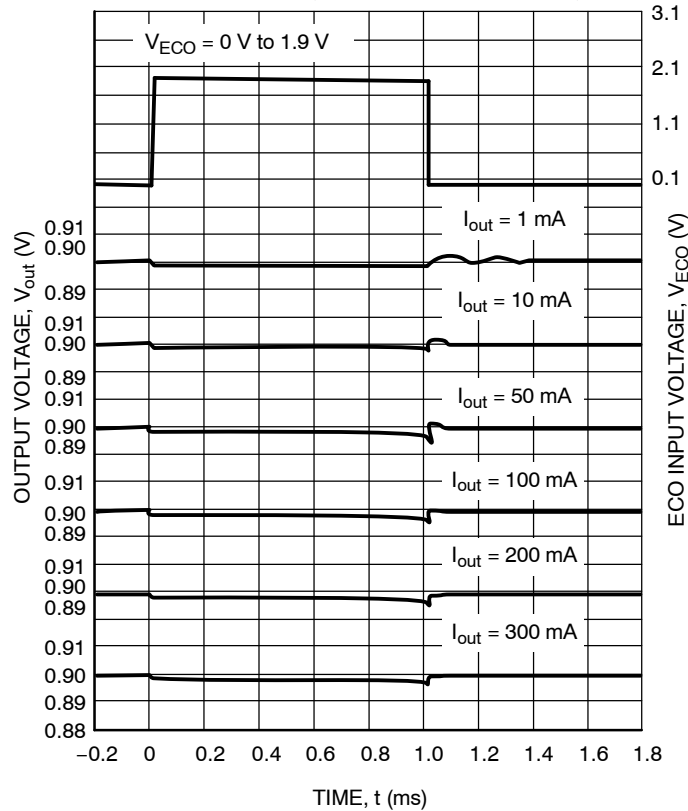


Figure 31. Output Voltage at Mode Alternative Point

TYPICAL CHARACTERISTICS

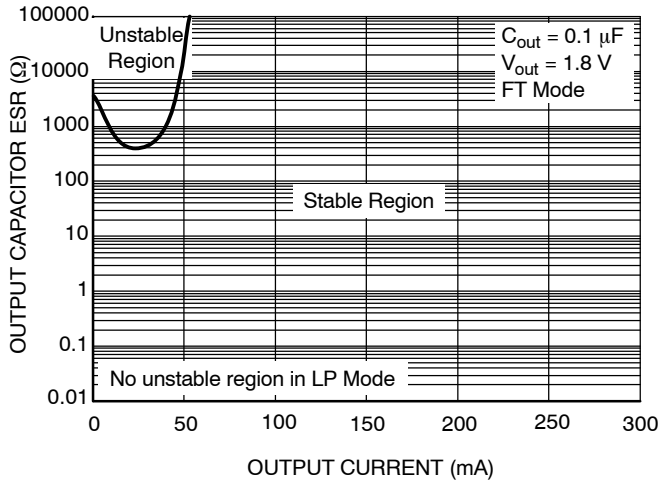


Figure 32. Output Stability, Output Capacitor ESR vs. Output Load Current (0.1 μF)

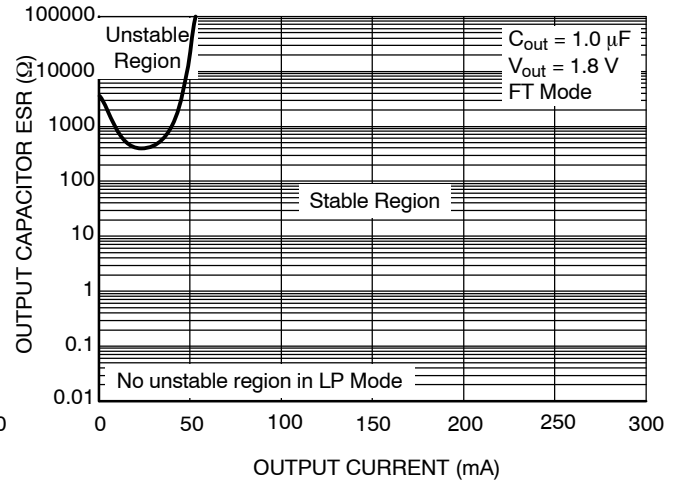


Figure 33. Output Stability, Output Capacitor ESR vs. Output Load Current (1.0 μF)

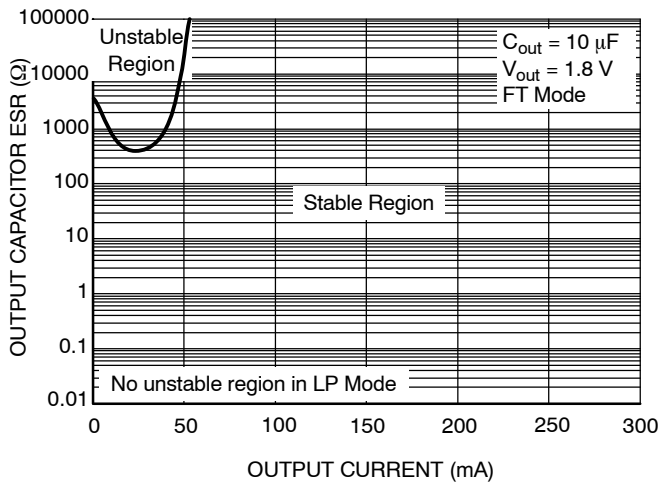


Figure 34. Output Stability, Output Capacitor ESR vs. Output Load Current (10 μF)

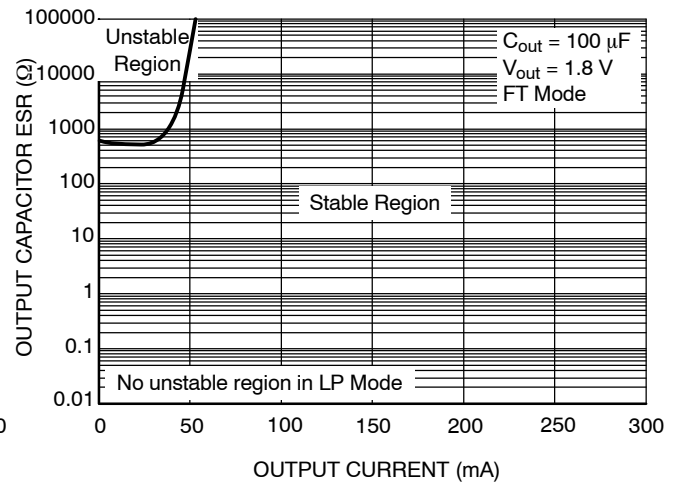


Figure 35. Output Stability, Output Capacitor ESR vs. Output Load Current (100 μF)

APPLICATION INFORMATION

Input Decoupling

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

Output Decoupling

It is best to use a 1.0 μF capacitor value 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.

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ORDERING INFORMATION

| Device | Output Type / Features | Nominal Output Voltage | Marking | Package | Shipping [†] |
|-----------------|--|------------------------|---------|-------------------|-----------------------|
| NCP585DSAN09T1G | Active High w/Auto Discharge, LP and FT Mode | 0.9 | B09D | HSO-6 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSAN12T1G | Active High w/Auto Discharge, LP and FT Mode | 1.2 | B12D | HSO-6 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSAN18T1G | Active High w/Auto Discharge, LP and FT Mode | 1.8 | B18D | HSO-6 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSN09T1G | Active High w/Auto Discharge, LP and FT Mode | 0.9 | R09 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSN12T1G | Active High w/Auto Discharge, LP and FT Mode | 1.2 | R12 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSN125T1G | Active High w/Auto Discharge, LP and FT Mode | 1.25 | R01 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSN15T1G | Active High w/Auto Discharge, LP and FT Mode | 1.5 | R15 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSN18T1G | Active High w/Auto Discharge, LP and FT Mode | 1.8 | R18 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSN25T1G | Active High w/Auto Discharge, LP and FT Mode | 2.5 | R25 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSN28T1G | Active High w/Auto Discharge, LP and FT Mode | 2.8 | R28 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSN30T1G | Active High w/Auto Discharge, LP and FT Mode | 3.0 | R30 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585DSN33T1G | Active High w/Auto Discharge, LP and FT Mode | 3.3 | R33 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585HSAN09T1G | Active High, LP and FT Mode | 0.9 | B09B | HSO-6 (Pb-Free) | 3000 Tape & Reel |
| NCP585HSAN12T1G | Active High, LP and FT Mode | 1.2 | B12B | HSO-6 (Pb-Free) | 3000 Tape & Reel |
| NCP585HSAN18T1G | Active High, LP and FT Mode | 1.8 | B18B | HSO-6 (Pb-Free) | 3000 Tape & Reel |
| NCP585HSN09T1G | Active High, LP and FT Mode | 0.9 | Q09 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585HSN10T1G | Active High, LP and FT Mode | 1.0 | Q10 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585HSN12T1G | Active High, LP and FT Mode | 1.2 | Q12 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585HSN18T1G | Active High, LP and FT Mode | 1.8 | Q18 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585HSN30T1G | Active High, LP and FT Mode | 3.0 | Q30 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585LSAN09T1G | Active Low, LP and FT Mode | 0.9 | B09A | HSO-6 (Pb-Free) | 3000 Tape & Reel |
| NCP585LSAN12T1G | Active Low, LP and FT Mode | 1.2 | B12A | HSO-6 (Pb-Free) | 3000 Tape & Reel |
| NCP585LSAN18T1G | Active Low, LP and FT Mode | 1.8 | B18A | HSO-6 (Pb-Free) | 3000 Tape & Reel |
| NCP585LSN09T1G | Active Low, LP and FT Mode | 0.9 | P09 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585LSN12T1G | Active Low, LP and FT Mode | 1.2 | P12 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |
| NCP585LSN18T1G | Active Low, LP and FT Mode | 1.8 | P18 | SOT23-5 (Pb-Free) | 3000 Tape & Reel |

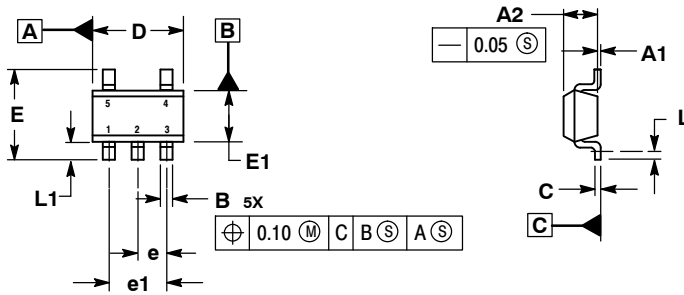
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

Other voltages are available. Consult your ON Semiconductor representative.

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PACKAGE DIMENSIONS

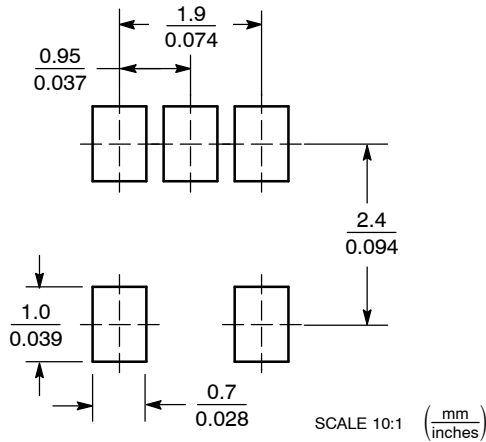
SOT23-5
 SN SUFFIX
 CASE 1212-01
 ISSUE O



- 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 |

SOLDERING FOOTPRINT*

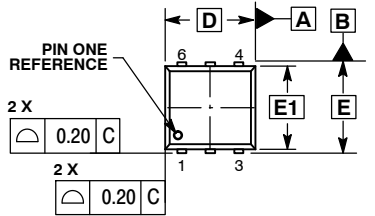


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

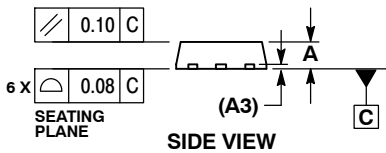
NCP585

PACKAGE DIMENSIONS

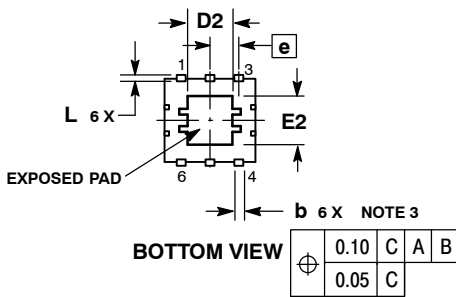
HSO_N-6
 SAN SUFFIX
 CASE 506AE-01
 ISSUE A



TOP VIEW



SIDE VIEW



BOTTOM VIEW

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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