# NCP580

# Ultra-Fast, Low Noise 120 mA CMOS LDO Regulator with Enable

The NCP580 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 small SC−82AB package.

A 2.2 μF ceramic capacitor or higher is the recommended value to be used with these devices on the output pin.

### Features

- Ultra−Low Dropout Voltage of 150 mV at 100 mA
- Low Output Noise of 30 μVrms without Noise Reduction Cap
- Excellent Line Regulation of 0.02%/V
- Excellent Load Regulation of 12 mV
- High Output Voltage Accuracy of ±1.5%
- Low Iq Current of 90 μA
- Very Low Shutdown Current of 0.1 μA
- Excellent Power Supply Rejection Ratio of 70 dB at f = 1.0 kHz
- Wide Output Voltage Range of 1.5 V to 3.3 V
- Fold Back Protection Circuit
- Fast Dynamic Performance
- Low Temperature Drift Coefficient on the Output Voltage of ±100 ppm/°C
- Input Voltage up to 6.5 V
- These are Pb−Free Devices

### Typical Applications

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

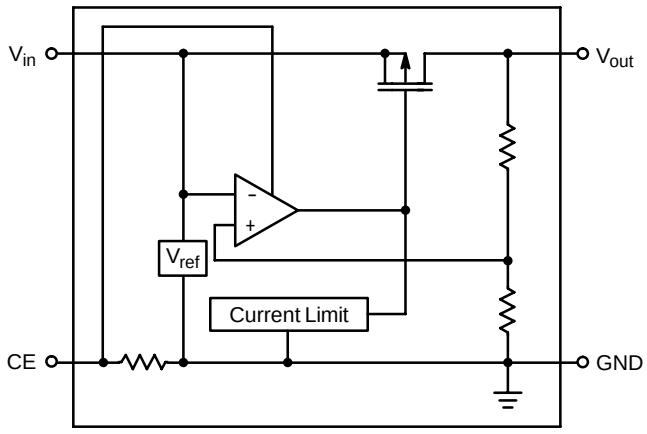
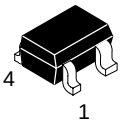



**Figure 1. Simplified Block Diagram**

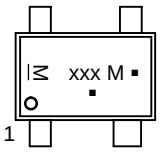
**ON Semiconductor®**

**http://onsemi.com**

**MARKING DIAGRAM**




**SC−82AB**
**SQ SUFFIX**
**CASE 419C**




xxx = Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing location.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

**PIN FUNCTION DESCRIPTION**

| Pin | Symbol | Description |
|---|---|---|
| 1 | $V_{out}$ | Regulated output voltage. |
| 2 | GND | Power supply ground. |
| 3 | CE | Chip enable pin. |
| 4 | $V_{in}$ | Power supply input voltage. |

**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 $V_{in}$ +0.3 | V |
| Output Voltage | $V_{out}$ | −0.3 to $V_{in}$ +0.3 | V |
| Output Current | $I_{out}$ | 140 | mA |
| Power Dissipation | $P_D$ | 150 | mW |
| Operating Junction Temperature Range | $T_J$ | −40 to +85 | °C |
| Storage Temperature Range | $T_{stg}$ | −55 to +150 | °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, $T_A = 25°C$, unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Input Voltage | $V_{in}$ | 2.2 | – | 6.0 | V |
| Output Voltage ($I_{out}$ = 1.0 mA to 30 mA) | $V_{out}$ | $V_{out}$ X 0.985 | – | $V_{out}$ X 1.015 | V |
| Line Regulation ($I_{out}$ = 30 mA)<br>($V_{out}$ + 0.5 V ≤ $V_{in}$ ≤ 6.0 V)<br>($V_{out}$ = 1.5 V, 2.2 V ≤ $V_{in}$ ≤ 6.0 V) | $Reg_{line}$ | – | 0.02 | 0.10 | %/V |
| Load Regulation ($I_{out}$ = 1.0 mA to 120 mA) | $Reg_{load}$ | – | 12 | 40 | mV |
| Dropout Voltage ($I_{out}$ = 120 mA)<br>$V_{out}$ = 1.5 V<br>$V_{out}$ = 1.8 V<br>$V_{out}$ = 2.5 V<br>2.8 V ≤ $V_{out}$ ≤ 3.3 V | $V_{DO}$ | <br>–<br>–<br>–<br>– | <br>0.36<br>0.28<br>0.24<br>0.18 | <br>0.70<br>0.40<br>0.35<br>0.28 | V |
| Quiescent Current ($I_{out}$ = 0 mA) | Iq | – | 90 | 160 | μA |
| Output Current | $I_{out}$ | 120 | – | – | mA |
| Shutdown Current ($V_{in} = V_{CE}$) | $I_{SD}$ | | 0.1 | 1.0 | μA |
| Output Short Circuit Current ($V_{out}$ = 0) | $I_{lim}$ | – | 40 | – | mA |
| Ripple Rejection ($I_{out}$ = 30 mA)<br>f = 1.0 kHz<br>($V_{out}$ = 1.5 V, $V_{in} – V_{out}$ = 1.2 V)<br>($V_{out}$ ≥ 2.5 V, $V_{in} – V_{out}$ = 1.0 V) | RR | <br><br>–<br>– | <br><br>75<br>70 | <br><br>–<br>– | dB |
| Enable Input Threshold Voltage<br>High<br>Low | <br>$Vth_{enh}$<br>$Vth_{enl}$ | <br>1.5<br>0 | <br>–<br>– | <br>$V_{in}$<br>0.3 | V |
| Output Noise Voltage (Bandwidth = 10 Hz to 100 kHz) | $V_n$ | – | 30 | – | μVrms |
| Output Voltage Temperature Coefficient<br>($I_{out}$ = 30 mA, −40°C ≤ $T_A$ ≤ 85°C) | $\Delta V_{out}/\Delta T$ | – | ±100 | – | ppm/°C |

## TYPICAL CHARACTERISTICS

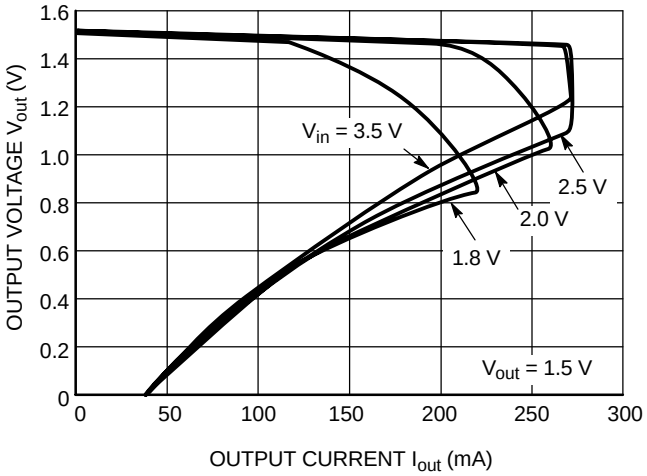



**Figure 2. Output Voltage vs. Output Current**

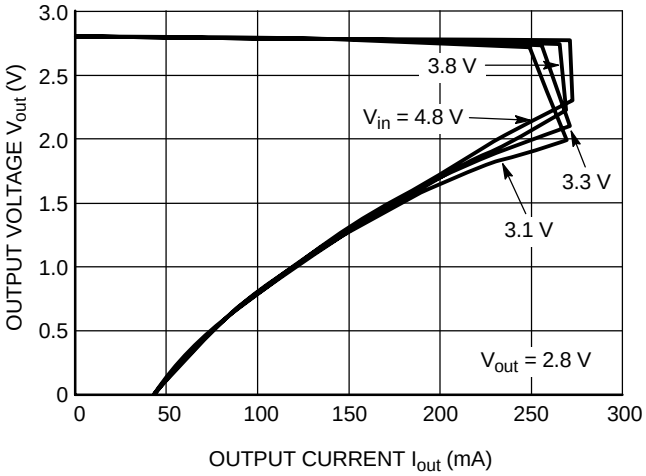



**Figure 3. Output Voltage vs. Output Current**

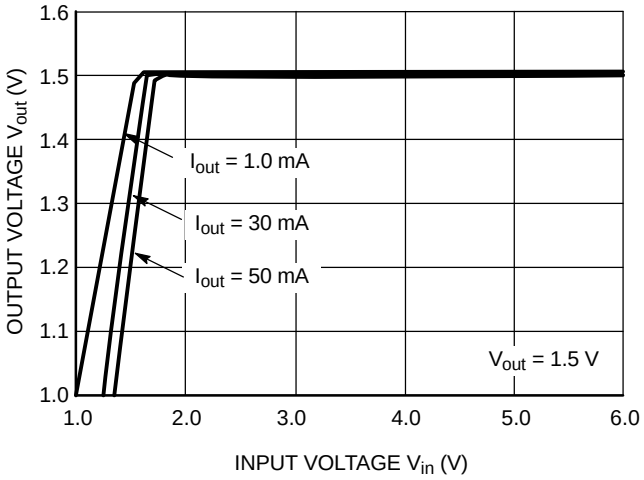



**Figure 4. Output Voltage vs. Input Voltage**

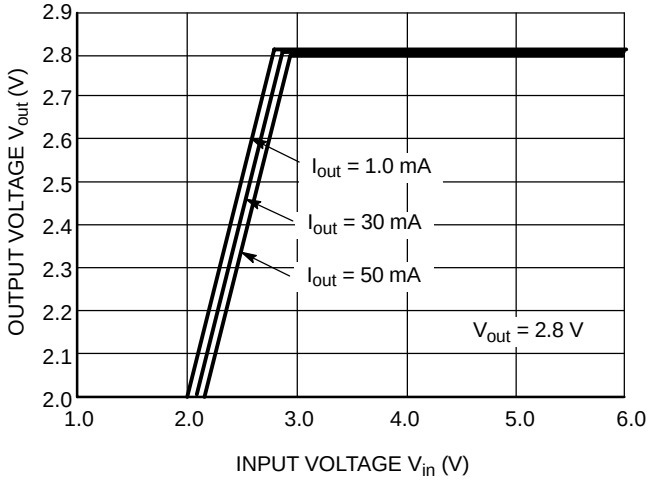



**Figure 5. Output Voltage vs. Input Voltage**

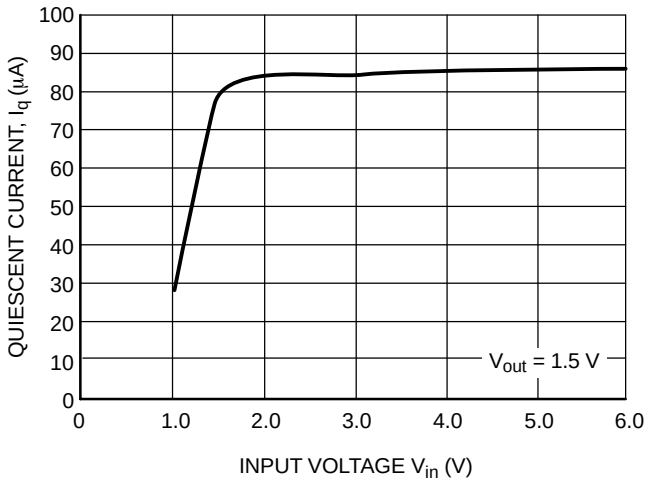



**Figure 6. Quiescent Current vs. Input Voltage**

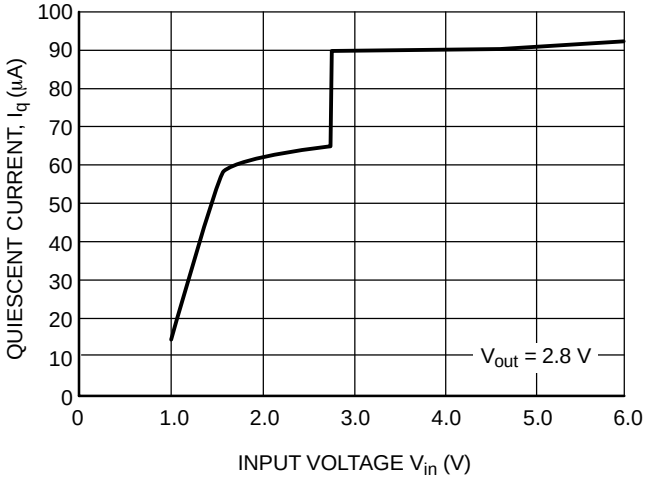



**Figure 7. Quiescent Current vs. Input Voltage**

## TYPICAL CHARACTERISTICS

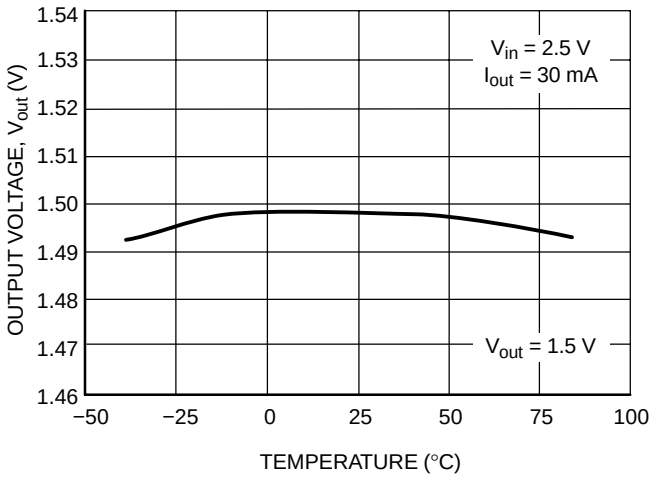



**Figure 8. Output Voltage vs. Temperature**

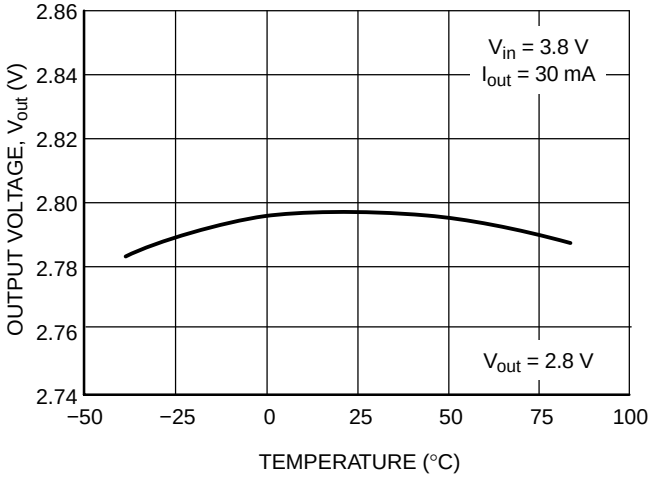



**Figure 9. Output Voltage vs. Temperature**

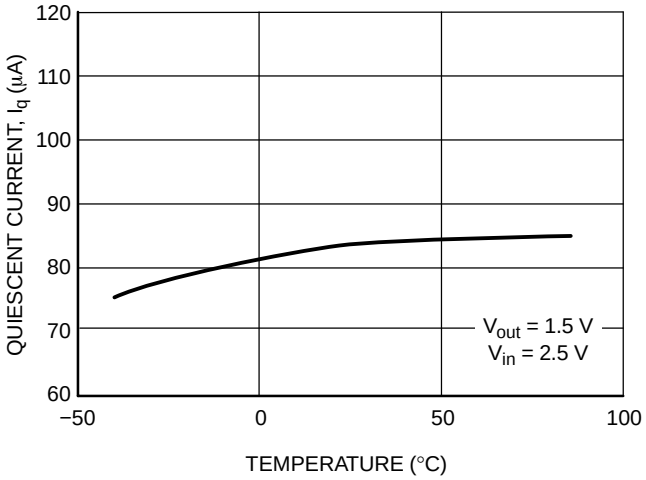



**Figure 10. Quiescent Current vs. Temperature**

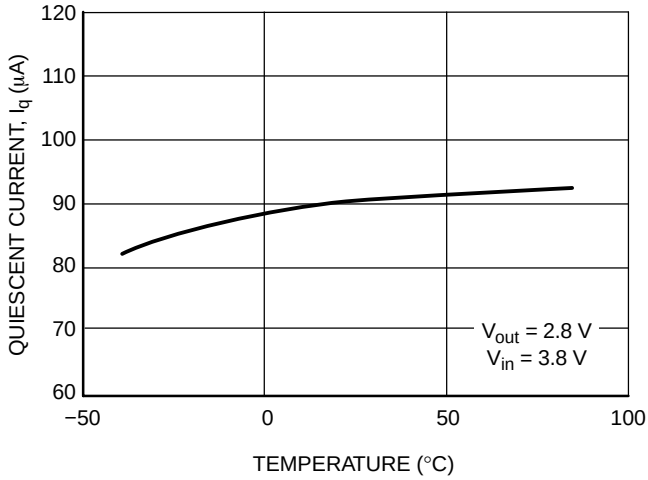



**Figure 11. Quiescent Current vs. Temperature**

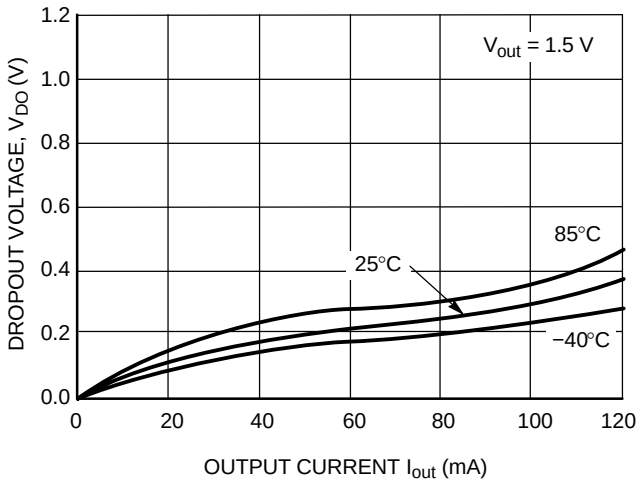



**Figure 12. Dropout Voltage vs. Output Current**

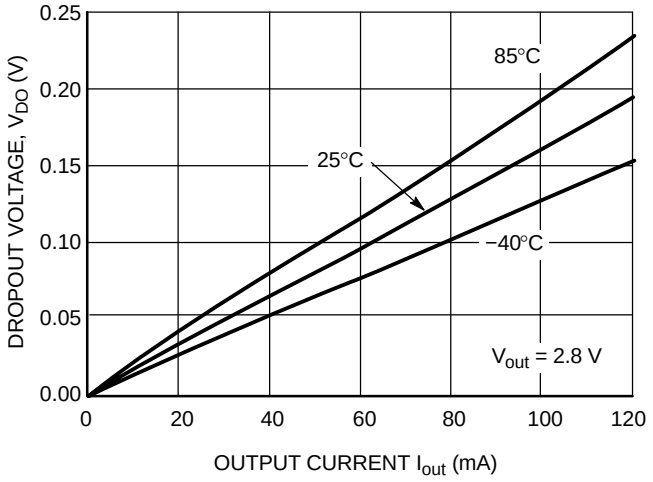



**Figure 13. Dropout Voltage vs. Output Current**

## TYPICAL CHARACTERISTICS

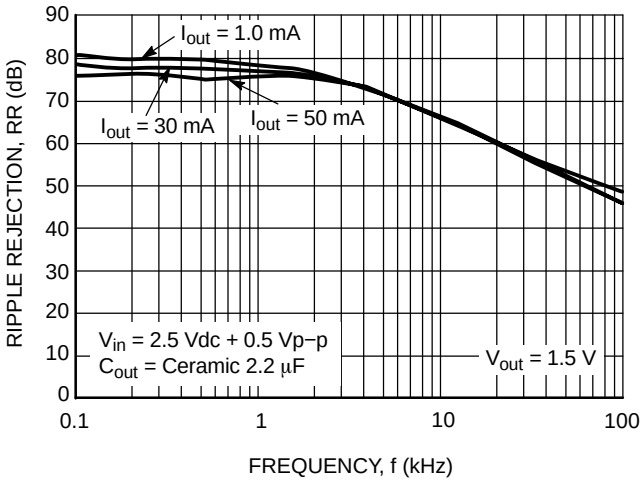



**Figure 14. Ripple Rejection vs. Frequency**

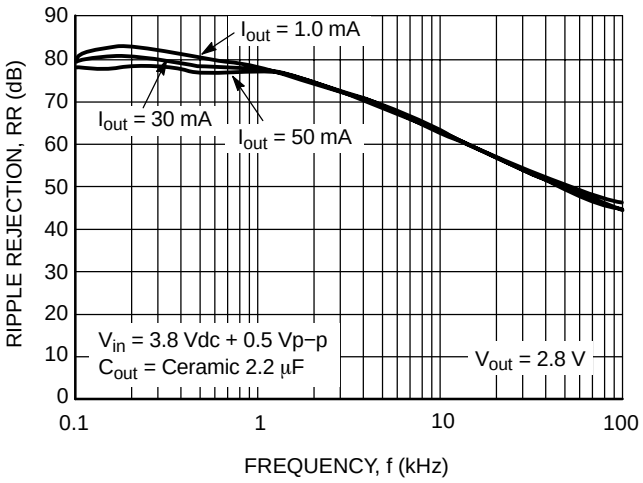
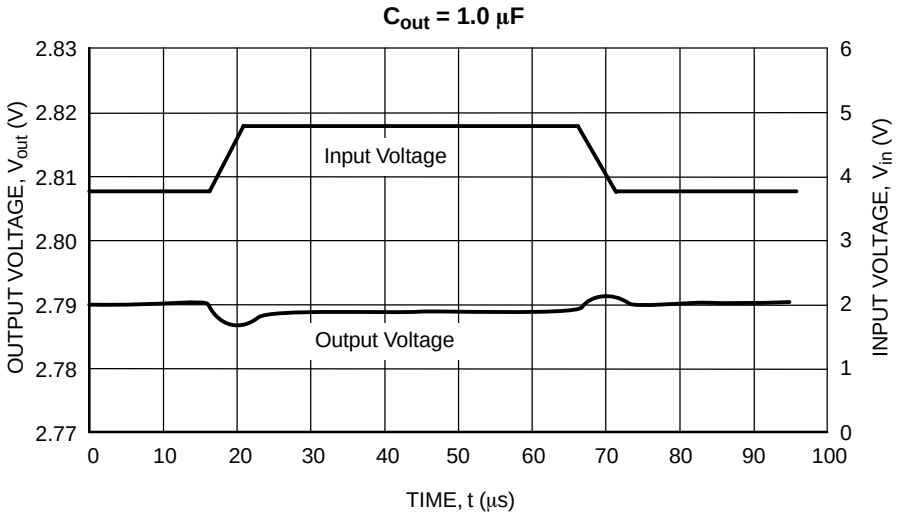
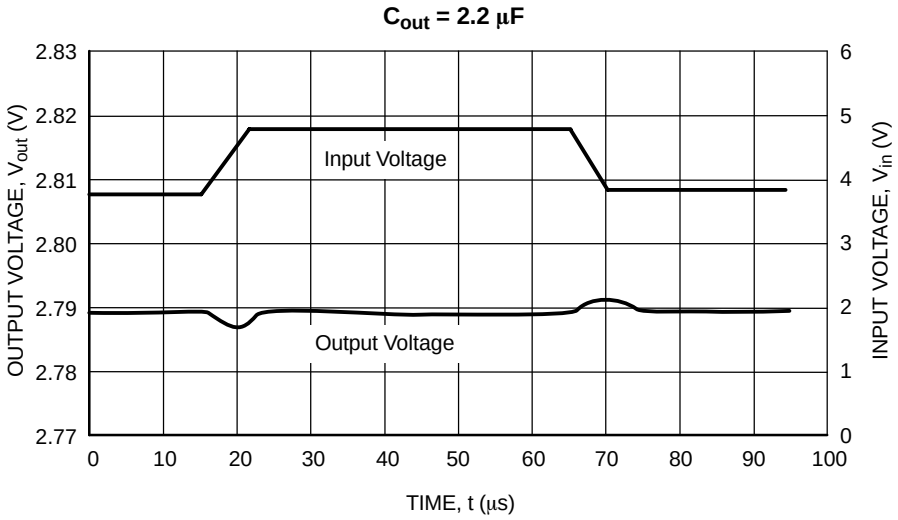



**Figure 15. Ripple Rejection vs. Frequency**

## TYPICAL CHARACTERISTICS



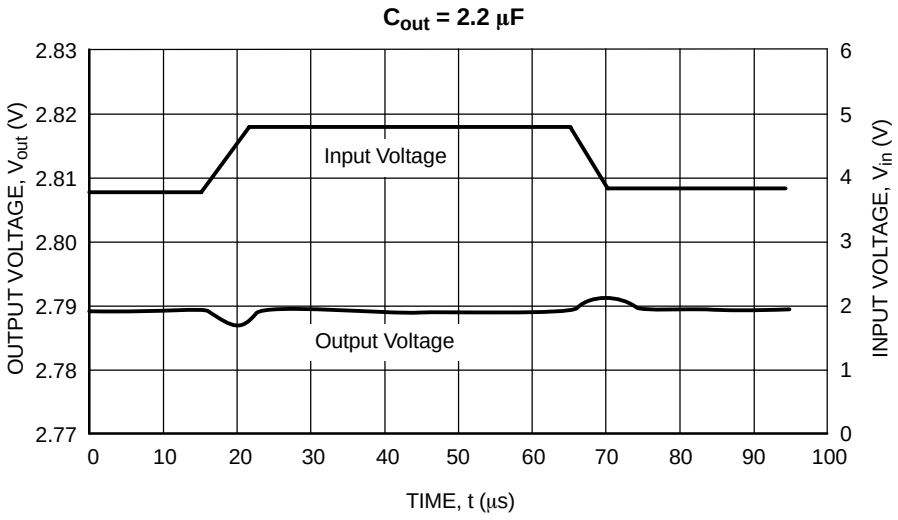




**Figure 16. Input Transient Response**
**($V_{in}$ = 3.8 V to 4.8 V, $I_{out}$ = 30 mA, tr = tf = 5.0 μs, $V_{out}$ = 2.8 V)**

## TYPICAL CHARACTERISTICS

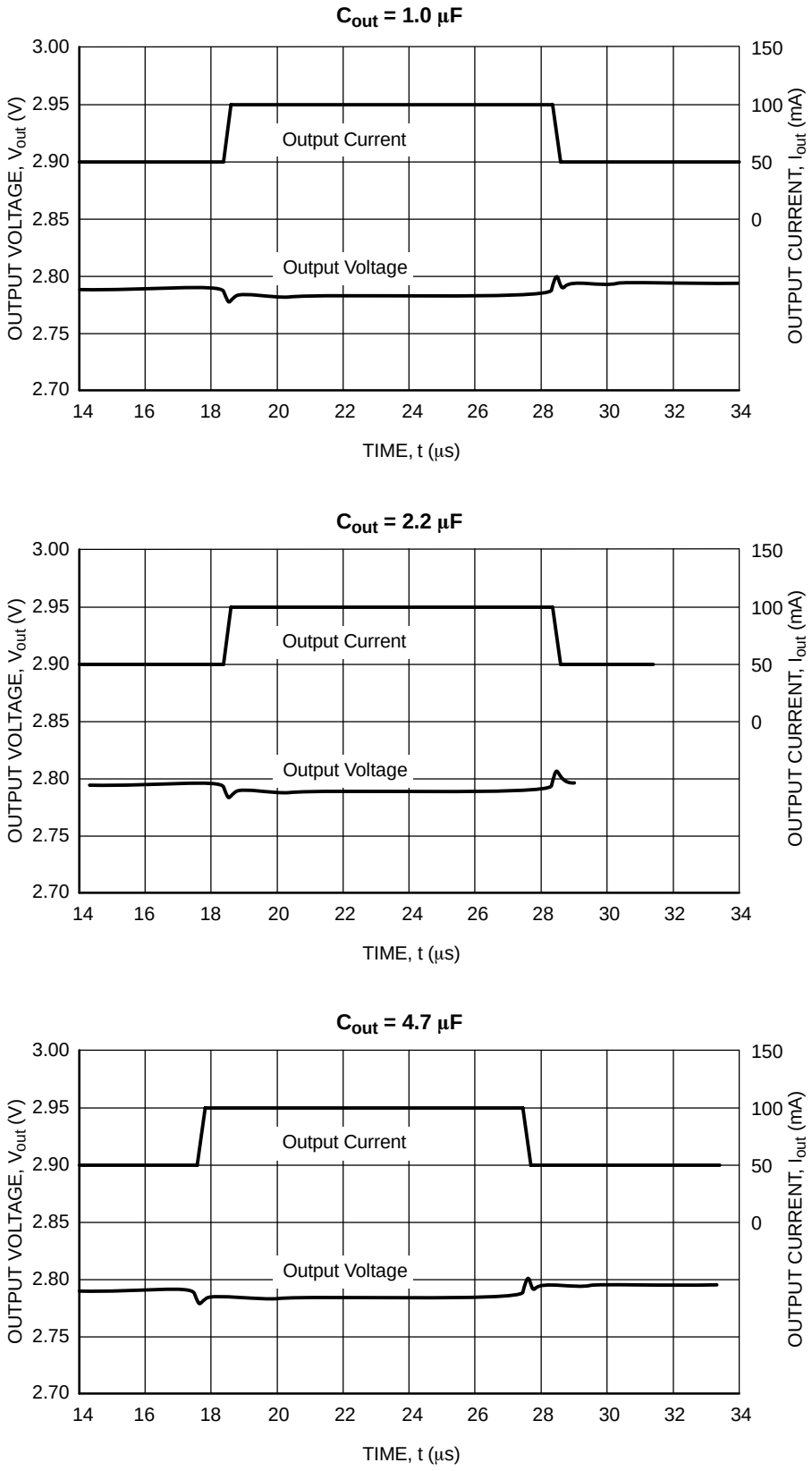



**Figure 17. Load Transient Response**
**($V_{in}$ = 3.8 V, $I_{out}$ = 50 mA to 100 mA, tr = tf = 5.0 μs, $C_{in}$ = 1.0 μF, $V_{out}$ = 2.8 V)**

## 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 of $V_{in}$ and GND should be sufficiently wide in order to minimize noise and prevent unstable operation.

### Output Decoupling

It is best to use a 2.2 μF or higher 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.

### ORDERING INFORMATION

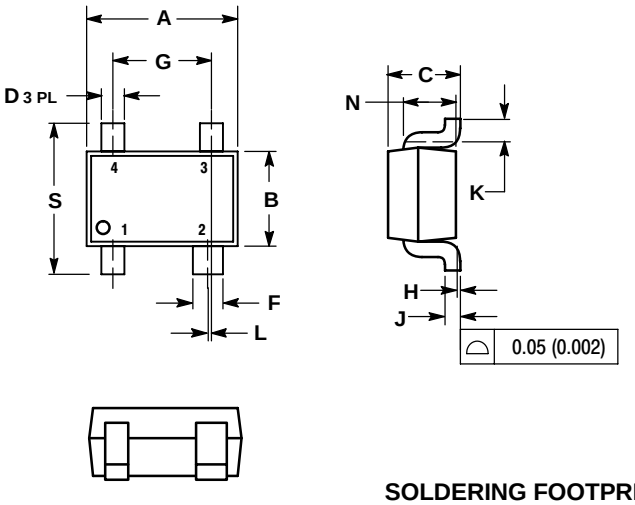
| Device | Output Type / Features | Nominal Output Voltage | Marking | Package | Shipping† |
|---|---|---|---|---|---|
| NCP580SQ15T1G | Active High | 1.5 | AF | SC−82AB (Pb−Free) | 3000 / Tape & Reel |
| NCP580SQ18T1G | Active High | 1.8 | AJ | SC−82AB (Pb−Free) | 3000 / Tape & Reel |
| NCP580SQ25T1G | Active High | 2.5 | BF | SC−82AB (Pb−Free) | 3000 / Tape & Reel |
| NCP580SQ28T1G | Active High | 2.8 | BJ | SC−82AB (Pb−Free) | 3000 / Tape & Reel |
| NCP580SQ30T1G | Active High | 3.0 | CA | SC−82AB (Pb−Free) | 3000 / Tape & Reel |
| NCP580SQ33T1G | Active High | 3.3 | CD | SC−82AB (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.

## PACKAGE DIMENSIONS

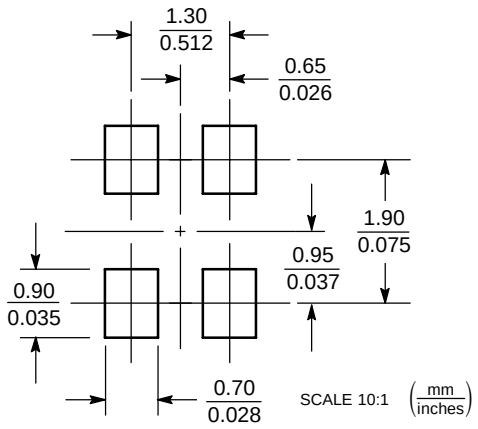
**SC−82AB**
**SQ SUFFIX**
CASE 419C−02
ISSUE E




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. 419C−01 OBSOLETE. NEW STANDARD IS 419C−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 1.8 | 2.2 | 0.071 | 0.087 |
| B | 1.15 | 1.35 | 0.045 | 0.053 |
| C | 0.8 | 1.1 | 0.031 | 0.043 |
| D | 0.2 | 0.4 | 0.008 | 0.016 |
| F | 0.3 | 0.5 | 0.012 | 0.020 |
| G | 1.1 | 1.5 | 0.043 | 0.059 |
| H | 0.0 | 0.1 | 0.000 | 0.004 |
| J | 0.10 | 0.26 | 0.004 | 0.010 |
| K | 0.1 | −−− | 0.004 | −−− |
| L | 0.05 BSC | | 0.002 BSC | |
| N | 0.2 REF | | 0.008 REF | |
| S | 1.8 | 2.4 | 0.07 | 0.09 |

### 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.



### PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
**Phone**: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
**Fax**: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
**Email**: orderlit@onsemi.com

**N. American Technical Support**: 800−282−9855 Toll Free USA/Canada
**Europe, Middle East and Africa Technical Support:**
Phone: 421 33 790 2910
**Japan Customer Focus Center**
Phone: 81−3−5773−3850

**ON Semiconductor Website**: **www.onsemi.com**

**Order Literature**: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative