NCP582

Ultra-Fast, Low Noise 150 mA CMOS LDO Regulator with Enable

The NCP582 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 and are offered in active low and active high with auto discharge.

The following ceramic capacitors are the recommended values to be used with these devices; for V_{out} < 2.5 V, C_{in} = C_{out} = 1.0 μF, V_{out} ≥ 2.5 V, C_{in} = C_{out} = 0.47 μF.

Features

- Ultra−Low Dropout Voltage of 220 mV at 150 mA
- Low Output Noise of 30 μVrms without Noise Reduction Cap
- Excellent Line Regulation of 0.02%/V
- Excellent Load Regulation of 22 mV
- High Output Voltage Accuracy of ±2%
- Low Iq Current of 75 μA
- Very Low Shutdown Current
- 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
- Fast Dynamic Performance
- Fold Back Protection Circuit
- 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

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MARKING DIAGRAMS

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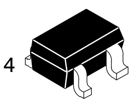

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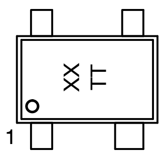
SC−82AB
SQ SUFFIX
CASE 419C



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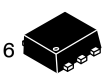
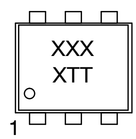


1

SOT−563
XV SUFFIX
CASE 463A



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X = Device Code
T = Traceability Information

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 10 of this data sheet.

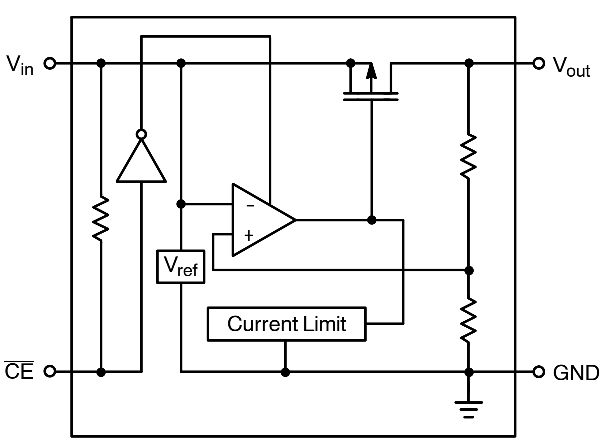


Figure 1. Simplified Block Diagram for Active Low

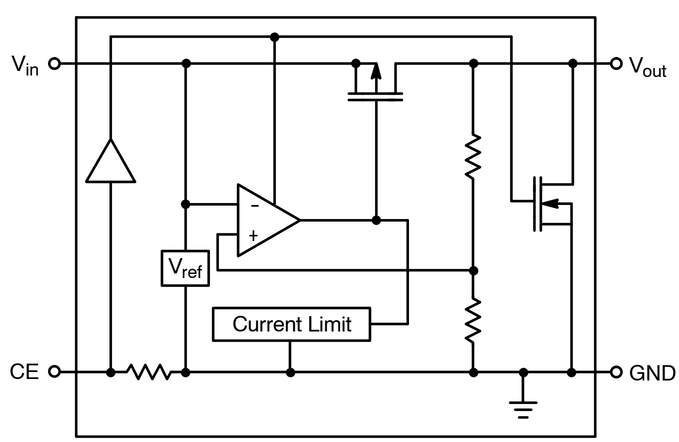


Figure 2. Simplified Block Diagram for Active High with Auto Discharge

PIN FUNCTION DESCRIPTION

SOT−563 Pin	SC−82AB Pin	Symbol	Description
1	4	Vin	Power supply inout voltage.
2	2	GND	Power supply ground.
3	3	V_{out}	Regulated output voltage.
4	–	NC	No connect.
5	–	GND	Power supply ground.
6	1	$\overline{CE}$ or CE	Chip enable pin.

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}	200	mA
Power Dissipation SC−82AB SOT−563	P_D	 150 500	mW
ESD Capability, Human Body Model, C = 100 pF, R = 1.5 kΩ	ESD_{HBM}	2000	V
ESD Capability, Machine Model, C = 200 pF, R = 0 Ω	ESD_{MM}	200	V
Operating Ambient Temperature Range	T_A	−40 to +85	°C
Maximum Junction Temperature	$T_{J(max)}$	125	°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}	2.0	–	6.0	V
Output Voltage (I_{out} = 1.0 mA to 30 mA)	V_{out}	V_{out} X 0.980	–	V_{out} X 1.020	V
Line Regulation (I_{out} = 30 mA), (V_{out} > 1.7 V; V_{out} + 0.5 V ≤ V_{in} ≤ 6.0 V) (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 150 mA)	Reg_{load}	–	22	40	mV
Dropout Voltage (I_{out} = 150 mA) V_{out} = 1.5 V V_{out} = 1.8 V V_{out} = 2.5 V 2.8 V ≤ V_{out} ≤ 3.3 V	V_{DO}	– – – –	0.38 0.32 0.28 0.22	0.70 0.55 0.50 0.35	V
Quiescent Current (I_{out} = 0 mA)	Iq	–	75	95	μA
Output Current	I_{out}	150	–	–	mA
Shutdown Current (V_{CE} = Gnd for Active High with Auto Discharge) (V_{CE} = V_{in} for Active Low)	I_{SD}	–	0.1	1.0	μA
Output Short Circuit Current (V_{out} = 0)	I_{lim}	–	40	–	mA
Ripple Rejection (I_{out} = 30 mA) (V_{out} > 1.7 V; V_{in} – V_{out} = 1.0 V) (V_{out} = 1.5 V; V_{in} – V_{out} = 1.2 V) f = 1.0 kHz f = 10 kHz	RR	 – –	 70 60	 – –	dB
Enable Input Threshold Voltage High Low	Vth_{enh} Vth_{enl}	1.5 0	– –	V_{in} 0.3	V
Output Noise Voltage (Bandwidth = 10 Hz to 100 kHz)	V_n	–	30	–	μVrms
Output Voltage Temperature Coefficient (I_{out} = 30 mA, –40°C ≤ T_A ≤ 85°C)	$\Delta V_{out}/\Delta T$	–	±100	–	ppm/°C
N−Channel On Resistance for Auto Discharge	R_{Low}	–	60	–	Ω

TYPICAL CHARACTERISTICS

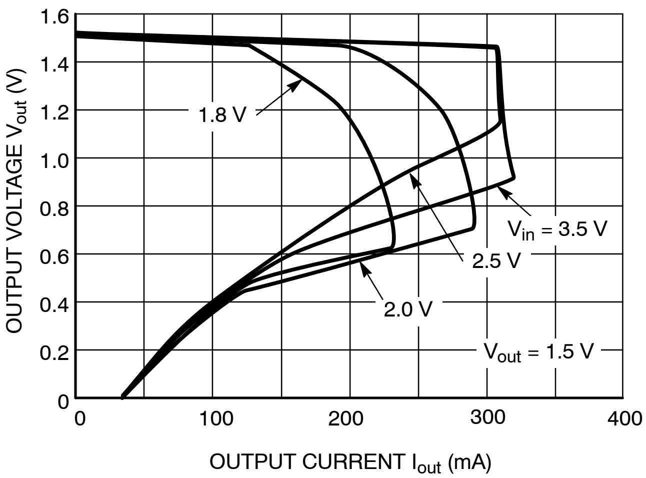


Figure 3. Output Voltage vs. Output Current

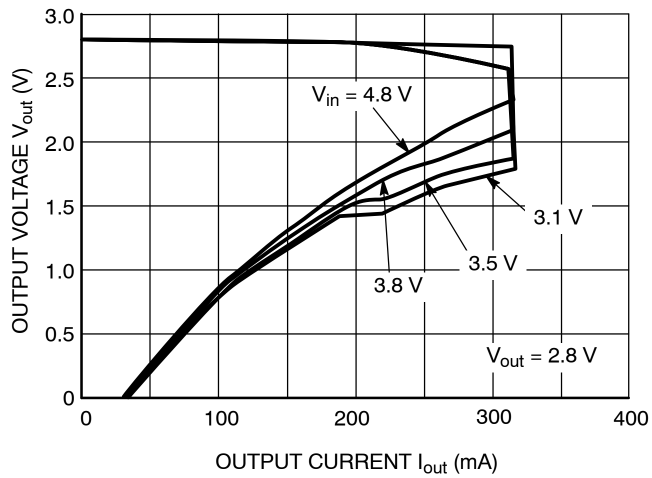


Figure 4. Output Voltage vs. Output Current

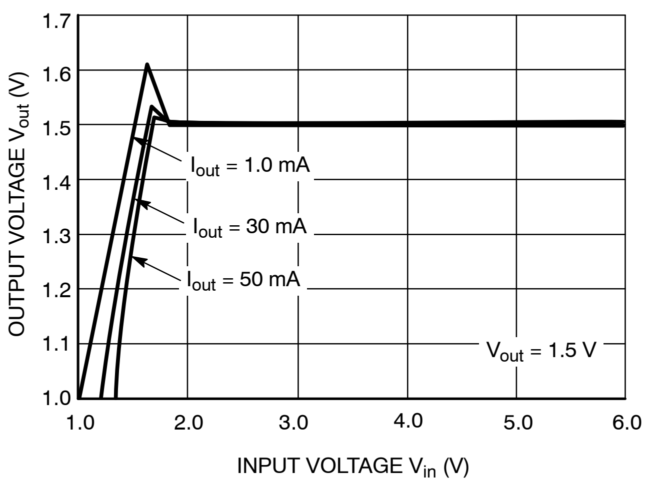


Figure 5. Output Voltage vs. Input Voltage

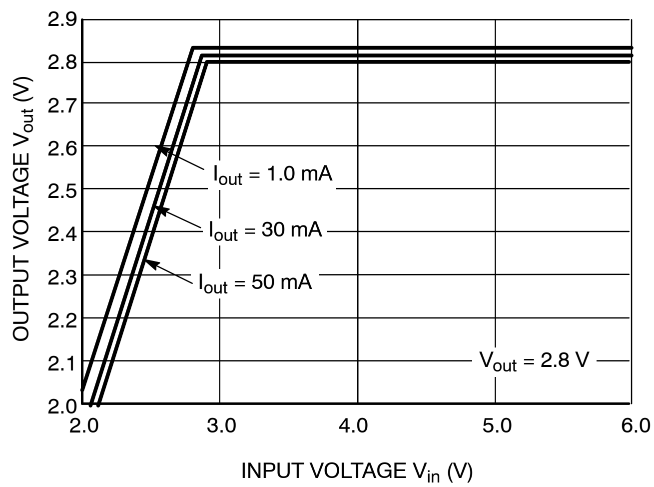


Figure 6. Output Voltage vs. Input Voltage

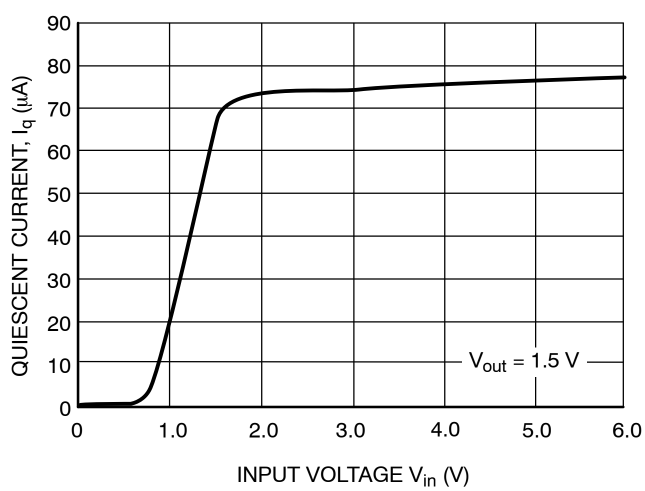


Figure 7. Quiescent Current vs. Input Voltage

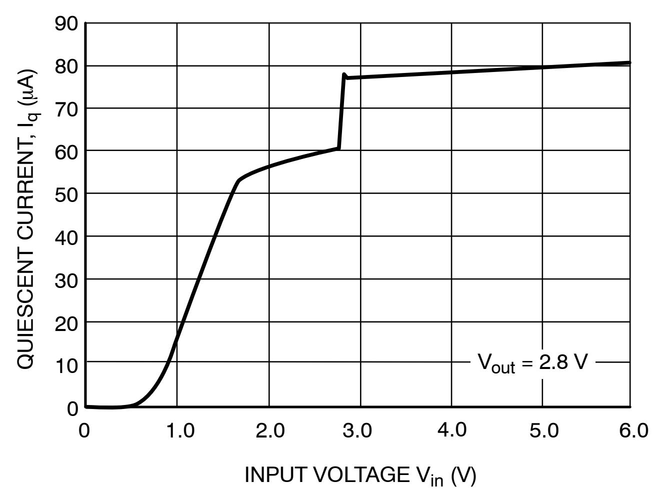


Figure 8. Quiescent Current vs. Input Voltage

TYPICAL CHARACTERISTICS

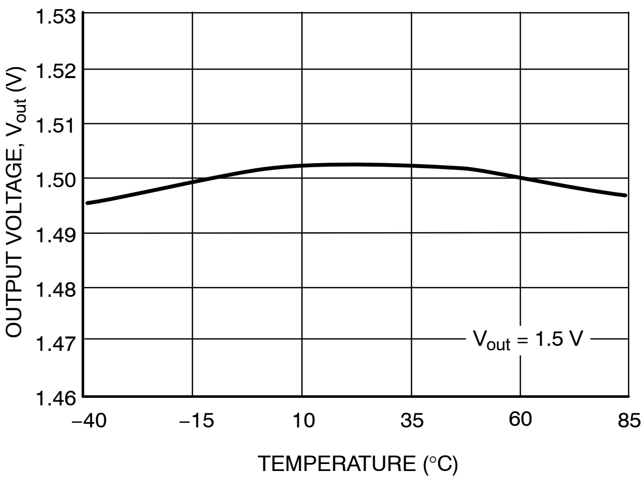


Figure 9. Output Voltage vs. Temperature

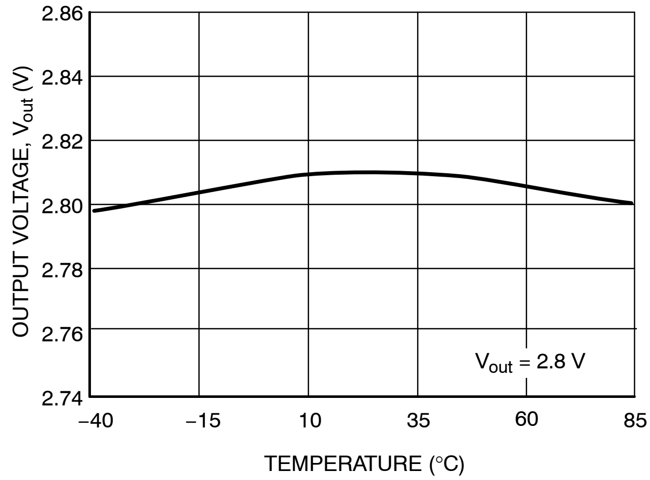


Figure 10. Output Voltage vs. Temperature

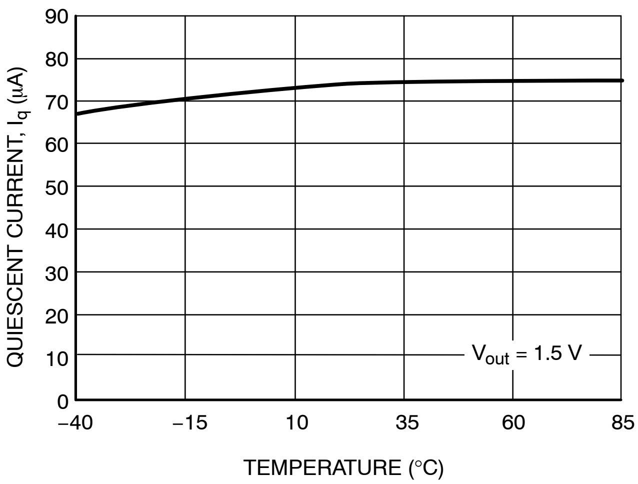


Figure 11. Quiescent Current vs. Temperature

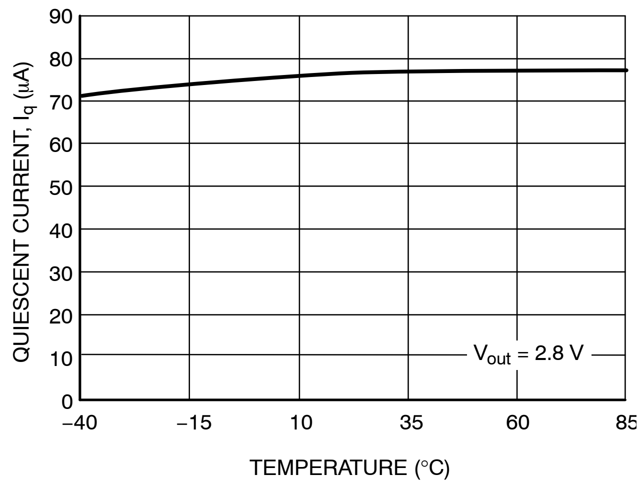


Figure 12. Quiescent Current vs. Temperature

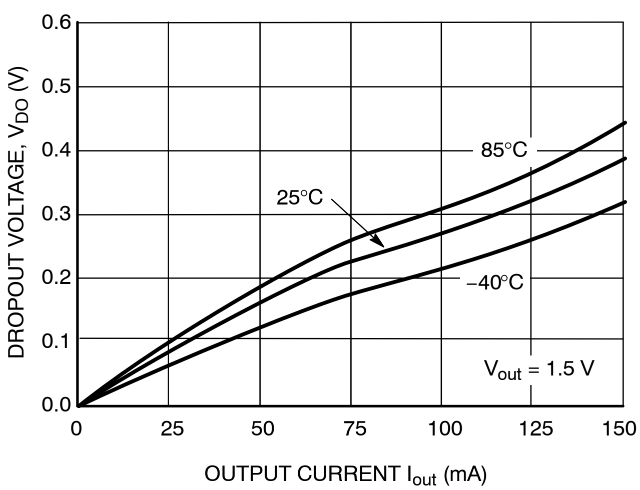


Figure 13. Dropout Voltage vs. Output Current

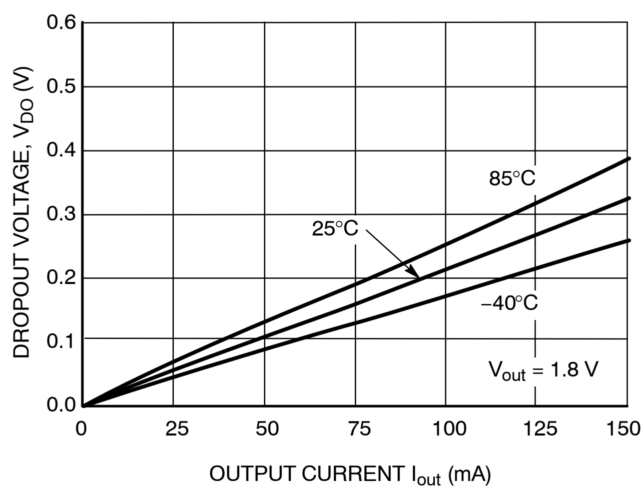


Figure 14. Dropout Voltage vs. Output Current

TYPICAL CHARACTERISTICS

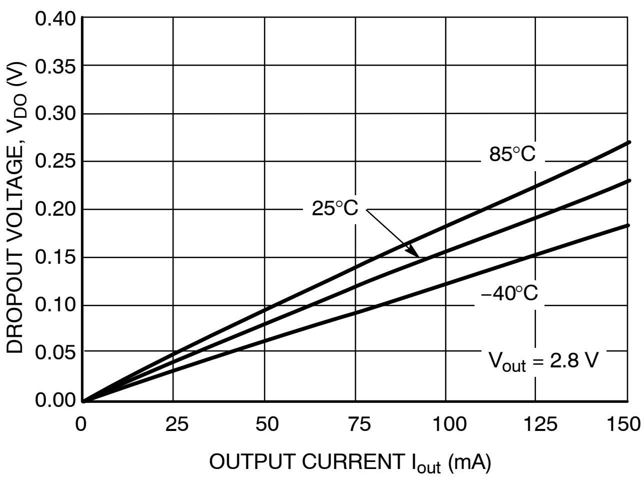


Figure 15. Dropout Voltage vs. Output Current

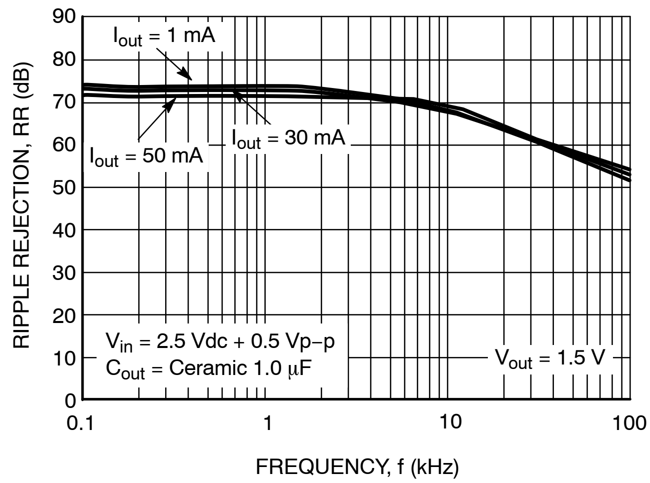


Figure 16. Ripple Rejection vs. Frequency

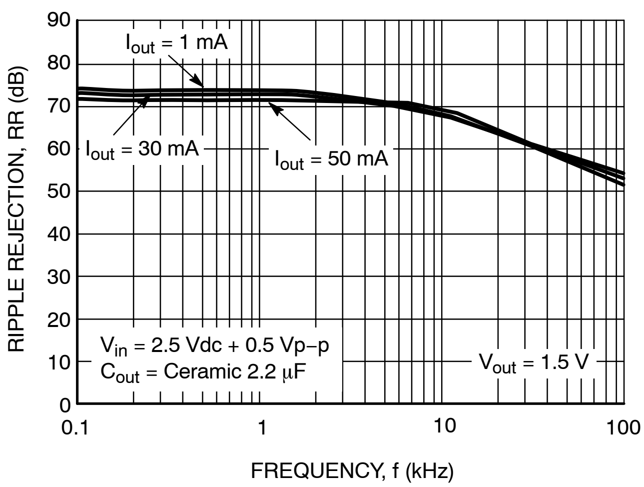


Figure 17. Ripple Rejection vs. Frequency

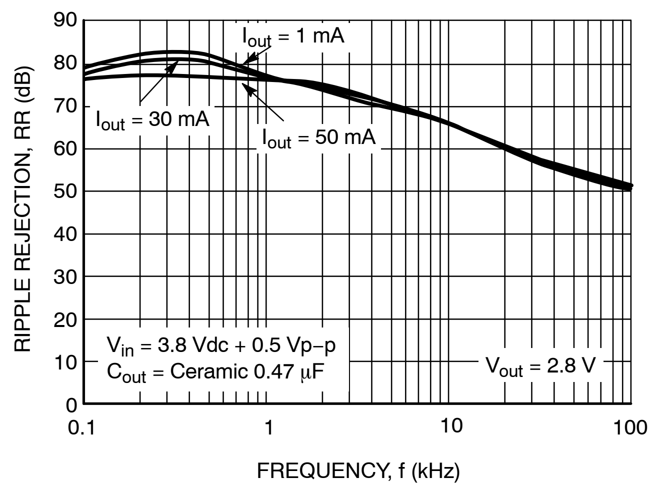


Figure 18. Ripple Rejection vs. Frequency

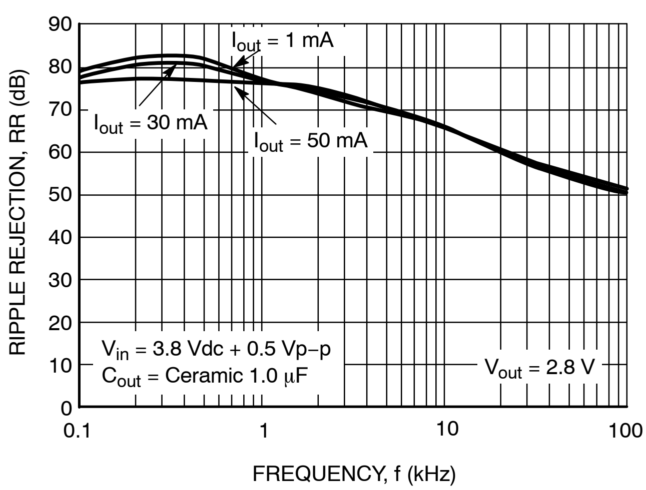
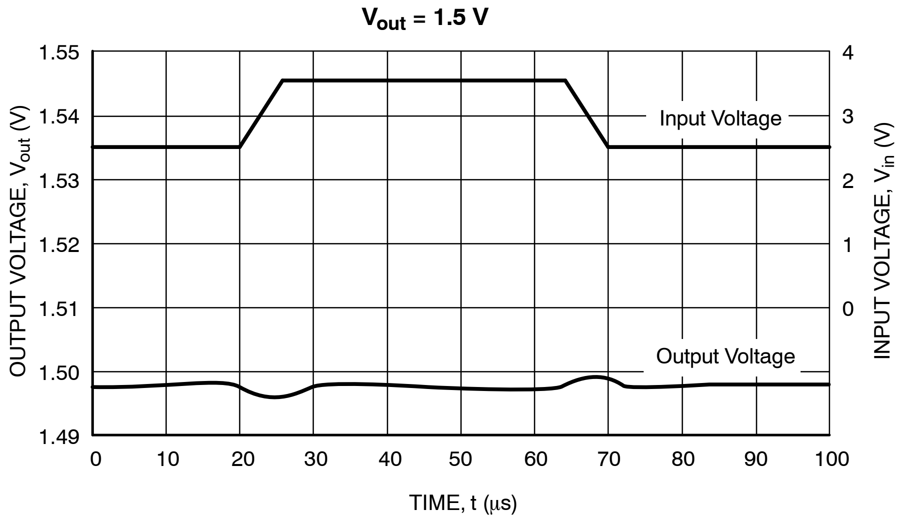


Figure 19. Ripple Rejection vs. Frequency

TYPICAL CHARACTERISTICS



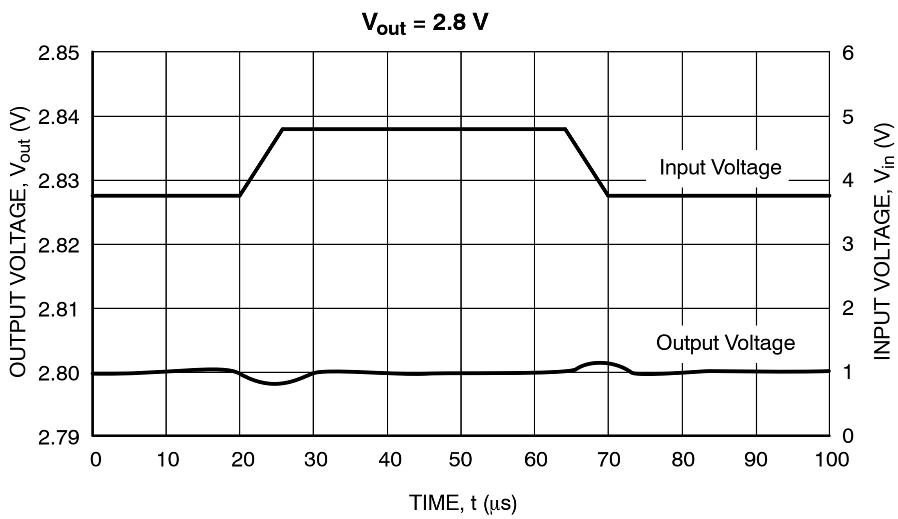
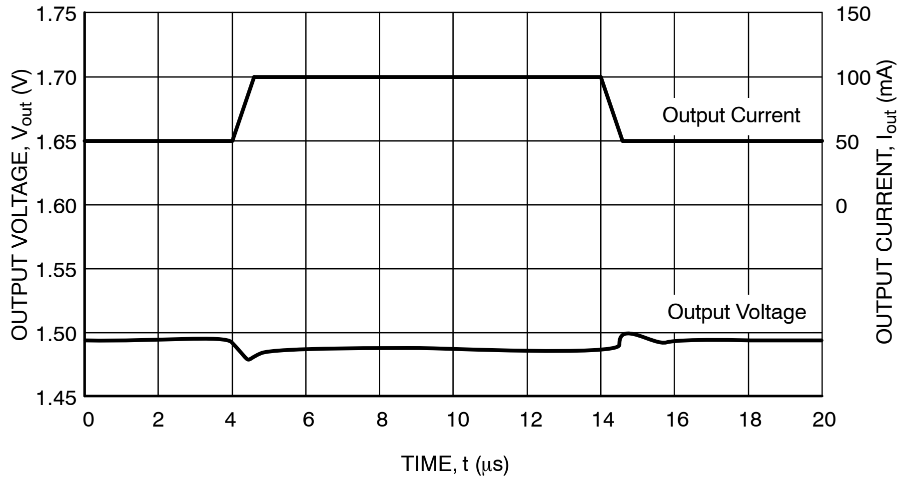


Figure 20. Input Transient Response
(I_{out} = 30 mA, C_{in} = 0, tr = tf = 5.0 μs, C_{out} = 0.47 μF)

TYPICAL CHARACTERISTICS

(V_{in} = 2.5 V, C_{out} = 1.0 μF, V_{out} = 1.5 V)



(V_{in} = 2.5 V, C_{out} = 2.2 μF, V_{out} = 1.5 V)

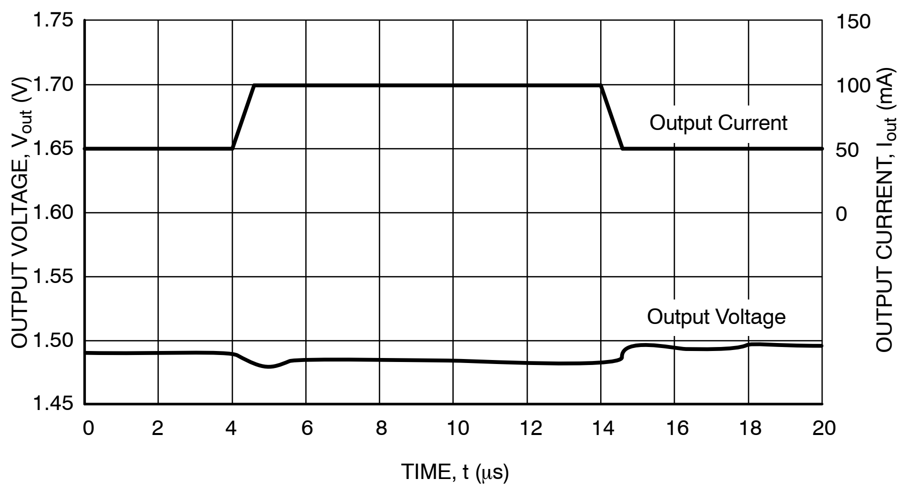
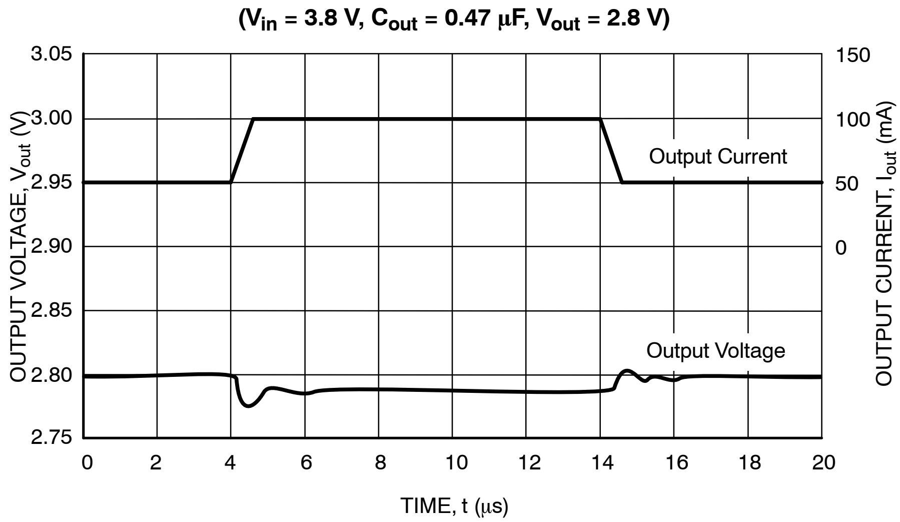
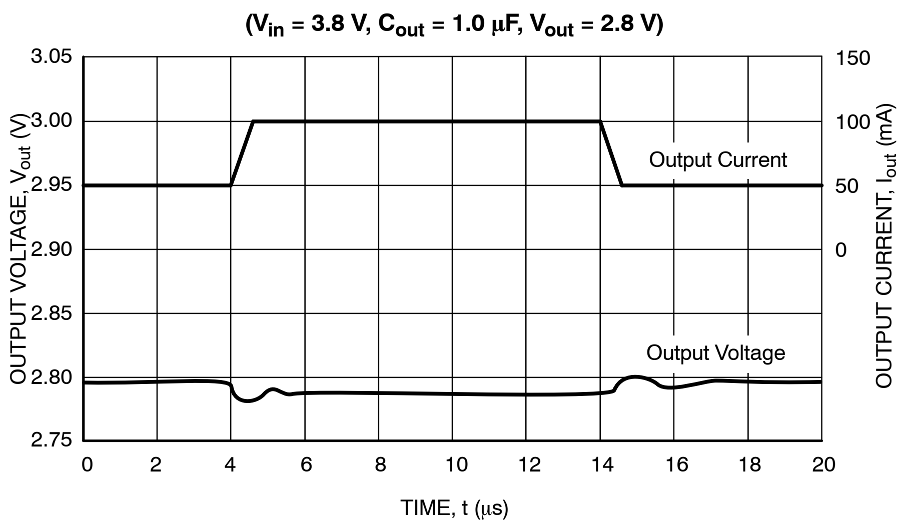


Figure 21. Load Transient Response
(tr = tf = 0.5 μs, C_{in} = 1.0 μF)

TYPICAL CHARACTERISTICS





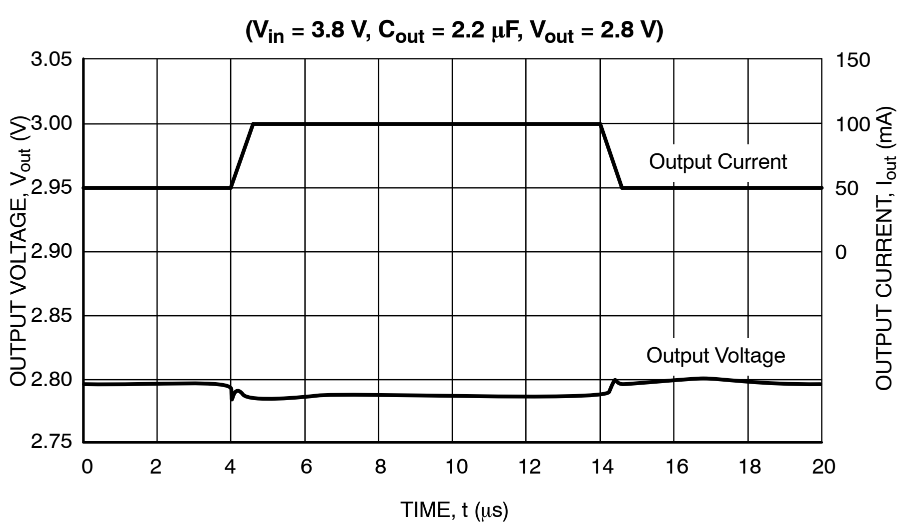


Figure 22. Load Transient Response
(tr = tf = 0.5 μs, C_{in} = 1.0 μF)

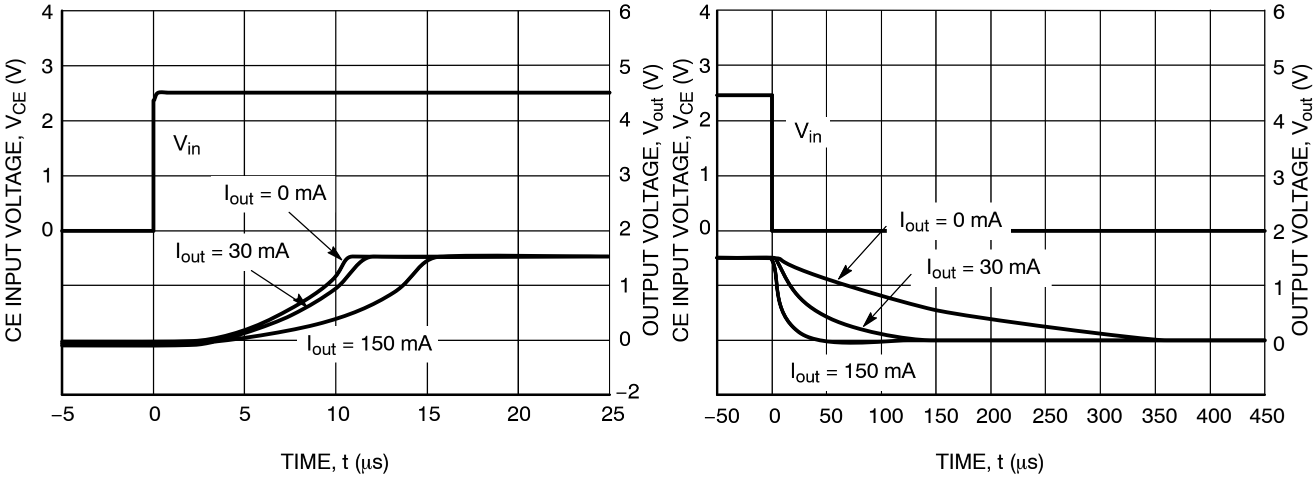


Figure 23. Turn−On/Off Speed with CE Pin (D Version)
(V_{out} = 1.5 V, V_{in} = 2.5 V, C_{in} = 1.0 μF, C_{out} = 1.0 μF)

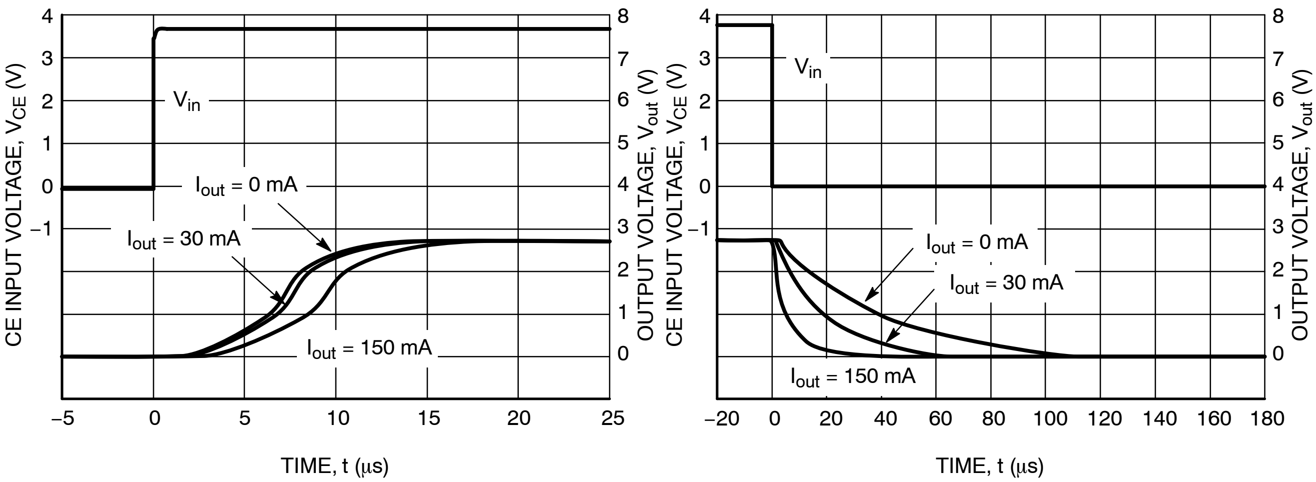


Figure 24. Turn−On/Off Speed with CE Pin (D Version)
(V_{out} = 2.8 V, V_{in} = 3.8 V, C_{in} = 0.47 μF, C_{out} = 0.47 μF)

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 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 1.0 μF capacitor value when V_{out} < 2.5 V and a 0.47 μF when $V_{out} \geq 2.5$ V. 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 as short as possible.

Noise Decoupling

The NCP582 series are low noise regulators and reach a noise level of only 30 μVrms between 10 Hz and 100 kHz.

ORDERING INFORMATION

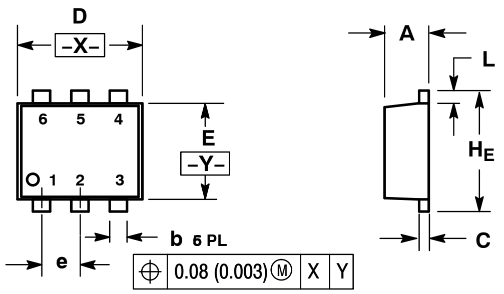
Device	Output Type / Features	Nominal Output Voltage	Marking	Package	Shipping†
NCP582DSQ15T1G	Active High w/Auto Discharge	1.5	SF	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582DSQ18T1G	Active High w/Auto Discharge	1.8	SJ	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582DSQ25T1G	Active High w/Auto Discharge	2.5	TF	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582DSQ28T1G	Active High w/Auto Discharge	2.8	TJ	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582DSQ30T1G	Active High w/Auto Discharge	3.0	UA	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582DSQ33T1G	Active High w/Auto Discharge	3.3	UD	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582LSQ15T1G	Active Low	1.5	JF	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582LSQ18T1G	Active Low	1.8	JJ	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582LSQ25T1G	Active Low	2.5	KF	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582LSQ28T1G	Active Low	2.8	KJ	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582LSQ30T1G	Active Low	3.0	LA	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582LSQ33T1G	Active Low	3.3	LD	SC−82AB (Pb−Free)	3000 Tape & Reel
NCP582DXV15T2G	Active High w/Auto Discharge	1.5	F15D	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582DXV18T2G	Active High w/Auto Discharge	1.8	F18D	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582DXV25T2G	Active High w/Auto Discharge	2.5	F25D	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582DXV28T2G	Active High w/Auto Discharge	2.8	F28D	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582DXV29T2G	Active High w/Auto Discharge	2.9	F29D	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582DXV30T2G	Active High w/Auto Discharge	3.0	F30D	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582DXV33T2G	Active High w/Auto Discharge	3.3	F33D	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582LXV15T2G	Active Low	1.5	F15A	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582LXV18T2G	Active Low	1.8	F18A	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582LXV25T2G	Active Low	2.5	F25A	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582LXV28T2G	Active Low	2.8	F28A	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582LXV29T2G	Active Low	2.9	F29A	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582LXV30T2G	Active Low	3.0	F30A	SOT−563 (Pb−Free)	4000 Tape & Reel
NCP582LXV33T2G	Active Low	3.3	F33A	SOT−563 (Pb−Free)	4000 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

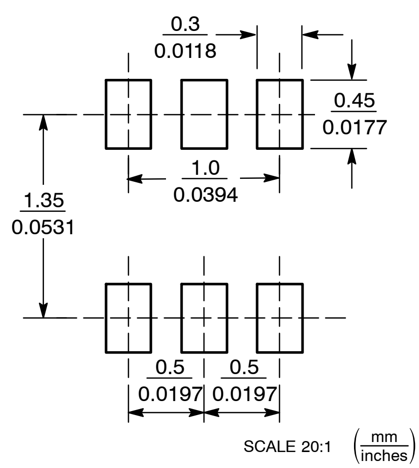
SOT−563
XV SUFFIX
CASE 463A−01
ISSUE F



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.50	0.55	0.60	0.020	0.021	0.023
b	0.17	0.22	0.27	0.007	0.009	0.011
C	0.08	0.12	0.18	0.003	0.005	0.007
D	1.50	1.60	1.70	0.059	0.062	0.066
E	1.10	1.20	1.30	0.043	0.047	0.051
e		0.5 BSC			0.02 BSC	
L	0.10	0.20	0.30	0.004	0.008	0.012
H_E	1.50	1.60	1.70	0.059	0.062	0.066

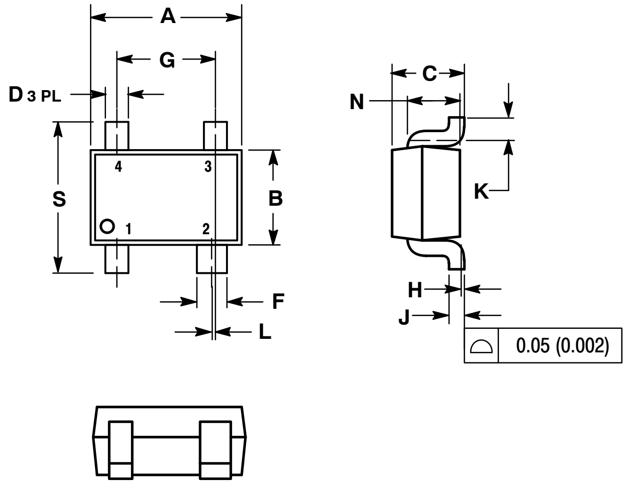
SOLDERING FOOTPRINT*



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

PACKAGE DIMENSIONS

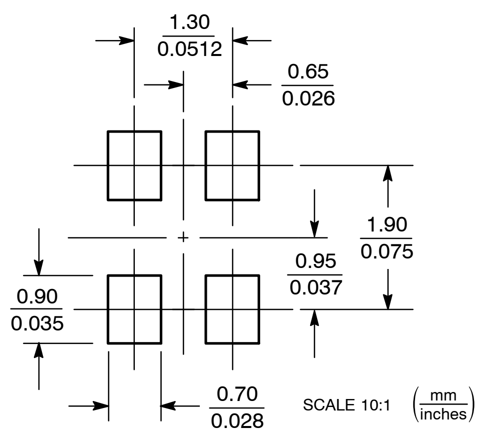
SC−82AB
SQ SUFFIX
CASE 419C−02
ISSUE E



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.

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