NCP3335

High Accuracy Ultra-low Iq, 500 mA Low Dropout Regulator

The NCP3335 is a high performance low dropout regulator that entails all the required features for consumer electronics and encompasses a unique design technology that allows for a high accuracy of ±0.9% over line and load regulation. This device operates using a minimum output capacitance and is guaranteed to be stable using any type of capacitor.

With output voltage options at 2.5 V, 2.85 V, and 3.3 V, delivering 500 mA of current, this device is offered in a Micro8 package. It contains thermal protection, current limitation and is lead free.

Features

- High Accuracy Over Line and Load (±0.9% at 25°C)
- Ultra Low Dropout Voltage
- Low Noise
- Low Shutdown Current
- Low Dropout Voltage
- 2.6 V to 12 V Supply Range
- Thermal Shutdown Protection
- Current Limitation
- Minimum Output Capacitance of 1.0 μF Required for Stability
- Stable with Any Type of Capacitor (including MLCC)
- No Minimum Output Current Required for Stability
- Available in 2.5 V, 2.85 V, and 3.3 V Output Voltages (Please contact factory for other voltage options)
- These are Pb−Free Devices

Applications

- PCMCIA Card
- Cellular Phones
- Camcoders and Cameras
- Networking Systems, DSL/Cable Modems
- Cable Set−Top Box
- MP3/CD Players
- DSP Supply

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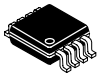
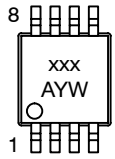
http://onsemi.com



Micro8™
DMR2 SUFFIX
CASE 846A

MARKING DIAGRAM



Pin 1,2. V_{out}
3. Sense Pin
4. GND
5. NR
6. $\overline{SD}$ (Shutdown Pin)
7,8. V_{in}

xxx	= LHX for 2.5 V
	= LHY for 2.85 V
	= LHZ for 3.3 V
A	= Assembly Location
Y	= Year
W	= Work Week

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

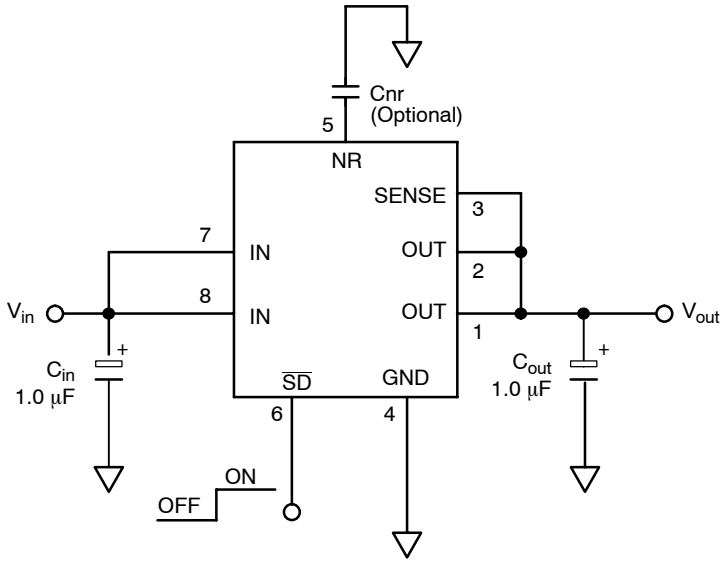


Figure 1. Typical Application Schematic

PIN FUNCTION DESCRIPTION

Pin No.	Pin Name	Description
1, 2	V_{out}	Regulated output voltage. Bypass to ground with $C_{out} \geq 1.0$ μF.
3	SENSE	For output voltage sensing, connect to Pins 1 and 2.
4	GND	Power Supply Ground
5	NR	Noise Reduction Pin. This is an optional pin used to further reduce noise.
6	$\overline{SD}$	Shutdown pin. When not in use, this pin should be connected to the input pin.
7, 8	V_{in}	Power Supply Input Voltage

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input Voltage	V_{in}	−0.3 to +16	V
Output Voltage	V_{out}	−0.3 to V_{in} +0.3	V
Shutdown Pin Voltage	V_{sh}	−0.3 to +16	V
Thermal Characteristics Thermal Resistance, Junction−to−Air	$R_{\theta JA}$	238	°C/W
Operating Junction Temperature Range	T_J	−40 to +150	°C
Storage Temperature Range	T_{stg}	−50 to+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.

NOTE: This device series contains ESD protection and exceeds the following tests:
Human Body Model (HBM) JESD 22−A114−B
Machine Model (MM) JESD 22−A115−A

ELECTRICAL CHARACTERISTICS – 2.5 V (V_{out} = 2.5 V typical, V_{in} = 2.9 V, T_A = −40°C to +85°C, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (Accuracy) V_{in} = 2.9 V to 6.5 V, I_{load} = 0.1 mA to 500 mA, T_J = 25°C	V_{out}	−0.9% 2.477	2.5	+0.9% 2.523	V
Output Voltage (Accuracy) V_{in} = 2.9 V to 6.5 V, I_{load} = 0.1 mA to 500 mA, T_J = 0°C to +85°C	V_{out}	−1.4% 2.465	2.5	+1.4% 2.535	V
Output Voltage (Accuracy), (Note 1) V_{in} = 2.9 V to 6.5 V, I_{load} = 0.1 mA to 500 mA, T_J = −40°C to +150°C	V_{out}	−1.5% 2.462	2.5	+1.5% 2.538	V
Line Regulation V_{in} = 2.9 V to 6.5 V, I_{load} = 0.1 mA	$Line_{Reg}$		0.04		mV/V
Load Regulation V_{in} = 2.9 V, I_{load} = 0.1 mA to 500 mA	$Load_{Reg}$		0.04		mV/mA
Dropout voltage I_{load} = 500 mA (Note 2) I_{load} = 300 mA (Note 2) I_{load} = 50 mA I_{load} = 0.1mA	V_{DO}			 340 230 110 10	mV
Peak Output Current	I_{pk}	500	700		mA
Thermal Shutdown	T_J		160		°C
Ground Current In Regulation I_{load} = 500 mA (Note 2) I_{load} = 300 mA (Note 2) I_{load} = 50 mA I_{load} = 0.1 mA In Dropout V_{in} = 2.4 V, I_{load} = 0.1 mA In Shutdown S_D = 0 V	I_{GND} I_{GNDsh}		 9.0 4.6 0.8 – 0.07	 14 7.5 2.5 190 500 1.0	 mA μA μA μA
Output Noise C_{nr} = 0 nF, I_{load} = 500 mA, f = 10 Hz to 100 kHz, C_{out} = 10 μF C_{nr} = 10 nF, I_{load} = 500 mA, f = 10 Hz to 100 kHz, C_{out} = 10 μF	V_{noise}		 56 35		 μVrms μVrms
Shutdown Threshold Voltage ON Threshold Voltage OFF		 2.0		 0.4	 V V
$\overline{SD}$ Input Current, V_{SD} = 0 V to 0.4 V or V_{SD} = 2.0 V to V_{in}	I_{SD}		0.07	1.0	μA
Output Current In Shutdown Mode, V_{out} = 0 V	I_{OSD}		0.07	1.0	μA

1. For proper operation below T_J = 0°C, please refer to typical graphs.
2. T_A must be greater than 0°C.

ELECTRICAL CHARACTERISTICS – 2.85 V (V_{out} = 2.85 V typical, V_{in} = 3.25 V, T_A = −40°C to +85°C, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (Accuracy) V_{in} = 3.25 V to 6.85 V, I_{load} = 0.1 mA to 500 mA, T_J = 25°C	V_{out}	−0.9% 2.824	2.85	+0.9% 2.876	V
Output Voltage (Accuracy) V_{in} = 3.25 V to 6.85 V, I_{load} = 0.1 mA to 500 mA, T_J = 0°C to +85°C	V_{out}	−1.4% 2.810	2.85	+1.4% 2.890	V
Output Voltage (Accuracy) (Note 3) V_{in} = 3.25 V to 6.85 V, I_{load} = 0.1 mA to 500 mA, T_J = −40°C to +150°C	V_{out}	−1.5% 2.807	2.85	+1.5% 2.893	V
Line Regulation V_{in} = 3.25 V to 6.85 V, I_{load} = 0.1 mA	$Line_{Reg}$		0.04		mV/V
Load Regulation V_{in} = 3.25 V, I_{load} = 0.1 mA to 500 mA	$Load_{Reg}$		0.04		mV/mA
Dropout voltage I_{load} = 500 mA I_{load} = 300 mA I_{load} = 50 mA I_{load} = 0.1mA	V_{DO}			 340 230 110 10	mV
Peak Output Current	I_{pk}	500	700		mA
Thermal Shutdown	T_J		160		°C
Ground Current In Regulation I_{load} = 500 mA (Note 4) I_{load} = 300 mA I_{load} = 50 mA I_{load} = 0.1 mA In Dropout V_{in} = 2.75 V, I_{load} = 0.1 mA In Shutdown SD = 0 V	I_{GND} I_{GNDsh}		 9.0 4.6 0.8 – – 0.07	 14 7.5 2.5 190 500 1.0	 mA μA μA μA
Output Noise C_{nr} = 0 nF, I_{load} = 500 mA, f = 10 Hz to 100 kHz, C_{out} = 10 μF C_{nr} = 10 nF, I_{load} = 500 mA, f = 10 Hz to 100 kHz, C_{out} = 10 μF	V_{noise}		 61 40		 μVrms μVrms
Shutdown Threshold Voltage ON Threshold Voltage OFF		 2.0		 0.4	 V V
S_D Input Current, V_{SD} = 0 V to 0.4 V or V_{SD} = 2.0 V to V_{in}	I_{SD}		0.07	1.0	μA
Output Current In Shutdown Mode, V_{out} = 0 V	I_{OSD}		0.07	1.0	μA

3. For proper operation below T_J = 0°C, please refer to typical graphs.
4. T_A must be greater than 0°C.

ELECTRICAL CHARACTERISTICS – 3.3 V (V_{out} = 3.3 V typical, V_{in} = 3.7 V, T_A = −40°C to +85°C, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (Accuracy) V_{in} = 3.7 V to 7.3 V, I_{load} = 0.1 mA to 500 mA, T_J = 25°C	V_{out}	−0.9% 3.270	3.3	+0.9% 3.330	V
Output Voltage (Accuracy) V_{in} = 3.7 V to 7.3 V, I_{load} = 0.1 mA to 500 mA, T_J = 0°C to +85°C	V_{out}	−1.4% 3.254	3.3	+1.4% 3.346	V
Output Voltage (Accuracy) V_{in} = 3.7 V to 7.3 V, I_{load} = 0.1 mA to 500 mA, T_J = −40°C to +150°C	V_{out}	−1.5% 3.250	3.3	+1.5% 3.350	V
Line Regulation V_{in} = 3.7 V to 7.3 V, I_{load} = 0.1 mA	$Line_{Reg}$		0.04		mV/V
Load Regulation V_{in} = 3.7 V, I_{load} = 0.1 mA to 500 mA	$Load_{Reg}$		0.04		mV/mA
Dropout Voltage I_{load} = 500 mA I_{load} = 300 mA I_{load} = 50 mA I_{load} = 0.1 mA	V_{DO}			 340 230 110 10	mV
Peak Output Current	Ipk	500	700		mA
Thermal Shutdown	T_J		160		°C
Ground Current In Regulation I_{load} = 500 mA (Note 5) I_{load} = 300 mA I_{load} = 50 mA I_{load} = 0.1 mA In Dropout V_{in} = 3.2 V, I_{load} = 0.1 mA In Shutdown S_D = 0 V	I_{GND} I_{GNDsh}		 9.0 4.6 0.8 – – 0.07	 14 7.5 2.5 190 500 1.0	 mA μA μA μA
Output Noise C_{nr} = 0 nF, I_{load} = 500 mA, f = 10 Hz to 100 kHz, C_{out} = 10 μF C_{nr} = 10 nF, I_{load} = 500 mA, f = 10 Hz to 100 kHz, C_{out} = 10 μF	V_{noise}		 69 46		 μVrms μVrms
Shutdown Threshold Voltage ON Threshold Voltage OFF		2.0		 0.4	 V V
S_D Input Current, V_{SD} = 0 V to 0.4 V or V_{SD} = 2.0 V to V_{in}	I_{SD}		0.07	1.0	μA
Output Current In Shutdown Mode, V_{out} = 0 V	I_{OSD}		0.07	1.0	μA

5. T_A must be greater than 0°C.

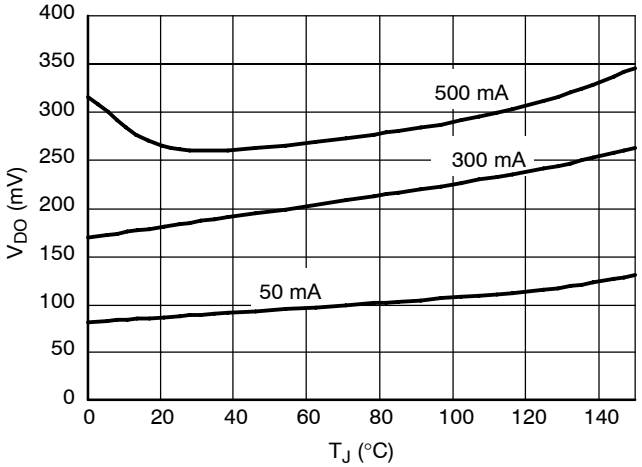


Figure 2. Dropout Voltage vs. Temperature

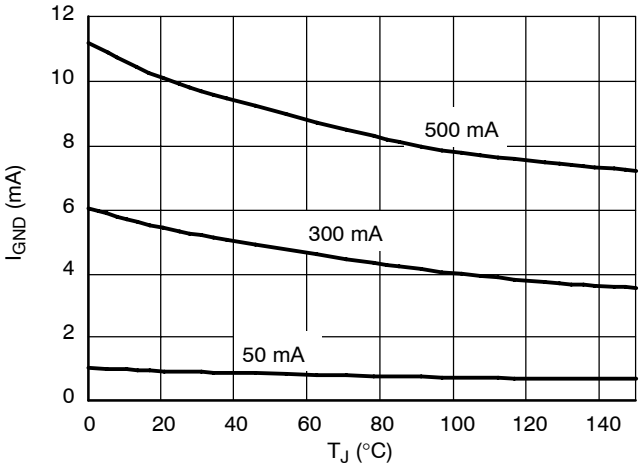


Figure 3. Ground Current vs. Temperature

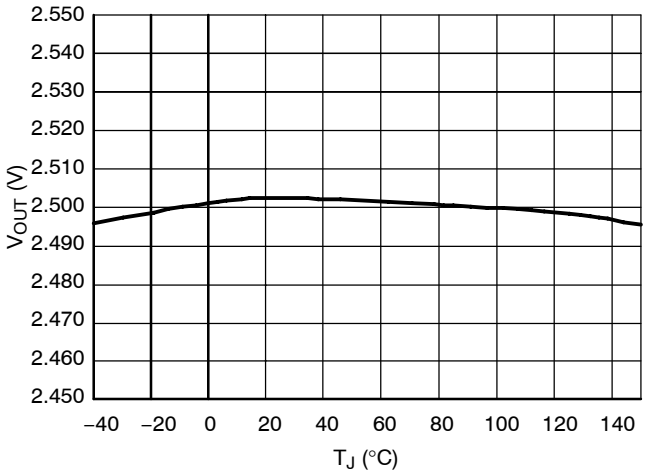


Figure 4. Output Voltage vs. Temperature

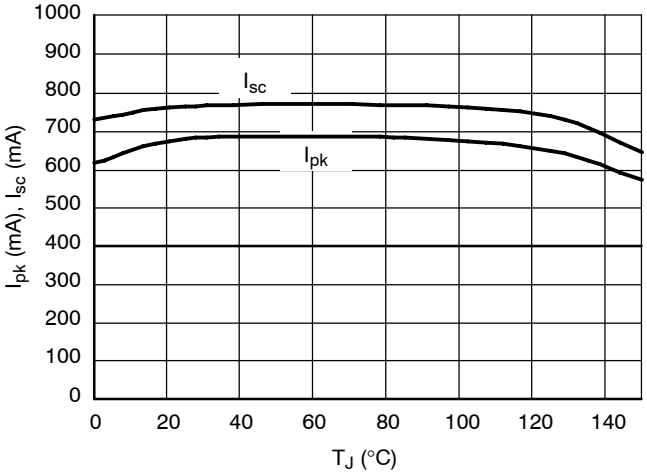


Figure 5. Peak and Short Current vs. Temperature

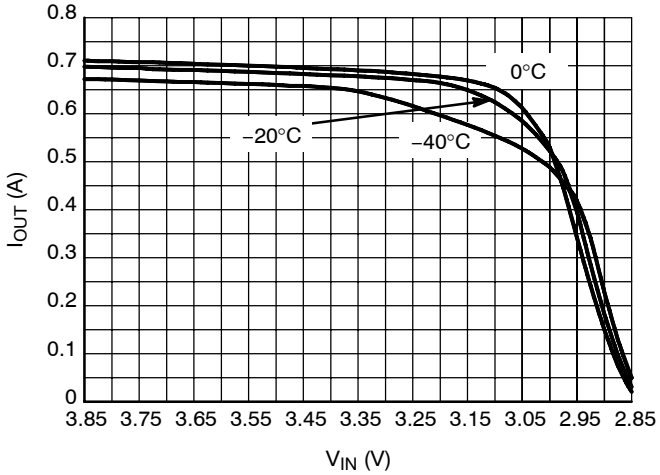


Figure 6. Output Current Capability for the 2.85 V Version

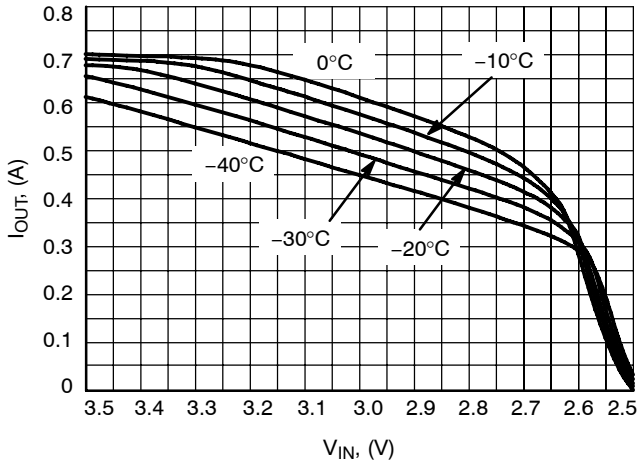


Figure 7. Output Current Capability for the 2.5 V Version

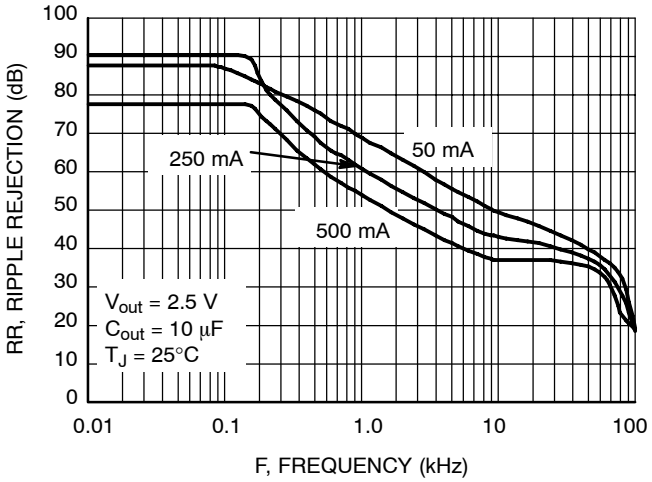


Figure 8. Ripple Rejection vs. Frequency

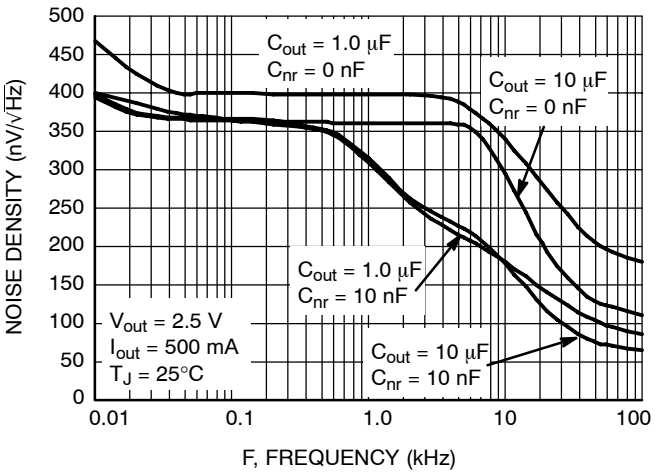


Figure 9. Output Noise Density

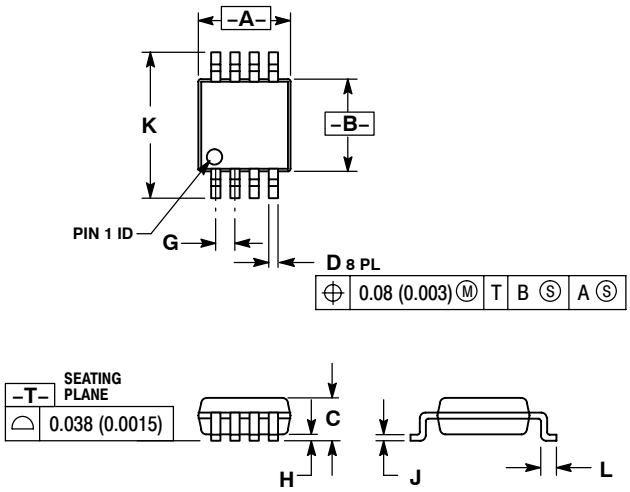
ORDERING INFORMATION

Device	Nominal Output Voltage	Package	Shipping†
NCP3335DMR2250G	2.5 V	Micro8 (Pb−Free)	4000 / Tape & Reel
NCP3335DMR2285G	2.85 V	Micro8 (Pb−Free)	4000 / Tape & Reel
NCP3335DMR2330G	3.3 V	Micro8 (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 Specifications Brochure, BRD8011/D.
*Please contact factory for other voltage options.

PACKAGE DIMENSIONS

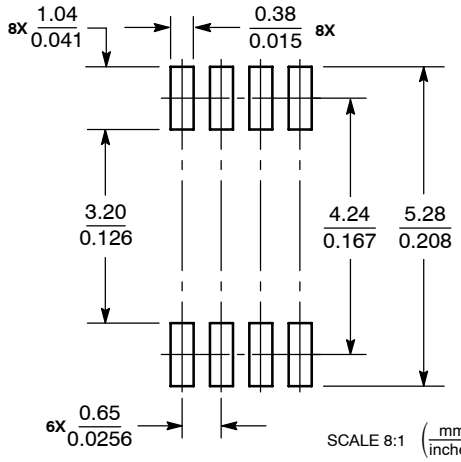
Micro8
CASE 846A–02
ISSUE F



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. 846A–01 OBSOLETE, NEW STANDARD 846A–02.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	---	1.10	---	0.043
D	0.25	0.40	0.010	0.016
G	0.65 BSC		0.026 BSC	
H	0.05	0.15	0.002	0.006
J	0.13	0.23	0.005	0.009
K	4.75	5.05	0.187	0.199
L	0.40	0.70	0.016	0.028

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.

The products described herein NCP3335, may be covered by one or more of the following U.S. patents; 5,920,184, 5,966,004, and 5,834,926. There may be other patents pending.
Micro8 is a trademark of International Rectifier.

PUBLICATION ORDERING INFORMATION

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Phone: 81–3–5773–3850

ON Semiconductor Website: http://onsemi.com

Order Literature: http://www.onsemi.com/litorder

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