

General Purpose Transistor Medium Power, NPN 80 V, 1 A

BCP56M

The BCP56MTW is designed for general purpose amplifier applications. It is housed in DFN2020–3 offering superior thermal performance. The transistor is ideal for medium–power surface mount applications where board space and reliability are at a premium.

Specification Features

- Wettable Flank Package for Optimal Automated Optical Inspection (AOI)
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q101 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS (T_A = 25°C)

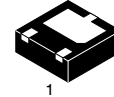
Rating	Symbol	Max	Unit
Collector–Emitter Voltage	V _{CEO}	80	Vdc
Collector–Base Voltage	V _{CB0}	100	Vdc
Emitter–Base Voltage	V _{EBO}	6.0	Vdc
Collector Current – Continuous (Note 1)	I _C	1.0	A
Collector Current – Peak (Note 1)	I _{CM}	2.0	A

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

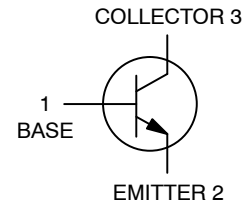
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Power Dissipation (Note 2) @ T _A = 25°C Derate above 25°C	P _D	1.5	W
Thermal Resistance, Junction–to–Ambient (Note 2)	R _{θJA}	78	°C/W
Total Power Dissipation (Note 3) @ T _A = 25°C Derate above 25°C	P _D	875	mW
Thermal Resistance, Junction–to–Ambient (Note 3)	R _{θJA}	138	°C/W
Junction and Storage Temperature Range	T _J , T _{stg}	–65 to +150	°C

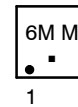
1. Reference SOA Curve
2. Surface–mounted on FR4 board using a 600 mm² pad area and 2 oz. Cu
3. Surface–mounted on FR4 board using a 100 mm² pad area and 2 oz. Cu



WDFNW3
CASE 515AA



MARKING DIAGRAM



6M = Specific Device Code
M = Date Code

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 2 of this data sheet.

BCP56M

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristics	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 1\text{ mA}$, $I_B = 0\text{ A}$)	$V_{(BR)CEO}$	80	-	-	V
Collector-Base Breakdown Voltage ($I_C = 100\ \mu\text{A}$, $I_E = 0\text{ A}$)	$V_{(BR)CBO}$	100	-	-	V
Emitter-Base Breakdown Voltage ($I_E = 10\ \mu\text{A}$, $I_C = 0$)	$V_{(BR)EBO}$	5	-	-	V
Collector-Base Cutoff Current ($V_{CB} = 30\text{ V}$, $I_E = 0$)	I_{CBO}	-	-	100	nA
Emitter-Base Cutoff Current ($V_{EB} = 5\text{ V}$, $I_C = 0$)	I_{EBO}	-	-	100	nA

ON CHARACTERISTICS (Note 4)

DC Current Gain ($I_C = 5\text{ mA}$, $V_{CE} = 2.0\text{ V}$) ($I_C = 150\text{ mA}$, $V_{CE} = 2.0\text{ V}$) ($I_C = 500\text{ mA}$, $V_{CE} = 2.0\text{ V}$)	All Part Types BCP56M BCP5610M BCP5616M All Part Types	h_{FE}	63 63 63 100 40	- - - - -	- 250 160 250 -	
Collector-Emitter Saturation Voltage ($I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$)		$V_{CE(sat)}$	-	-	0.50	V
Base-Emitter Saturation Voltage ($I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$)		$V_{BE(sat)}$	-	-	2.0	V
Base-Emitter Turn-on Voltage ($I_C = 500\text{ mA}$, $V_{CE} = 2.0\text{ V}$)		$V_{BE(on)}$	-	-	1.0	V

SMALL SIGNAL CHARACTERISTICS

Transition Frequency ($I_C = 10\text{ mA}$, $V_{CE} = 5.0\text{ V}$, $f = 100\text{ MHz}$)		f_T	-	140	-	MHz
Output Capacitance ($V_{CB} = 10\text{ V}$, $f = 1.0\text{ MHz}$)		C_{obo}	-	65	-	pF
Input Capacitance ($V_{EB} = -0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)		C_{ibo}	-	130	-	pF
Input Impedance ($I_C = -1.0\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$, $f = 1.0\text{ kHz}$)		h_{ie}	-	4	-	k
Voltage Feedback Ratio ($I_C = -1.0\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$, $f = 1.0\text{ kHz}$)		h_{re}	-	0.4	-	$\times 10^{-4}$
Small-Signal Current Gain ($I_C = -1.0\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$, $f = 1.0\text{ kHz}$)		h_{fe}	-	135	-	-
Output Admittance ($I_C = -1.0\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$, $f = 1.0\text{ kHz}$)		H_{oe}	-	4	-	μmhos
Noise Figure ($I_C = 0.2\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$, $R_S = 2.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$, $BW = 200\text{ Hz}$)		NF	-	1	-	dB

SWITCHING CHARACTERISTICS

Delay Time ($V_{CC} = 30\text{ Vdc}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$)		t_d	-	20	-	ns
Rise Time ($V_{CC} = 30\text{ Vdc}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$)		t_r	-	20	-	ns
Storage Time ($V_{CC} = 30\text{ Vdc}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$, $I_{B2} = 15\text{ mA}$)		t_s	-	900	-	ns
Fall Time ($V_{CC} = 30\text{ Vdc}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$, $I_{B2} = 15\text{ mA}$)		t_f	-	110	-	ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Condition: Pulse Width = 300 μs , Duty Cycle $\leq 2\%$.

ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
BCP56MTWG	6M	WDFNW3 (Pb-Free)	3000 / Tape & Reel
BCP5610MTWG	6N		
BCP5616MTWG	6P		
NSVBCP56MTWG*	6M		
NSVBCP5610MTWG*	6N		
NSVBCP5616MTWG*	6P		

[†]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.

*NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

BCP56M

TYPICAL CHARACTERISTICS

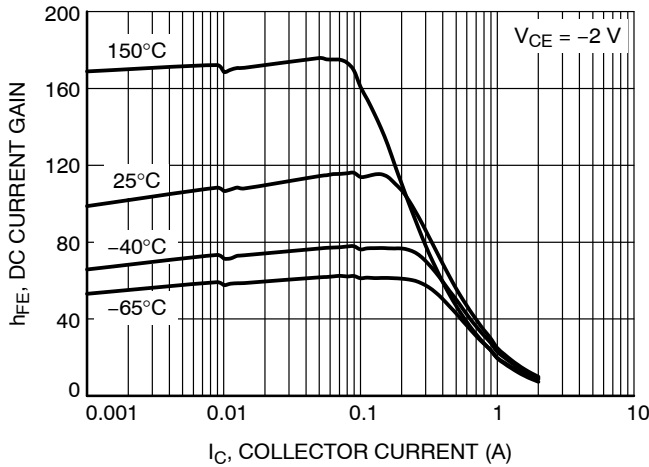


Figure 1. DC Current Gain

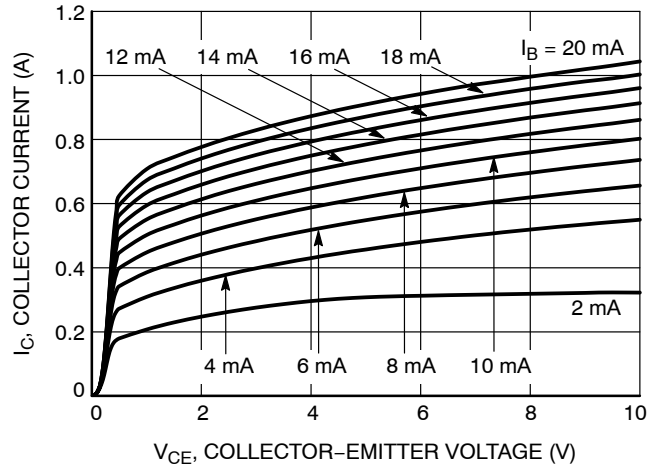


Figure 2. Collector Current vs. Collector Emitter Voltage

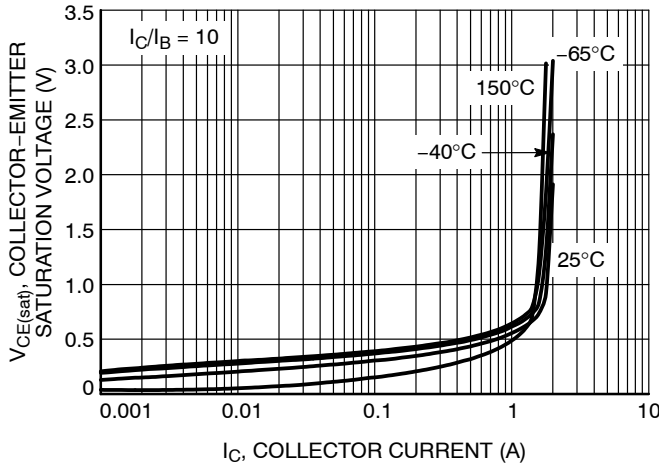


Figure 3. Collector Emitter Saturation Voltage vs. Collector Current

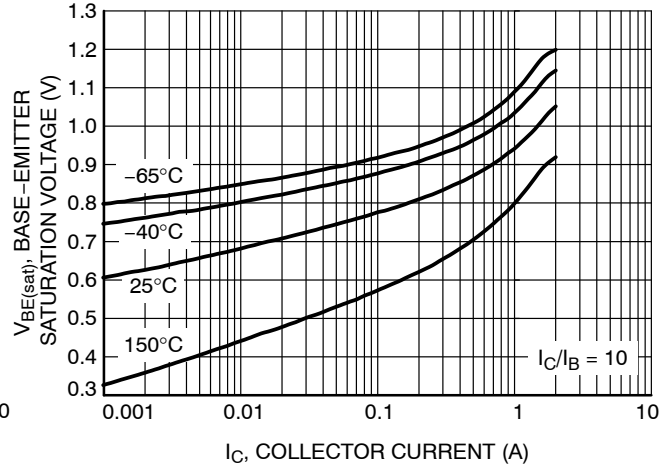


Figure 4. Base Emitter Saturation Voltage vs. Collector Current

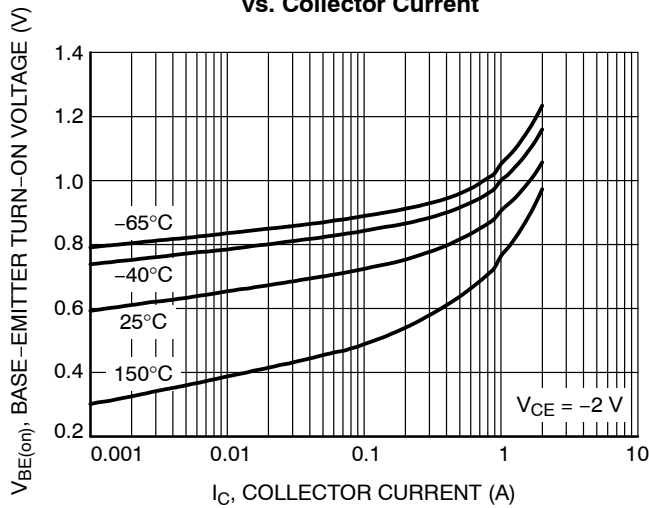


Figure 5. BCP53M, Base Emitter Turn-On Voltage vs. Collector Current $V_{BE(on)}$

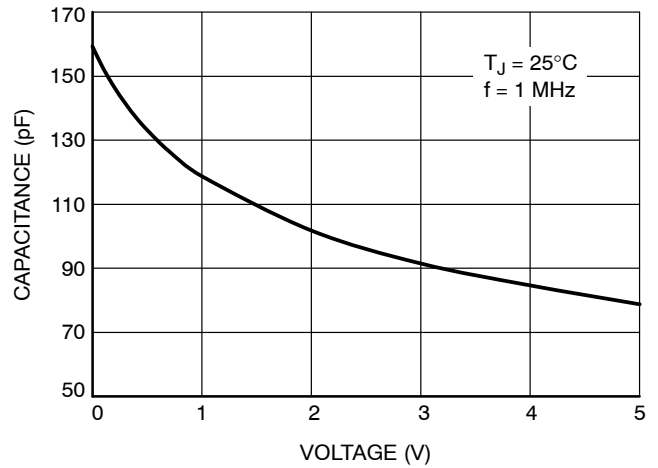


Figure 6. Input Capacitance

BCP56M

TYPICAL CHARACTERISTICS

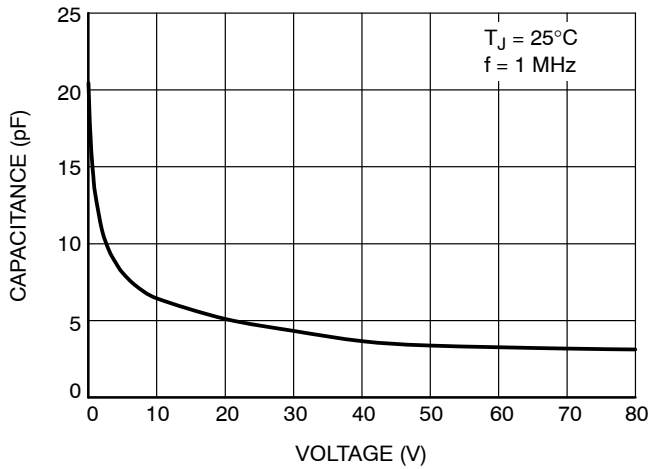


Figure 7. Output Capacitance

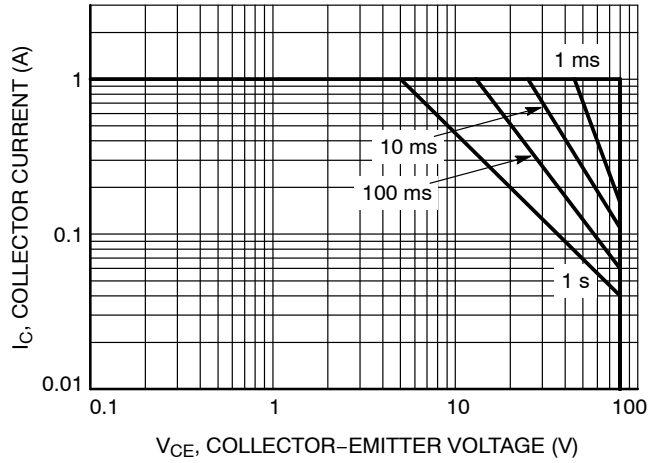


Figure 8. Safe Operating Area

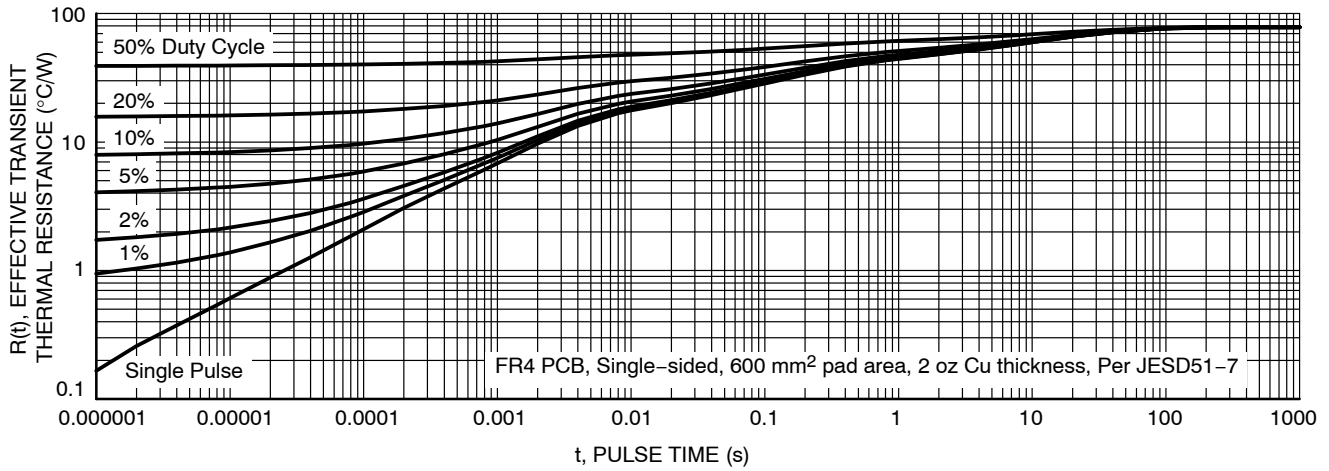


Figure 9. Transient Thermal Impedance from Junction-to-Ambient as a Function of Pulse Duration

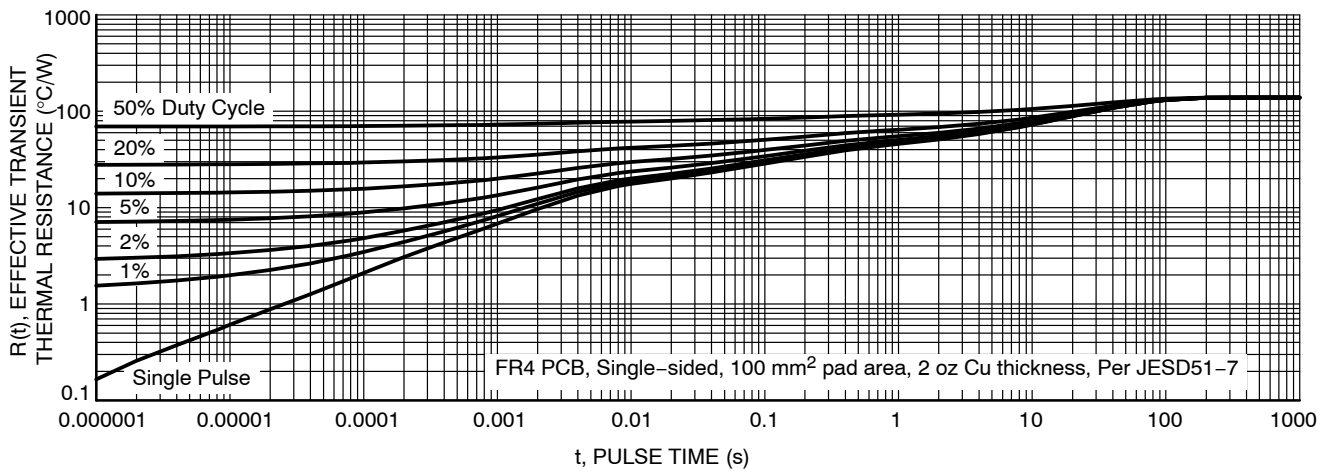


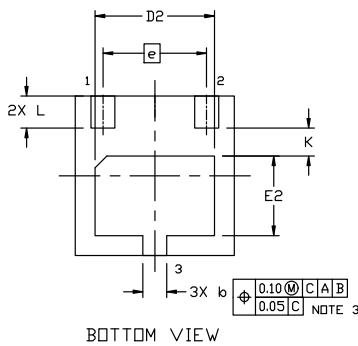
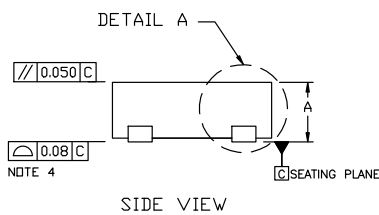
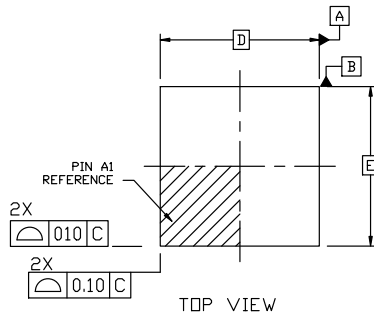
Figure 10. Transient Thermal Impedance from Junction-to-Ambient as a Function of Pulse Duration

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

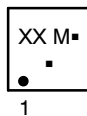


WDFNW3 2x2, 1.3P CASE 515AA ISSUE A

DATE 26 JUL 2022



GENERIC MARKING DIAGRAM*



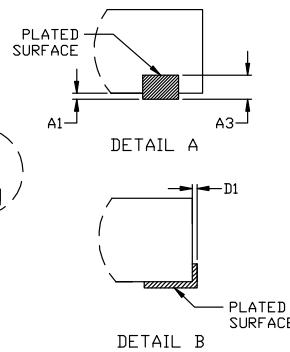
XX = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

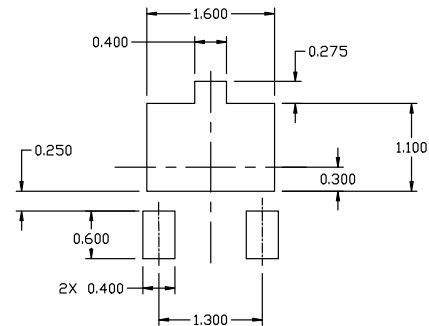
*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	---	0.05
A3	0.20 REF		
b	0.25	0.30	0.35
D	2.00 BSC		
D1	0.00	---	0.04
D2	1.40	1.50	1.60
E	2.00 BSC		
E2	0.90	1.00	1.10
e	1.30 BSC		
K	0.35 REF		
L	0.35	0.40	0.45



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

DOCUMENT NUMBER:	98AON33309H	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	WDFNW3 2x2, 1.3P	PAGE 1 OF 1

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales