

# NPN Transistor, 100 V, 3.0 A, Low $V_{CE(sat)}$

## NSS1C301ET4G

onsemi's e<sup>2</sup>PowerEdge family of low  $V_{CE(sat)}$  transistors are surface mount devices featuring ultra low saturation voltage ( $V_{CE(sat)}$ ) and high current gain capability. These are designed for use in low voltage, high speed switching applications where affordable efficient energy control is important.

Typical applications are DC-DC converters and power management in portable and battery powered products such as cellular and cordless phones, PDAs, computers, printers, digital cameras and MP3 players. Other applications are low voltage motor controls in mass storage products such as disc drives and tape drives. In the automotive industry they can be used in air bag deployment and in the instrument cluster. The high current gain allows e<sup>2</sup>PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

### Features

- Complement to NSS1C300ET4G
- 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 and are RoHS Compliant

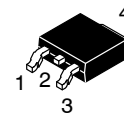
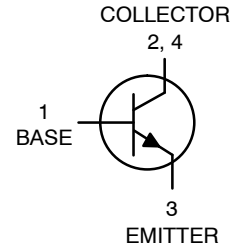
### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Rating	Symbol	Max	Unit
Collector-Base Voltage	$V_{CBO}$	140	Vdc
Collector-Emitter Voltage	$V_{CEO}$	100	Vdc
Emitter-Base Voltage	$V_{EB}$	6.0	Vdc
Collector Current - Continuous	$I_C$	3.0	Adc
Collector Current - Peak	$I_{CM}$	6.0	Adc
Base Current	$I_B$	0.5	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	33 0.26	W W/ $^\circ\text{C}$
Total Power Dissipation (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.1 0.017	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$

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.

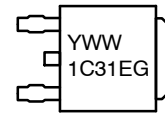
1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

## 100 VOLTS, 3.0 AMPS 12.5 WATTS NPN LOW $V_{CE(sat)}$ TRANSISTOR



DPAK  
CASE 369C  
STYLE 1

### MARKING DIAGRAM



Y = Year  
WW = Work Week  
1C31E = Device Code  
G = Pb-Free

### ORDERING INFORMATION

Device	Package	Shipping†
NSS1C301ET4G	DPAK (Pb-Free)	2500/ Tape & Reel
NSV1C301ET4G	DPAK (Pb-Free)	2500/ 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](#).

# NSS1C301ET4G

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.8	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	59.5	$^{\circ}C/W$

2. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

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

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

### OFF CHARACTERISTICS

Collector - Emitter Breakdown Voltage ( $I_C = 10 \text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	100	-	-	V
Collector - Base Breakdown Voltage ( $I_C = 0.1 \text{ mA}$ , $I_E = 0$ )	$V_{(BR)CBO}$	140	-	-	V
Emitter - Base Breakdown Voltage ( $I_E = 0.1 \text{ mA}$ , $I_C = 0$ )	$V_{(BR)EBO}$	6.0	-	-	V
Collector Cutoff Current ( $V_{CB} = 140 \text{ V}$ , $I_E = 0$ )	$I_{CBO}$	-	-	0.1	$\mu A$
Emitter Cutoff Current ( $V_{EB} = 6.0 \text{ V}$ )	$I_{EBO}$	-	-	0.1	$\mu A$

### ON CHARACTERISTICS

DC Current Gain (Note 3) ( $I_C = 0.1 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ ) ( $I_C = 0.5 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ ) ( $I_C = 1.0 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ ) ( $I_C = 3.0 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ )	$h_{FE}$	200 200 120 80	- - - -	- - 360 -	-
Collector - Emitter Saturation Voltage (Note 3) ( $I_C = 0.1 \text{ A}$ , $I_B = 10 \text{ mA}$ ) ( $I_C = 1.0 \text{ A}$ , $I_B = 0.100 \text{ A}$ ) ( $I_C = 2.0 \text{ A}$ , $I_B = 0.200 \text{ A}$ ) ( $I_C = 3.0 \text{ A}$ , $I_B = 0.300 \text{ A}$ )	$V_{CE(sat)}$	- - - -	0.015 0.045 0.080 0.115	0.050 0.090 0.150 0.250	V
Base - Emitter Saturation Voltage (Note 3) ( $I_C = 1.0 \text{ A}$ , $I_B = 0.1 \text{ A}$ )	$V_{BE(sat)}$	-	-	1.0	V
Base - Emitter Turn-on Voltage (Note 3) ( $I_C = 1.0 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ )	$V_{BE(on)}$	-	-	0.90	V
Cutoff Frequency ( $I_C = 500 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ , $f = 100 \text{ MHz}$ )	$f_T$	-	120	-	MHz
Input Capacitance ( $V_{EB} = 5.0 \text{ V}$ , $f = 1.0 \text{ MHz}$ )	$C_{ibo}$	-	360	-	pF
Output Capacitance ( $V_{CB} = 10 \text{ V}$ , $f = 1.0 \text{ MHz}$ )	$C_{obo}$	-	30	-	pF

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.

3. Pulsed Condition: Pulse Width = 300  $\mu s$ , Duty Cycle  $\leq 2\%$ .

# NSS1C301ET4G

## TYPICAL CHARACTERISTICS

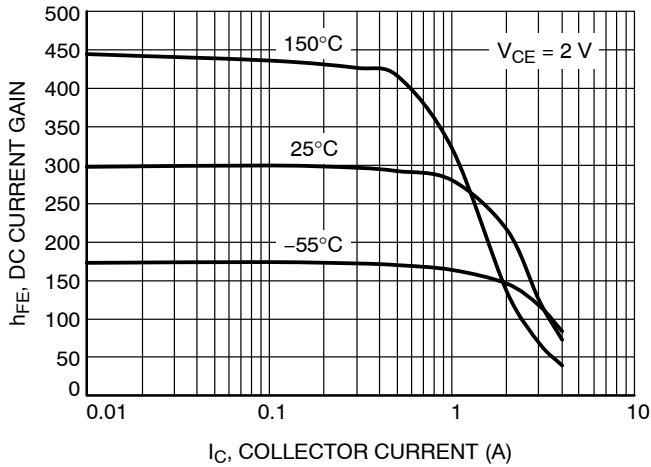


Figure 1. DC Current Gain

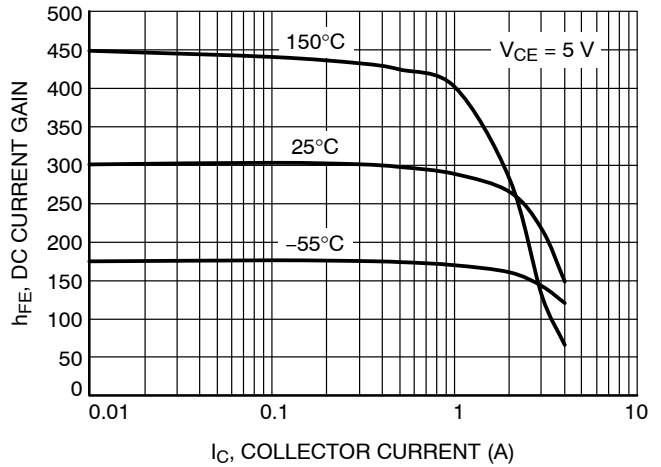


Figure 2. DC Current Gain

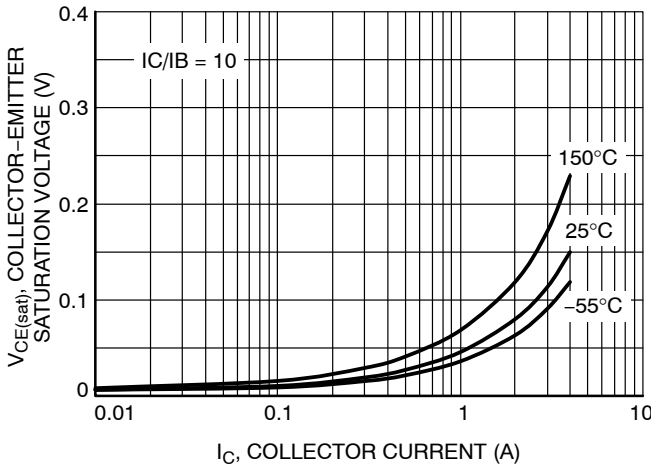


Figure 3. Collector-Emitter Saturation Voltage

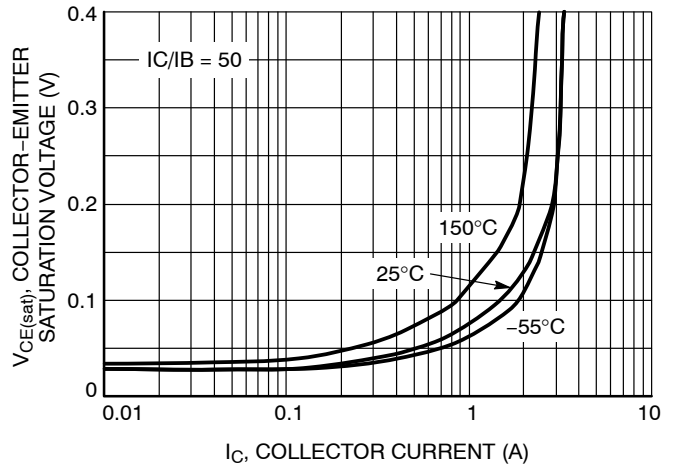


Figure 4. Collector-Emitter Saturation Voltage

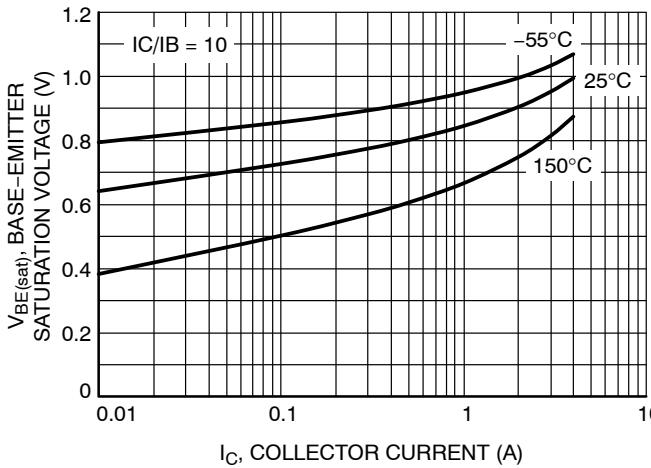


Figure 5. Base-Emitter Saturation Voltage

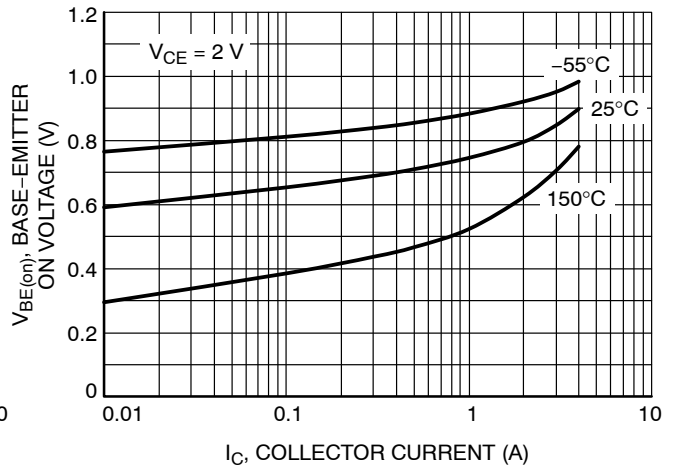


Figure 6. Base-Emitter "On" Voltage

# NSS1C301ET4G

## TYPICAL CHARACTERISTICS

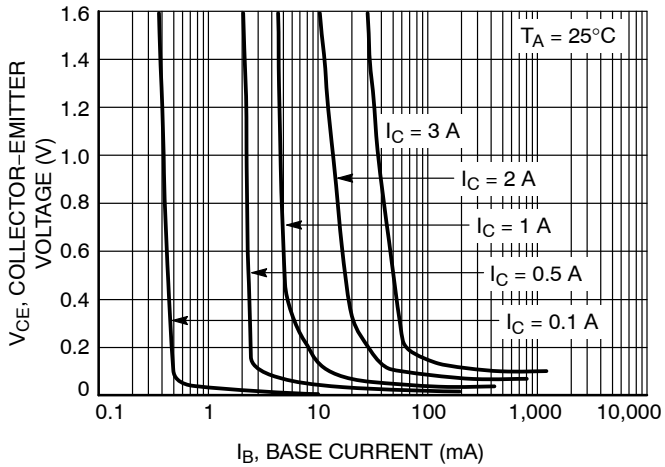


Figure 7. Collector Saturation Region

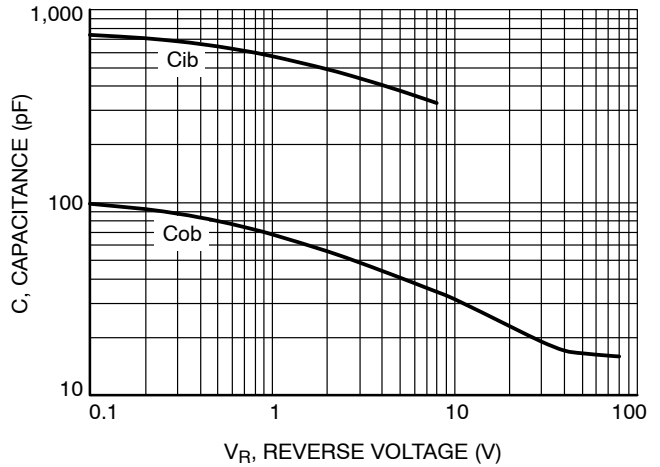


Figure 8. Capacitance

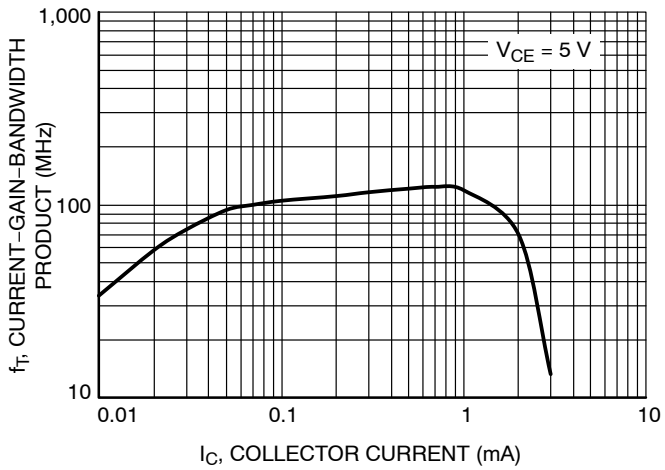


Figure 9. Current-Gain-Bandwidth Product

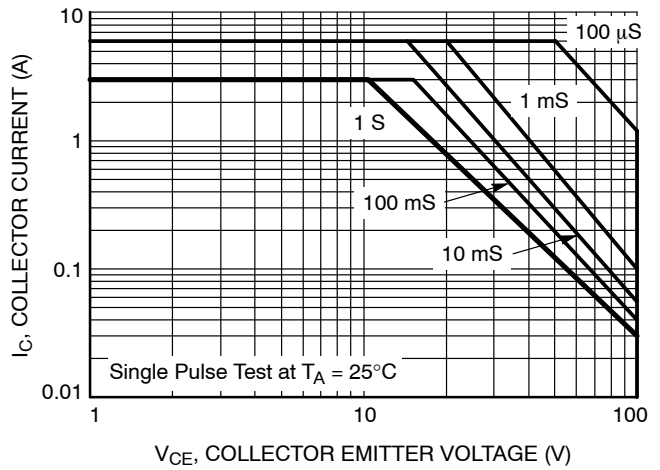


Figure 10. Safe Operating Area

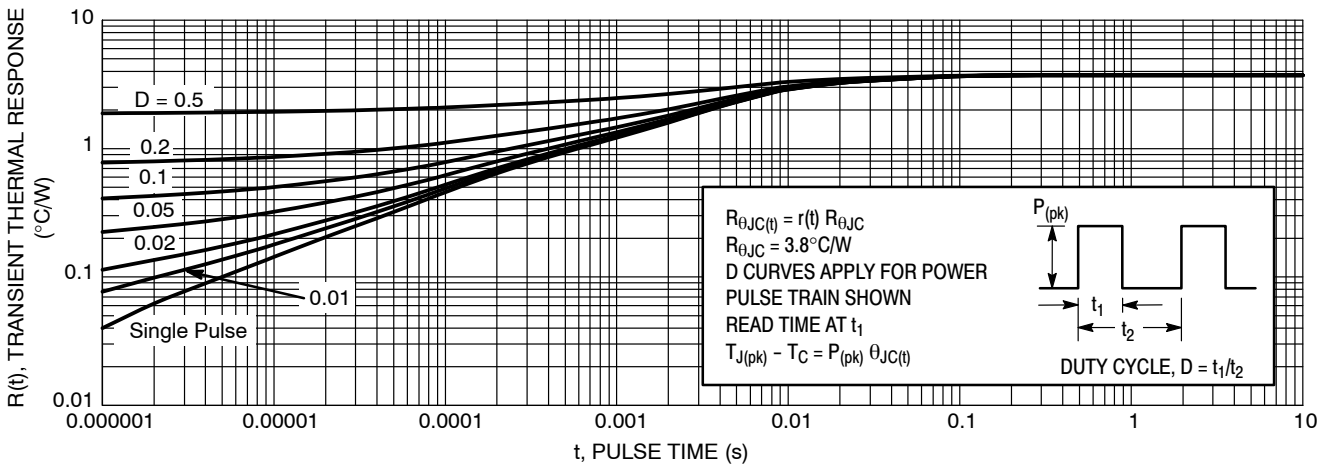


Figure 11. Typical Transient Thermal Response, Junction-to-Case

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS



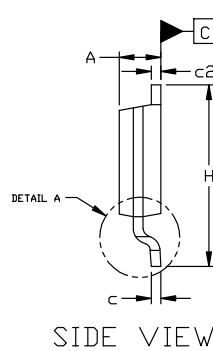
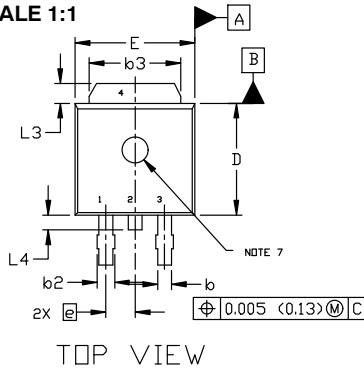
### DPAK (SINGLE GAUGE)

#### CASE 369C

#### ISSUE G

DATE 31 MAY 2023

SCALE 1:1



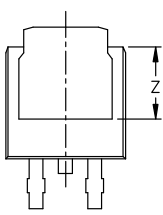
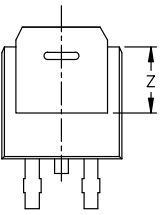
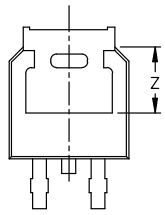
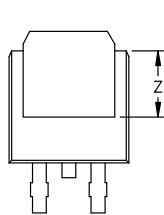
NOTES:

1. DIMENSIONING AND TOLERANCING ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3, AND Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.028	0.045	0.72	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090	BSC	2.29	BSC
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.114	REF	2.90	REF
L2	0.020	BSC	0.51	BSC
L3	0.035	0.050	0.89	1.27
L4	----	0.040	---	1.01
Z	0.155	----	3.93	---

TOP VIEW

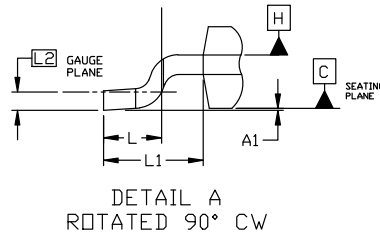
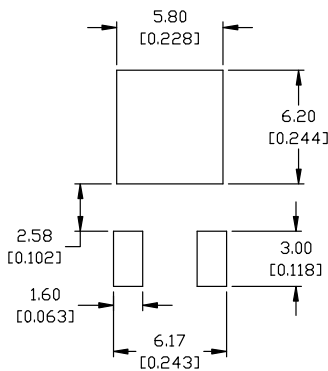
SIDE VIEW



BOTTOM VIEW

BOTTOM VIEW

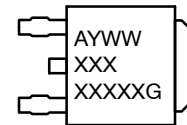
ALTERNATE CONSTRUCTIONS



### GENERIC MARKING DIAGRAM\*



IC



Discrete

- XXXXXX = Device Code
- A = Assembly Location
- L = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package

### RECOMMENDED MOUNTING 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.

- |  |  |   |   |  |
|--|--|---|---|--|
| <b>STYLE 1:</b><br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | <b>STYLE 2:</b><br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE<br>4. DRAIN          | <b>STYLE 3:</b><br>PIN 1. ANODE<br>2. CATHODE<br>3. ANODE<br>4. CATHODE | <b>STYLE 4:</b><br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE<br>4. ANODE              | <b>STYLE 5:</b><br>PIN 1. GATE<br>2. ANODE<br>3. CATHODE<br>4. ANODE     |
| <b>STYLE 6:</b><br>PIN 1. MT1<br>2. MT2<br>3. GATE<br>4. MT2                 | <b>STYLE 7:</b><br>PIN 1. GATE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | <b>STYLE 8:</b><br>PIN 1. N/C<br>2. CATHODE<br>3. ANODE<br>4. CATHODE   | <b>STYLE 9:</b><br>PIN 1. ANODE<br>2. CATHODE<br>3. RESISTOR ADJUST<br>4. CATHODE | <b>STYLE 10:</b><br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE<br>4. ANODE |

\*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.

<b>DOCUMENT NUMBER:</b>	<b>98AON10527D</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>DPAK (SINGLE GAUGE)</b>	<b>PAGE 1 OF 1</b>

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](http://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](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at [www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)