

# MOSFET – Dual, N-Channel, POWERTRENCH®

**20 V, 2.1 A, 550 mΩ**

## FDG6317NZ

### General Description

This dual N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC-DC converters using either synchronous or conventional switching PWM controllers. It has been optimized use in small switching regulators, providing an extremely low  $R_{DS(ON)}$  and gate charge (QG) in a small package.

### Features

- 0.7 A, 20 V
  - ♦  $R_{DS(ON)} = 400\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$
  - ♦  $R_{DS(ON)} = 550\text{ m}\Omega @ V_{GS} = 2.5\text{ V}$
- Gate-Source Zener for ESD Ruggedness
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(ON)}$
- Compact Industry Standard SC70-6 Surface Mount Package
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- DC-DC Converter
- Power Management
- Load Switch

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

| Symbol         | Parameter  | Ratings     | Units            |
|----------------|--|-------------|------------------|
| $V_{DSS}$      | Drain-Source Voltage                             | 20          | V                |
| $V_{GSS}$      | Gate-Source Voltage                              | $\pm 12$    | V                |
| $I_D$          | Drain Current:<br>Continuous (Note1)<br>Pulsed   | 0.7<br>2.1  | A                |
| $P_D$          | Power Dissipation for Single Operation           | 0.3         | W                |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ\text{C}$ |

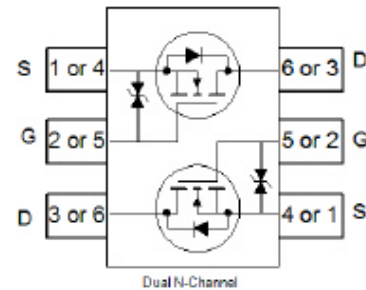
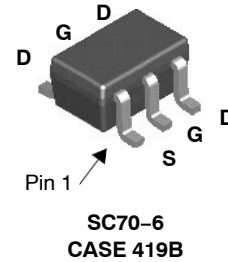
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

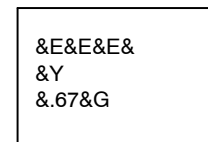
| Symbol          | Parameter   | FDG6317NZ | Unit               |
|-----------------|---|-----------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, (Note 1) | 415       | $^\circ\text{C/W}$ |

1.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.  $R_{\theta JA} = 415^\circ\text{C/W}$  when mounted on a minimum pad.

| $V_{DSS}$ | $R_{DS(ON)}\text{ MAX}$ | $I_D\text{ MAX}$ |
|-----------|-------------------------|------------------|
| 20 V      | 550 mΩ                  | 2.1 A            |



### MARKING DIAGRAM



&Y = Data Code  
&.67&G = Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

# FDG6317NZ

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------|-----------------|------|------|------|------|
|--------|-----------|-----------------|------|------|------|------|

### OFF CHARACTERISTICS

|                              |   |   |    |    |          |                      |
|------------------------------|---|---|----|----|----------|----------------------|
| $BV_{DSS}$                   | Drain to Source Breakdown Voltage         | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$               | 20 | –  | –        | V                    |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$ | –  | 13 | –        | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                    | Zero Gate Voltage Drain Current           | $V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$                 | –  | –  | 1        | $\mu\text{A}$        |
| $I_{GSS}$                    | Gate–Body Leakage                         | $V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$             | –  | –  | $\pm 10$ | $\mu\text{A}$        |
| $I_{GSS}$                    | Gate–Body Leakage                         | $V_{GS} = \pm 4.5\text{ V}, V_{DS} = 0\text{ V}$            | –  | –  | $\pm 1$  | $\mu\text{A}$        |

### ON CHARACTERISTICS

|                                |  |  |     |                   |                   |                      |
|--------------------------------|--|--|-----|-------------------|-------------------|----------------------|
| $V_{GS(th)}$                   | Gate Threshold Voltage                         | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$  | 0.6 | 1.2               | 1.5               | V                    |
| $\Delta V_{GS(th)}/\Delta T_J$ | Gate Threshold Voltage Temperature Coefficient | $I_D = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$   | –   | –2                | –                 | mV/ $^\circ\text{C}$ |
| $R_{DS(on)}$                   | Static Drain–Source On–Resistance              | $V_{GS} = 4.5\text{ V}, I_D = 0.7\text{ A}$<br>$V_{GS} = 2.5\text{ V}, I_D = 0.6\text{ A}$<br>$V_{GS} = 4.5\text{ V}, I_D = 0.7\text{ A}, T_J = 125^\circ\text{C}$ | –   | 300<br>450<br>390 | 400<br>550<br>560 | m $\Omega$           |
| $I_{D(on)}$                    | On–State Drain Current                         | $V_{GS} = 10\text{ V}, V_{DS} = 0\text{ V}$  | 1   | –                 | –                 | A                    |
| $g_{FS}$                       | Forward Transconductance                       | $V_{DS} = 20\text{ V}, I_D = 5\text{ A}$   | –   | 1.8               | –                 | S                    |

### DYNAMIC CHARACTERISTICS

|                 |                              |   |   |      |   |          |
|-----------------|------------------------------|---|---|------|---|----------|
| $C_{iss}$       | Input Capacitance            | $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$ | – | 66.5 | – | pF       |
| $C_{oss}$       | Output Capacitance           |   | – | 19   | – | pF       |
| $C_{rss(eff.)}$ | Reverse Transfer Capacitance |   | – | 10   | – | pF       |
| $R_G$           | Gate Resistance              | $V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$                     | – | 5.8  | – | $\Omega$ |

### SWITCHING CHARACTERISTICS

|              |                     |   |   |      |     |    |
|--------------|---------------------|---|---|------|-----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 10\text{ V}, I_D = 1\text{ A},$<br>$V_{GS} = 4.5\text{ V}, R_{GEN} = 6\ \Omega$ | – | 5.5  | 11  | ns |
| $t_r$        | Turn-On Rise Time   |   | – | 7    | 15  | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |   | – | 7.5  | 15  | ns |
| $t_f$        | Turn-Off Fall Time  |   | – | 2.5  | 5   | ns |
| $Q_g$        | Total Gate Charge   | $V_{DS} = 10\text{ V}, I_D = 0.7\text{ A},$<br>$V_{GS} = 4.5\text{ V},$                   | – | 0.76 | 1.1 | nC |
| $Q_{gs}$     | Gate–Source Charge  |   | – | 0.18 | –   | nC |
| $Q_{gd}$     | Gate–Drain Charge   |   | – | 0.20 | –   | nC |

### DRAIN–SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

|          |  |  |   |      |     |    |
|----------|--|--|---|------|-----|----|
| $I_S$    | Maximum Continuous Source to Drain Diode Forward Current | –  | – | 0.25 | A   |    |
| $V_{SD}$ | Source to Drain Diode Forward Voltage                    | $V_{GS} = 0\text{ V}, I_S = 0.25\text{ A}$ (Note 2)      | – | 0.8  | 1.2 | V  |
| $t_{rr}$ | Diode Reverse Recovery Time                              | $I_F = 0.7\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$ | – | 8.3  | –   | nS |
| $Q_{rr}$ | Diode Reverse Recovery Charge                            |  | – | 1.2  | –   | nC |

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.

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%

3. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

TYPICAL PERFORMANCE CHARACTERISTICS

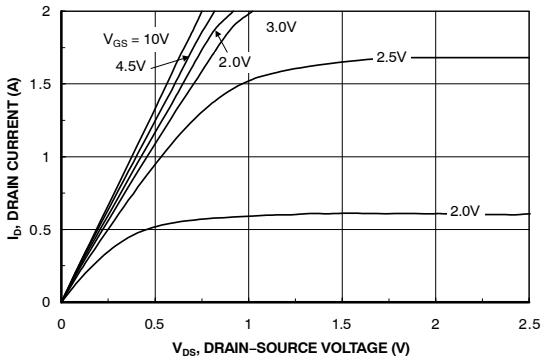


Figure 1. On-Region Characteristics

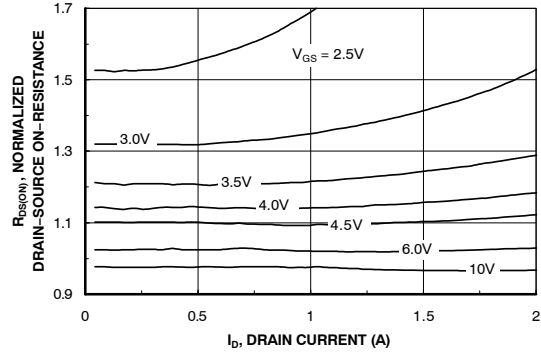


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

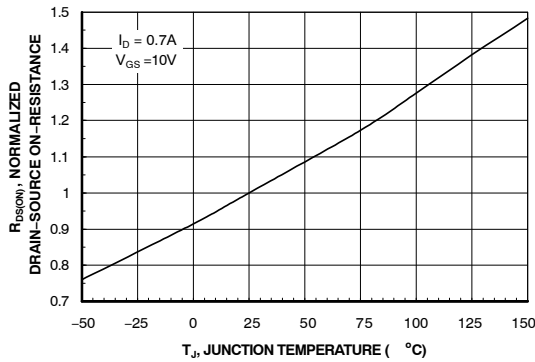


Figure 3. On-Resistance Variation with Temperature

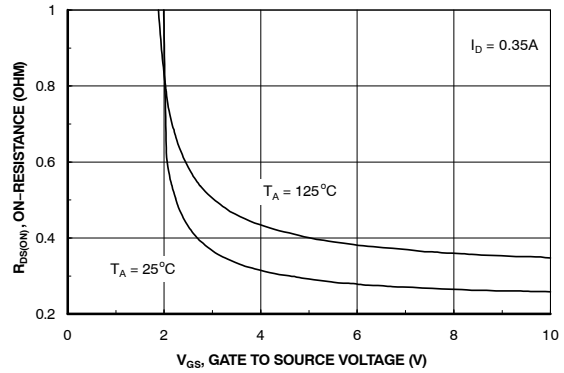


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

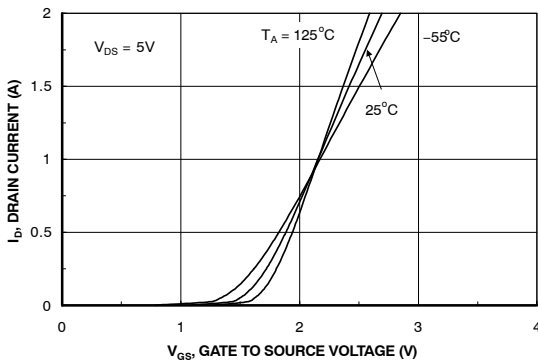


Figure 5. Transfer Characteristics

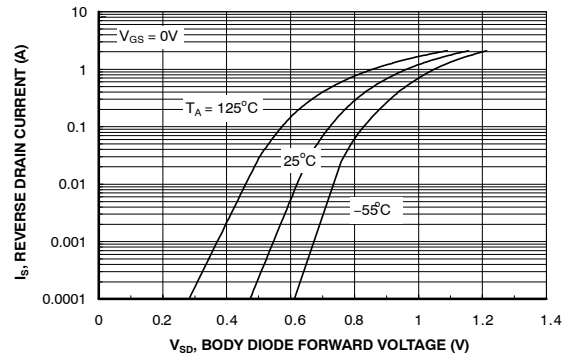


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

# FDG6317NZ

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

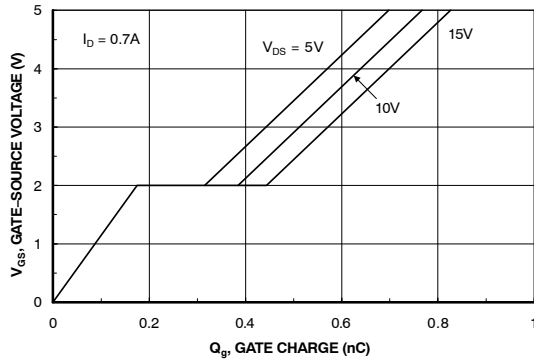


Figure 7. Gate Charge Characteristics

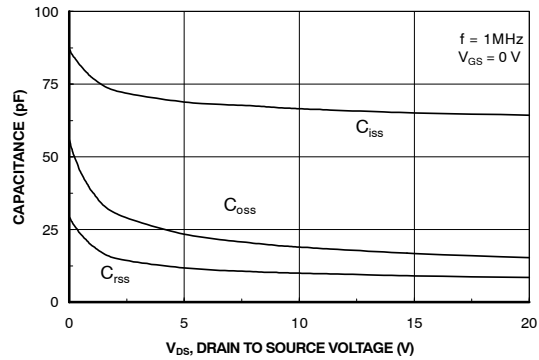


Figure 8. Capacitance Characteristics

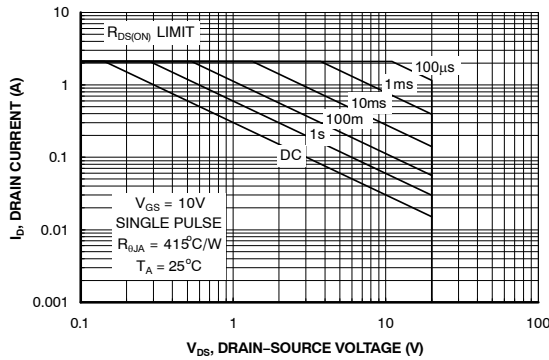


Figure 9. Maximum Safe Operating Area

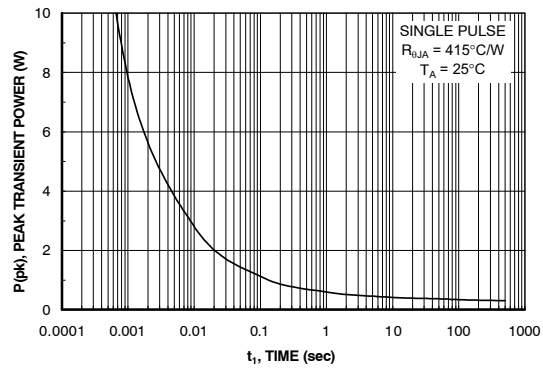


Figure 10. Single Pulse Maximum Power Dissipation

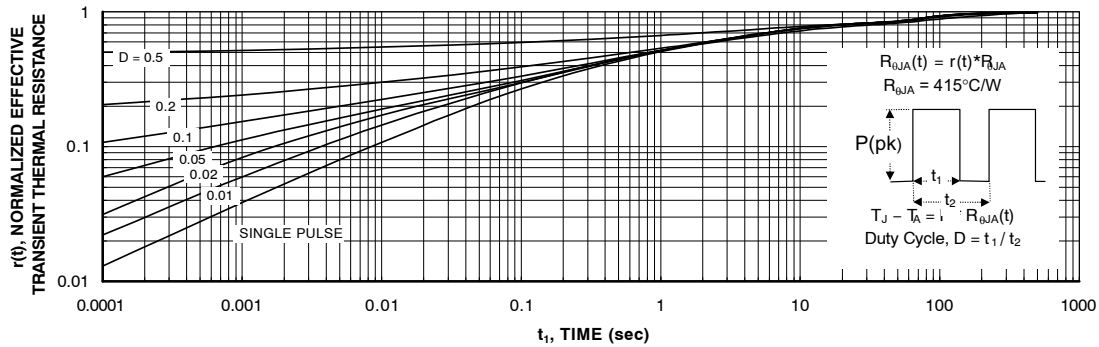


Figure 11. Transient Thermal Response Curve

### PACKAGE MARKING AND ORDERING INFORMATION

| Device    | Device Marking | Package Type        | Reel Size | Tape Width | Shipping†          |
|-----------|----------------|---------------------|-----------|------------|--------------------|
| FDG6317NZ | .67            | SC70-6<br>(Pb-free) | 7"        | 8 mm       | 3000 / 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](#).

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# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

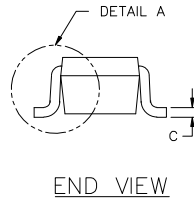
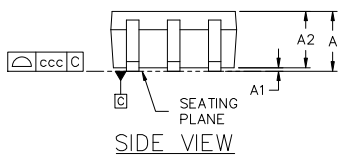
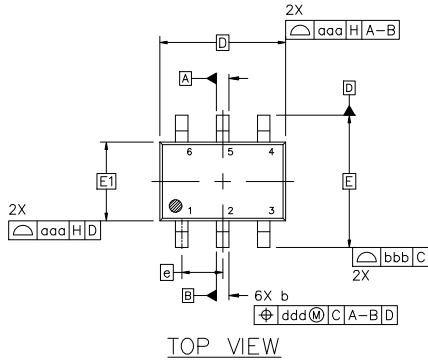


**SC-88 2.00x1.25x0.90, 0.65P**  
CASE 419B-02  
ISSUE Z

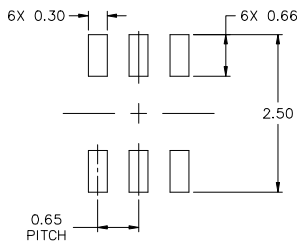
DATE 18 APR 2024

NOTES:

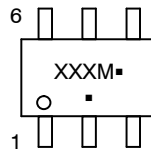
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.



| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | ---         | ---  | 1.10 |
| A1  | 0.00        | ---  | 0.10 |
| A2  | 0.70        | 0.90 | 1.00 |
| b   | 0.15        | 0.20 | 0.25 |
| c   | 0.08        | 0.15 | 0.22 |
| D   | 2.00 BSC    |      |      |
| E   | 2.10 BSC    |      |      |
| E1  | 1.25 BSC    |      |      |
| e   | 0.65 BSC    |      |      |
| L   | 0.26        | 0.36 | 0.46 |
| L2  | 0.15 BSC    |      |      |
| aaa | 0.15        |      |      |
| bbb | 0.30        |      |      |
| ccc | 0.10        |      |      |
| ddd | 0.10        |      |      |



**GENERIC MARKING DIAGRAM\***



- XXX = Specific 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.  
 \*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.

FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

**STYLES ON PAGE 2**

|                         |                                    |  |
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| <b>DESCRIPTION:</b>     | <b>SC-88 2.00x1.25x0.90, 0.65P</b> | <b>PAGE 1 OF 2</b>   |

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**SC-88 2.00x1.25x0.90, 0.65P**  
**CASE 419B-02**  
**ISSUE Z**

DATE 18 APR 2024

|   |   |  |  |  |  |
|---|---|--|--|--|--|
| <b>STYLE 1:</b><br>PIN 1. EMITTER 2<br>2. BASE 2<br>3. COLLECTOR 1<br>4. EMITTER 1<br>5. BASE 1<br>6. COLLECTOR 2 | <b>STYLE 2:</b><br>CANCELLED  | <b>STYLE 3:</b><br>CANCELLED   | <b>STYLE 4:</b><br>PIN 1. CATHODE<br>2. CATHODE<br>3. COLLECTOR<br>4. EMITTER<br>5. BASE<br>6. ANODE               | <b>STYLE 5:</b><br>PIN 1. ANODE<br>2. ANODE<br>3. COLLECTOR<br>4. EMITTER<br>5. BASE<br>6. CATHODE                 | <b>STYLE 6:</b><br>PIN 1. ANODE 2<br>2. N/C<br>3. CATHODE 1<br>4. ANODE 1<br>5. N/C<br>6. CATHODE 2          |
| <b>STYLE 7:</b><br>PIN 1. SOURCE 2<br>2. DRAIN 2<br>3. GATE 1<br>4. SOURCE 1<br>5. DRAIN 1<br>6. GATE 2           | <b>STYLE 8:</b><br>CANCELLED  | <b>STYLE 9:</b><br>PIN 1. EMITTER 2<br>2. EMITTER 1<br>3. COLLECTOR 1<br>4. BASE 1<br>5. BASE 2<br>6. COLLECTOR 2  | <b>STYLE 10:</b><br>PIN 1. SOURCE 2<br>2. SOURCE 1<br>3. GATE 1<br>4. DRAIN 1<br>5. DRAIN 2<br>6. GATE 2           | <b>STYLE 11:</b><br>PIN 1. CATHODE 2<br>2. CATHODE 2<br>3. ANODE 1<br>4. CATHODE 1<br>5. CATHODE 1<br>6. ANODE 2   | <b>STYLE 12:</b><br>PIN 1. ANODE 2<br>2. ANODE 2<br>3. CATHODE 1<br>4. ANODE 1<br>5. ANODE 1<br>6. CATHODE 2 |
| <b>STYLE 13:</b><br>PIN 1. ANODE<br>2. N/C<br>3. COLLECTOR<br>4. EMITTER<br>5. BASE<br>6. CATHODE                 | <b>STYLE 14:</b><br>PIN 1. VREF<br>2. GND<br>3. GND<br>4. IOUT<br>5. VEN<br>6. VCC                            | <b>STYLE 15:</b><br>PIN 1. ANODE 1<br>2. ANODE 2<br>3. ANODE 3<br>4. CATHODE 3<br>5. CATHODE 2<br>6. CATHODE 1     | <b>STYLE 16:</b><br>PIN 1. BASE 1<br>2. EMITTER 2<br>3. COLLECTOR 2<br>4. BASE 2<br>5. EMITTER 1<br>6. COLLECTOR 1 | <b>STYLE 17:</b><br>PIN 1. BASE 1<br>2. EMITTER 1<br>3. COLLECTOR 2<br>4. BASE 2<br>5. EMITTER 2<br>6. COLLECTOR 1 | <b>STYLE 18:</b><br>PIN 1. VIN1<br>2. VCC<br>3. VOUT2<br>4. VIN2<br>5. GND<br>6. VOUT1                       |
| <b>STYLE 19:</b><br>PIN 1. IOUT<br>2. GND<br>3. GND<br>4. V CC<br>5. V EN<br>6. V REF                             | <b>STYLE 20:</b><br>PIN 1. COLLECTOR<br>2. COLLECTOR<br>3. BASE<br>4. EMITTER<br>5. COLLECTOR<br>6. COLLECTOR | <b>STYLE 21:</b><br>PIN 1. ANODE 1<br>2. N/C<br>3. ANODE 2<br>4. CATHODE 2<br>5. N/C<br>6. CATHODE 1               | <b>STYLE 22:</b><br>PIN 1. D1 (i)<br>2. GND<br>3. D2 (i)<br>4. D2 (c)<br>5. VBUS<br>6. D1 (c)                      | <b>STYLE 23:</b><br>PIN 1. Vn<br>2. CH1<br>3. Vp<br>4. N/C<br>5. CH2<br>6. N/C                                     | <b>STYLE 24:</b><br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE<br>4. CATHODE<br>5. CATHODE<br>6. CATHODE       |
| <b>STYLE 25:</b><br>PIN 1. BASE 1<br>2. CATHODE<br>3. COLLECTOR 2<br>4. BASE 2<br>5. EMITTER<br>6. COLLECTOR 1    | <b>STYLE 26:</b><br>PIN 1. SOURCE 1<br>2. GATE 1<br>3. DRAIN 2<br>4. SOURCE 2<br>5. GATE 2<br>6. DRAIN 1      | <b>STYLE 27:</b><br>PIN 1. BASE 2<br>2. BASE 1<br>3. COLLECTOR 1<br>4. EMITTER 1<br>5. EMITTER 2<br>6. COLLECTOR 2 | <b>STYLE 28:</b><br>PIN 1. DRAIN<br>2. DRAIN<br>3. GATE<br>4. SOURCE<br>5. DRAIN<br>6. DRAIN                       | <b>STYLE 29:</b><br>PIN 1. ANODE<br>2. ANODE<br>3. COLLECTOR<br>4. EMITTER<br>5. BASE/ANODE<br>6. CATHODE          | <b>STYLE 30:</b><br>PIN 1. SOURCE 1<br>2. DRAIN 2<br>3. DRAIN 2<br>4. SOURCE 2<br>5. GATE 1<br>6. DRAIN 1    |

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

|                         |                                    |  |
|-------------------------|------------------------------------|--|
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| <b>DESCRIPTION:</b>     | <b>SC-88 2.00x1.25x0.90, 0.65P</b> | <b>PAGE 2 OF 2</b>   |

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