

# NTGS3441, NVGS3441

## Power MOSFET

1 Amp, 20 Volts, P-Channel TSOP-6



ON Semiconductor®

<http://onsemi.com>

**1 AMPERE**  
**20 VOLTS**  
 $R_{DS(on)} = 90 \text{ m}\Omega$

### Features

- Ultra Low  $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Miniature TSOP-6 Surface Mount Package
- NV 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

### Applications

- Power Management in Portable and Battery-Powered Products, i.e.: Cellular and Cordless Telephones, and PCMCIA Cards

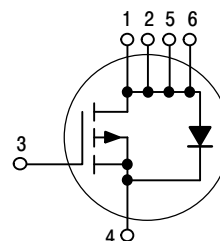
### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	-20	V
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 8.0$	V
Thermal Resistance Junction-to-Ambient (Note 1)	$R_{\theta JA}$	244	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_d$	0.5	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$	$I_D$	-1.65	A
– Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$I_{DM}$	-10	A
Thermal Resistance Junction-to-Ambient (Note 2)	$R_{\theta JA}$	128	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_d$	1.0	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$	$I_D$	-2.35	A
– Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$I_{DM}$	-14	A
Thermal Resistance Junction-to-Ambient (Note 3)	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_d$	2.0	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$	$I_D$	-3.3	A
– Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$I_{DM}$	-20	A
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$
Maximum Lead Temperature for Soldering Purposes for 10 Seconds	$T_L$	260	$^\circ\text{C}$

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.

1. Minimum FR-4 or G-10 PCB, operating to steady state.
2. Mounted onto a 2" square FR-4 board (1 in sq, 2 oz. Cu. 0.06" thick single sided), operating to steady state.
3. Mounted onto a 2" square FR-4 board (1 in sq, 2 oz. Cu. 0.06" thick single sided),  $t < 5.0$  seconds.

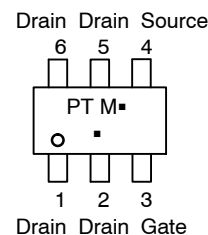
P-Channel



### MARKING DIAGRAM & PIN ASSIGNMENT



TSOP-6  
CASE 318G  
STYLE 1



PT = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping†
NTGS3441T1G	TSOP-6 (Pb-Free)	3000 / Tape & Reel
NVGS3441T1G	TSOP-6 (Pb-Free)	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.

# NTGS3441, NVGS3441

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted) (Notes 4 & 5)

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = -10 μA)	V <sub>(BR)DSS</sub>	-20	-	-	Vdc	
Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0 Vdc, V <sub>DS</sub> = -20 Vdc, T <sub>J</sub> = 25°C) (V <sub>GS</sub> = 0 Vdc, V <sub>DS</sub> = -20 Vdc, T <sub>J</sub> = 70°C)	I <sub>DSS</sub>	-	-	-1.0 -5.0	μAdc	
Gate-Body Leakage Current (V <sub>GS</sub> = -8.0 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	-	-	-100	nAdc	
Gate-Body Leakage Current (V <sub>GS</sub> = +8.0 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	-	-	100	nAdc	
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μAdc)	V <sub>GS(th)</sub>	-0.45	-1.05	-1.50	Vdc	
Static Drain-Source On-State Resistance (V <sub>GS</sub> = -4.5 Vdc, I <sub>D</sub> = -3.3 Adc) (V <sub>GS</sub> = -2.5 Vdc, I <sub>D</sub> = -2.9 Adc)	R <sub>DS(on)</sub>	-	0.069 0.117	0.090 0.135	Ω	
Forward Transconductance (V <sub>DS</sub> = -10 Vdc, I <sub>D</sub> = -3.3 Adc)	g <sub>FS</sub>	-	6.8	-	Mhos	
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	(V <sub>DS</sub> = -5.0 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>ISS</sub>	-	480	-	pF
Output Capacitance		C <sub>OSS</sub>	-	265	-	pF
Reverse Transfer Capacitance		C <sub>RSS</sub>	-	100	-	pF
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	(V <sub>DD</sub> = -20 Vdc, I <sub>D</sub> = -1.6 Adc, V <sub>GS</sub> = -4.5 Vdc, R <sub>g</sub> = 6.0 Ω)	t <sub>d(on)</sub>	-	13	25	ns
Rise Time		t <sub>r</sub>	-	23.5	45	ns
Turn-Off Delay Time		t <sub>d(off)</sub>	-	27	50	ns
Fall Time		t <sub>f</sub>	-	24	45	ns
Total Gate Charge	(V <sub>DS</sub> = -10 Vdc, V <sub>GS</sub> = -4.5 Vdc, I <sub>D</sub> = -3.3 Adc)	Q <sub>tot</sub>	-	6.2	14	nC
Gate-Source Charge		Q <sub>gs</sub>	-	1.3	-	nC
Gate-Drain Charge		Q <sub>gd</sub>	-	2.5	-	nC
<b>BODY-DRAIN DIODE RATINGS</b>						
Diode Forward On-Voltage	(I <sub>S</sub> = -1.6 Adc, V <sub>GS</sub> = 0 Vdc)	V <sub>SD</sub>	-	-0.88	-1.2	Vdc
Diode Forward On-Voltage	(I <sub>S</sub> = -3.3 Adc, V <sub>GS</sub> = 0 Vdc)	V <sub>SD</sub>	-	-0.98	-	Vdc
Reverse Recovery Time	(I <sub>S</sub> = -1.6 Adc, dI <sub>S</sub> /dt = 100 A/μs)	t <sub>rr</sub>	-	30	60	ns

4. Indicates Pulse Test: P.W. = 300 μsec max, Duty Cycle = 2%.

5. Handling precautions to protect against electrostatic discharge are mandatory.

TYPICAL ELECTRICAL CHARACTERISTICS

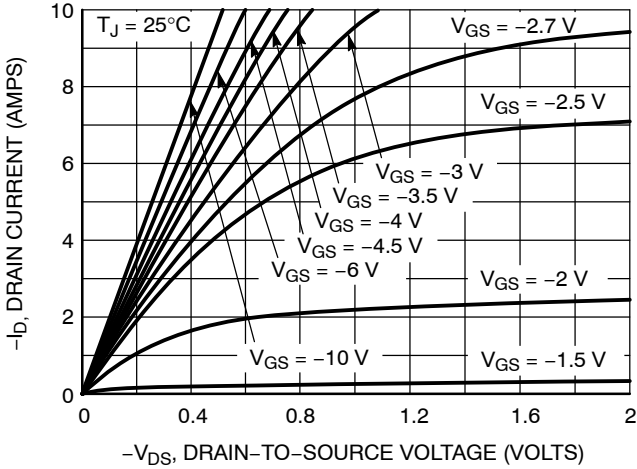


Figure 1. On-Region Characteristics

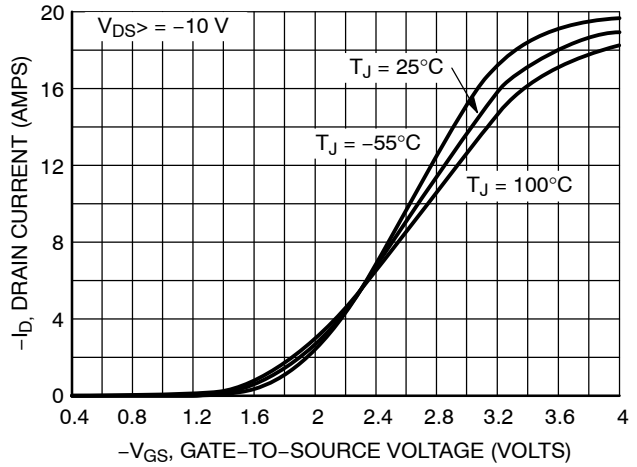


Figure 2. Transfer Characteristics

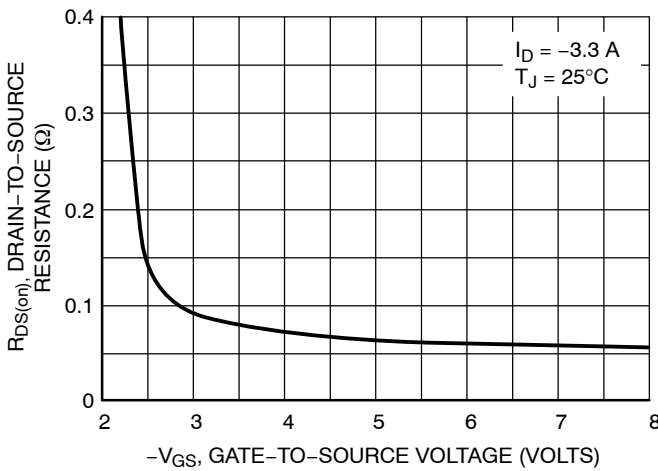


Figure 3. On-Resistance vs. Gate-to-Source Voltage

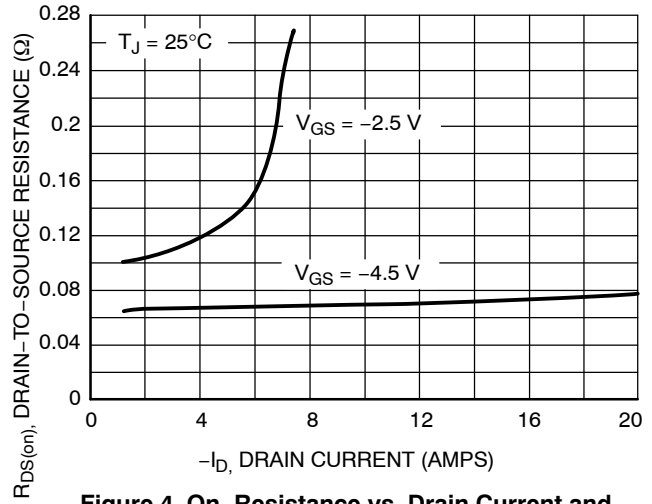


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

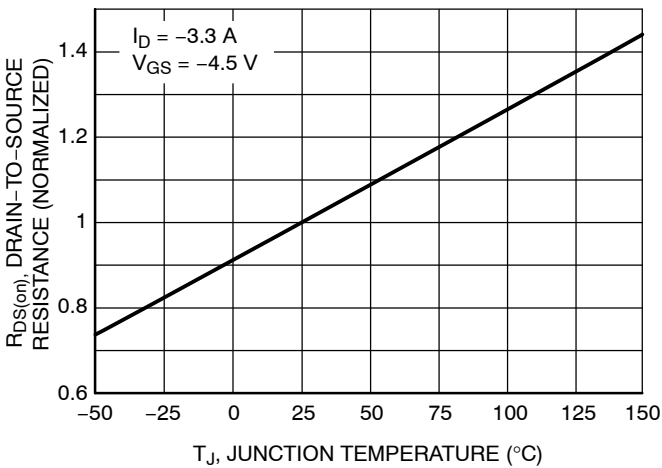


Figure 5. On-Resistance Variation with Temperature

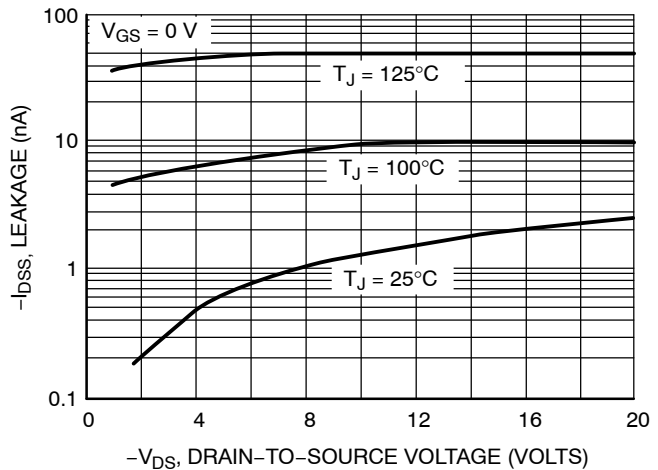
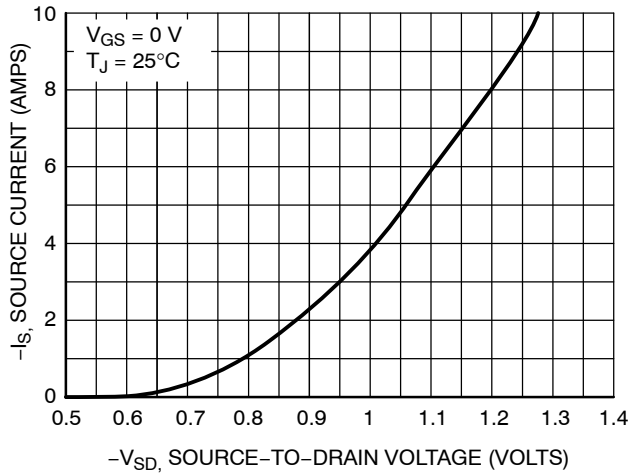
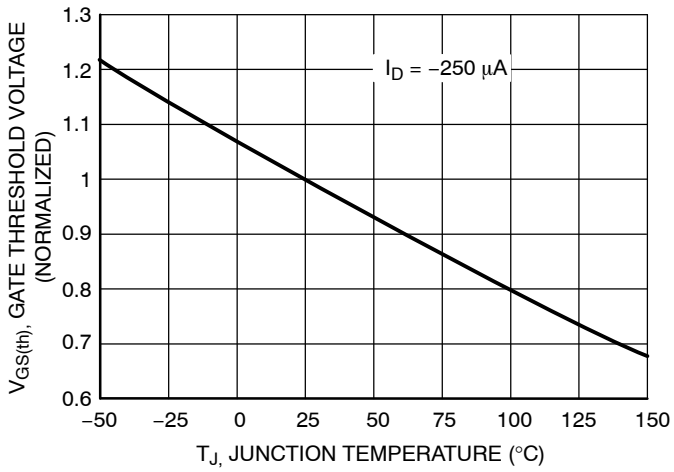
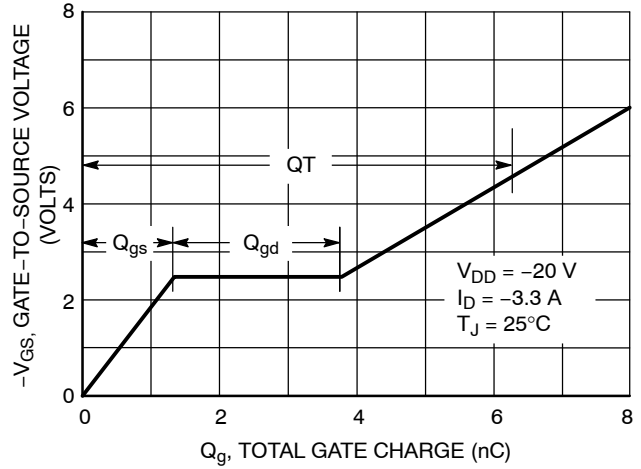
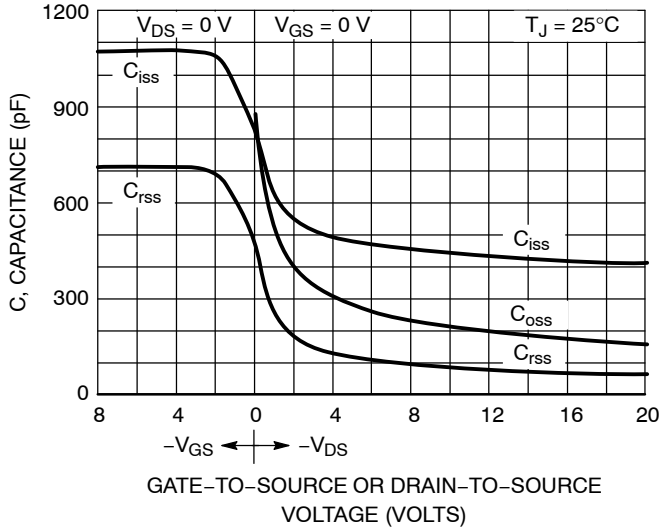


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL ELECTRICAL CHARACTERISTICS



# NTGS3441, NVGS3441

## TYPICAL ELECTRICAL CHARACTERISTICS

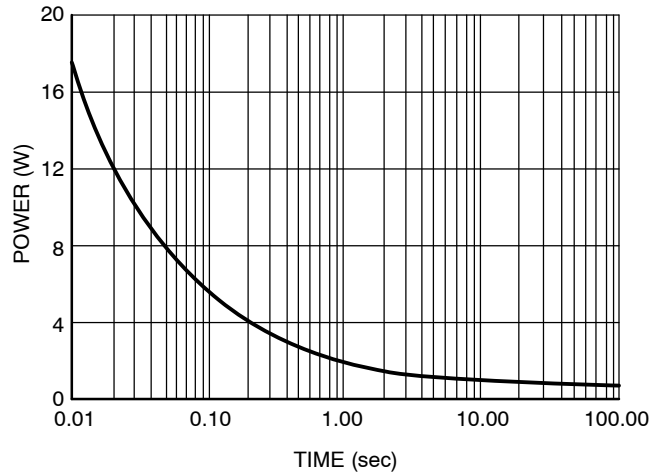


Figure 11. Single Pulse Power

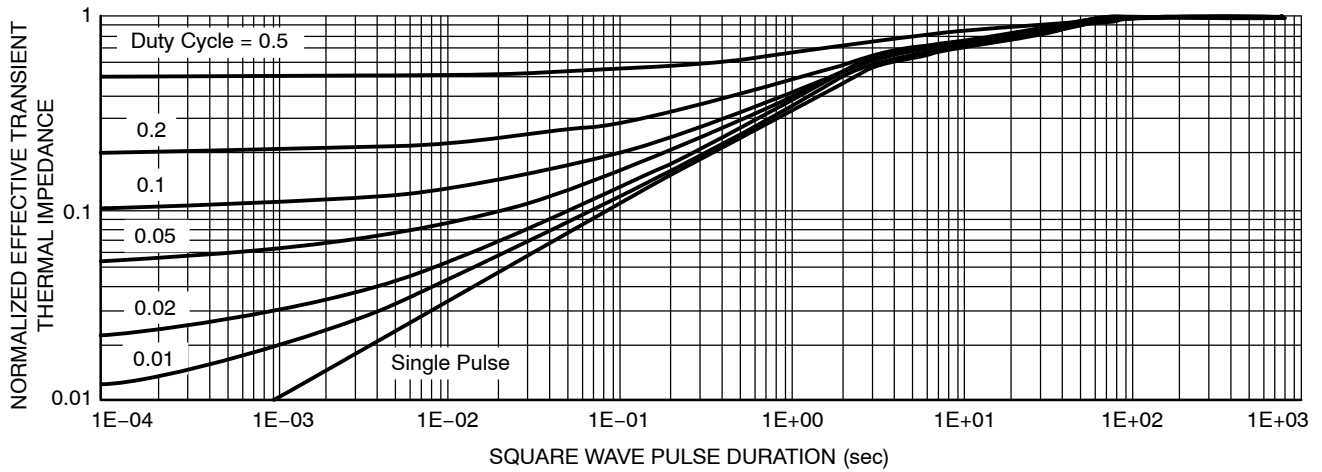


Figure 12. Normalized Thermal Transient Impedance, Junction-to-Ambient

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

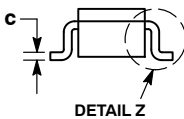
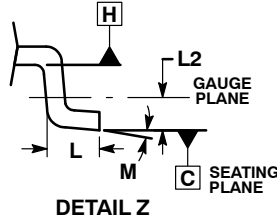
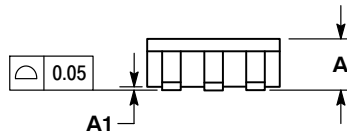
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SCALE 2:1

### TSOP-6 CASE 318G-02 ISSUE V

DATE 12 JUN 2012



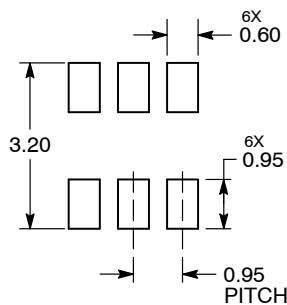
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.90	3.00	3.10
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.85	0.95	1.05
L	0.20	0.40	0.60
L2	0.25 BSC		
M	0°	-	10°

- |  |  |   |   |   |  |
|--|--|---|---|---|--|
| <p>STYLE 1:<br/>PIN 1. DRAIN<br/>2. DRAIN<br/>3. GATE<br/>4. SOURCE<br/>5. DRAIN<br/>6. DRAIN</p>              | <p>STYLE 2:<br/>PIN 1. EMITTER 2<br/>2. BASE 1<br/>3. COLLECTOR 1<br/>4. EMITTER 1<br/>5. BASE 2<br/>6. COLLECTOR 2</p>    | <p>STYLE 3:<br/>PIN 1. ENABLE<br/>2. N/C<br/>3. R BOOST<br/>4. Vz<br/>5. V in<br/>6. V out</p>                            | <p>STYLE 4:<br/>PIN 1. N/C<br/>2. V in<br/>3. NOT USED<br/>4. GROUND<br/>5. ENABLE<br/>6. LOAD</p>                | <p>STYLE 5:<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</p> | <p>STYLE 6:<br/>PIN 1. COLLECTOR<br/>2. COLLECTOR<br/>3. BASE<br/>4. EMITTER<br/>5. COLLECTOR<br/>6. COLLECTOR</p> |
| <p>STYLE 7:<br/>PIN 1. COLLECTOR<br/>2. COLLECTOR<br/>3. BASE<br/>4. N/C<br/>5. COLLECTOR<br/>6. EMITTER</p>   | <p>STYLE 8:<br/>PIN 1. Vbus<br/>2. D(in)<br/>3. D(in)+<br/>4. D(out)+<br/>5. D(out)<br/>6. GND</p>                         | <p>STYLE 9:<br/>PIN 1. LOW VOLTAGE GATE<br/>2. DRAIN<br/>3. SOURCE<br/>4. DRAIN<br/>5. DRAIN<br/>6. HIGH VOLTAGE GATE</p> | <p>STYLE 10:<br/>PIN 1. D(OUT)+<br/>2. GND<br/>3. D(OUT)-<br/>4. D(IN)-<br/>5. VBUS<br/>6. D(IN)+</p>             | <p>STYLE 11:<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/GATE 2</p>  | <p>STYLE 12:<br/>PIN 1. I/O<br/>2. GROUND<br/>3. I/O<br/>4. I/O<br/>5. VCC<br/>6. I/O</p>                          |
| <p>STYLE 13:<br/>PIN 1. GATE 1<br/>2. SOURCE 2<br/>3. GATE 2<br/>4. DRAIN 2<br/>5. SOURCE 1<br/>6. DRAIN 1</p> | <p>STYLE 14:<br/>PIN 1. ANODE<br/>2. SOURCE<br/>3. GATE<br/>4. CATHODE/DRAIN<br/>5. CATHODE/DRAIN<br/>6. CATHODE/DRAIN</p> | <p>STYLE 15:<br/>PIN 1. ANODE<br/>2. SOURCE<br/>3. GATE<br/>4. DRAIN<br/>5. N/C<br/>6. CATHODE</p>                        | <p>STYLE 16:<br/>PIN 1. ANODE/CATHODE<br/>2. BASE<br/>3. EMITTER<br/>4. COLLECTOR<br/>5. ANODE<br/>6. CATHODE</p> | <p>STYLE 17:<br/>PIN 1. EMITTER<br/>2. BASE<br/>3. ANODE/CATHODE<br/>4. ANODE<br/>5. CATHODE<br/>6. COLLECTOR</p>       |  |

### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

### GENERIC MARKING DIAGRAM\*



- |  |   |
|--|---|
| <p>XXX = Specific Device Code<br/>A = Assembly Location<br/>Y = Year<br/>W = Work Week<br/>▪ = Pb-Free Package</p> | <p>XXX = Specific Device Code<br/>M = Date Code<br/>▪ = Pb-Free Package</p> |
|--|---|

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

\*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.

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