

# NTGS3443, NVGS3443

## Power MOSFET 4.4 Amps, 20 Volts

### P-Channel TSOP-6

#### Features

- Ultra Low  $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Miniature TSOP-6 Surface Mount Package
- These Devices are Pb-Free and are RoHS Compliant
- NVGS Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

#### 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	$V_{DS}$	-20	Volts
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 12$	Volts
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	Watts
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ – Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$I_D$ $I_{DM}$	-2.2 -10	Amps Amps
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	Watts
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ – Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$I_D$ $I_{DM}$	-3.1 -14	Amps Amps
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	Watts
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ – Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$I_D$ $I_{DM}$	-4.4 -20	Amps Amps
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.

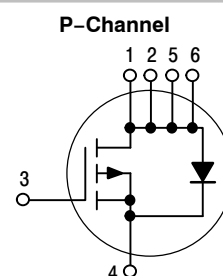
1. Minimum FR-4 or G-10 PCB, operating to steady state.
2. Mounted onto a 2 in square FR-4 board (1 in sq, 2 oz. Cu. 0.06" thick single sided), operating to steady state.
3. Mounted onto a 2 in square FR-4 board (1 in sq, 2 oz. Cu. 0.06" thick single sided),  $t < 5.0$  seconds.



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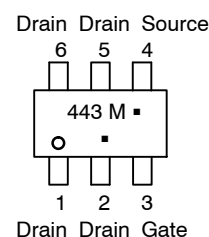
**4.4 AMPERES  
20 VOLTS**  
 $R_{DS(on)} = 65 \text{ m}\Omega$



#### MARKING DIAGRAM & PIN ASSIGNMENT



TSOP-6  
CASE 318G  
STYLE 1



443 = 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†
NTGS3443T1G	TSOP-6 (Pb-Free)	3000 / Tape & Reel
NVGS3443T1G	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.

# NTGS3443, NVGS3443

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) (Notes 4 & 5)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = -10\text{ }\mu\text{A}$ )	$V_{(BR)DSS}$	-20	-	-	Vdc
Zero Gate Voltage Drain Current ( $V_{GS} = 0\text{ Vdc}$ , $V_{DS} = -20\text{ Vdc}$ , $T_J = 25^\circ\text{C}$ ) ( $V_{GS} = 0\text{ Vdc}$ , $V_{DS} = -20\text{ Vdc}$ , $T_J = 70^\circ\text{C}$ )	$I_{DSS}$	- -	- -	-1.0 -5.0	$\mu\text{Adc}$
Gate-Body Leakage Current ( $V_{GS} = -12\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	-	-	-100	nAdc
Gate-Body Leakage Current ( $V_{GS} = +12\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	-	-	100	nAdc

### ON CHARACTERISTICS

Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = -250\text{ }\mu\text{Adc}$ )	$V_{GS(th)}$	-0.60	-0.95	-1.50	Vdc
Static Drain-Source On-State Resistance ( $V_{GS} = -4.5\text{ Vdc}$ , $I_D = -4.4\text{ Adc}$ ) ( $V_{GS} = -2.7\text{ Vdc}$ , $I_D = -3.7\text{ Adc}$ ) ( $V_{GS} = -2.5\text{ Vdc}$ , $I_D = -3.5\text{ Adc}$ )	$R_{DS(on)}$	- - -	0.058 0.082 0.092	0.065 0.090 0.100	$\Omega$
Forward Transconductance ( $V_{DS} = -10\text{ Vdc}$ , $I_D = -4.4\text{ Adc}$ )	$g_{FS}$	-	8.8	-	mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = -5.0\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $f = 1.0\text{ MHz}$ )	$C_{iss}$	-	565	-	pF
Output Capacitance		$C_{oss}$	-	320	-	pF
Reverse Transfer Capacitance		$C_{rss}$	-	120	-	pF

### SWITCHING CHARACTERISTICS

Turn-On Delay Time	$(V_{DD} = -20\text{ Vdc}$ , $I_D = -1.0\text{ Adc}$ , $V_{GS} = -4.5\text{ Vdc}$ , $R_g = 6.0\text{ }\Omega$ )	$t_{d(on)}$	-	10	25	ns
Rise Time		$t_r$	-	18	45	ns
Turn-Off Delay Time		$t_{d(off)}$	-	30	50	ns
Fall Time		$t_f$	-	31	50	ns
Total Gate Charge	$(V_{DS} = -10\text{ Vdc}$ , $V_{GS} = -4.5\text{ Vdc}$ , $I_D = -4.4\text{ Adc}$ )	$Q_{tot}$	-	7.5	15	nC
Gate-Source Charge		$Q_{gs}$	-	1.4	-	nC
Gate-Drain Charge		$Q_{gd}$	-	2.9	-	nC

### BODY-DRAIN DIODE RATINGS

Diode Forward On-Voltage	$(I_S = -1.7\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ )	$V_{SD}$	-	-0.83	-1.2	Vdc
Reverse Recovery Time	$(I_S = -1.7\text{ Adc}$ , $dI_S/dt = 100\text{ A}/\mu\text{s}$ )	$t_{rr}$	-	30	-	ns

- Indicates Pulse Test: P.W. = 300  $\mu\text{sec}$  max, Duty Cycle = 2%.
- Handling precautions to protect against electrostatic discharge are mandatory.

TYPICAL ELECTRICAL CHARACTERISTICS

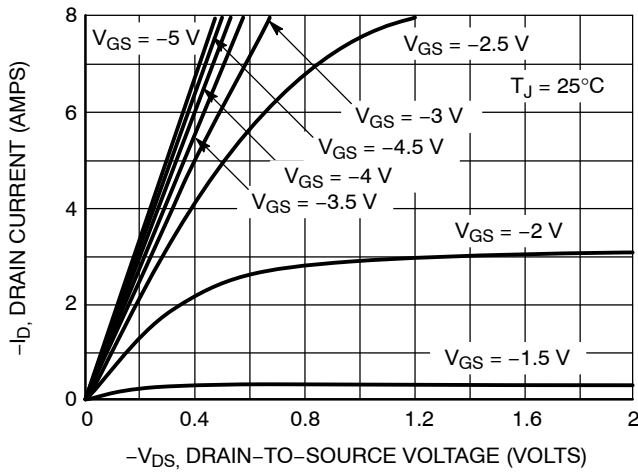


Figure 1. On-Region Characteristics

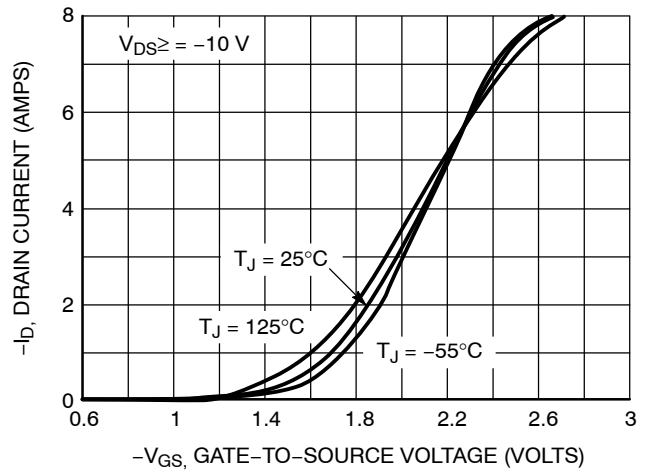


Figure 2. Transfer Characteristics

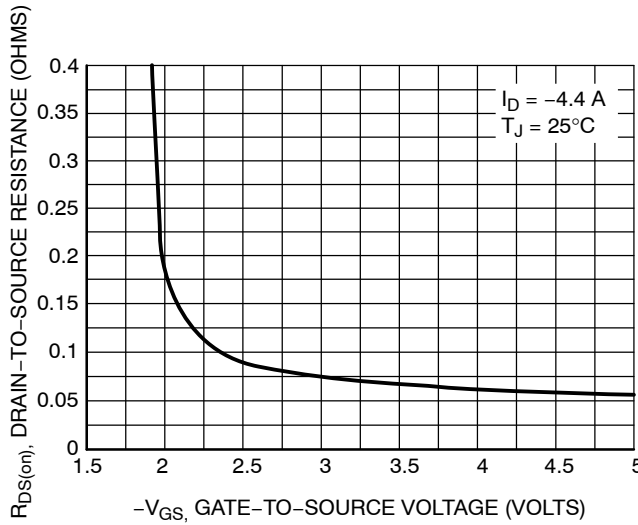


Figure 3. On-Resistance vs. Gate-to-Source Voltage

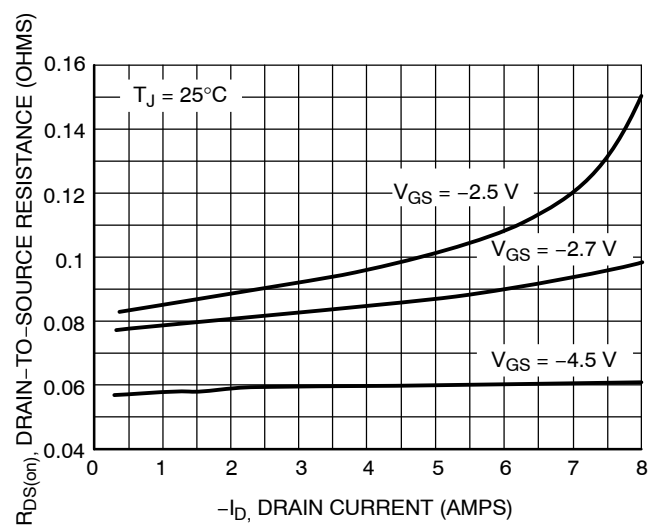


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

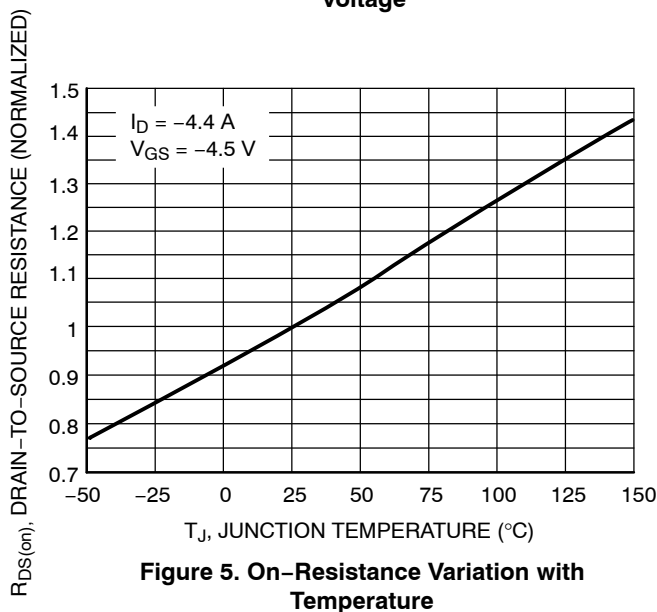


Figure 5. On-Resistance Variation with Temperature

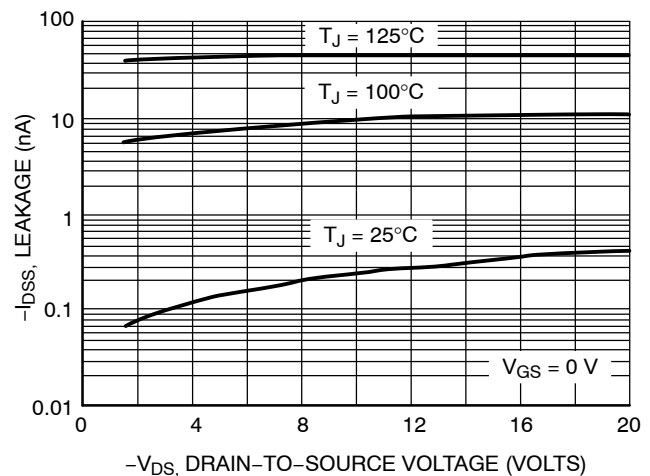


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL ELECTRICAL CHARACTERISTICS

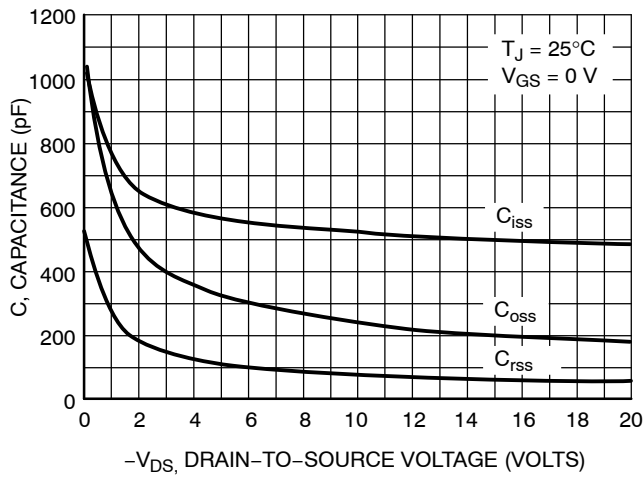


Figure 7. Capacitance Variation

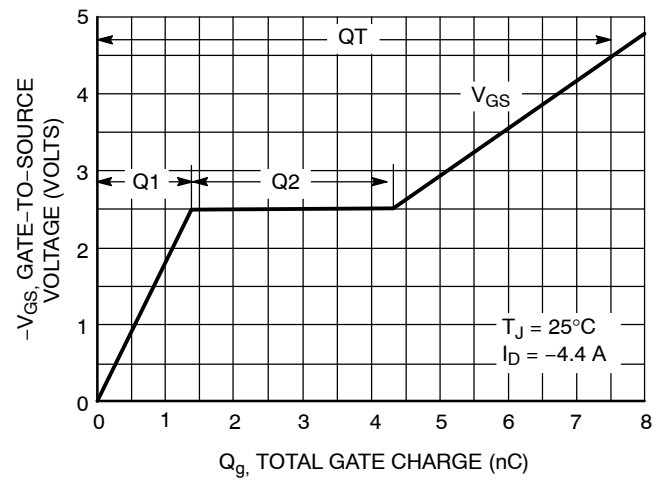


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

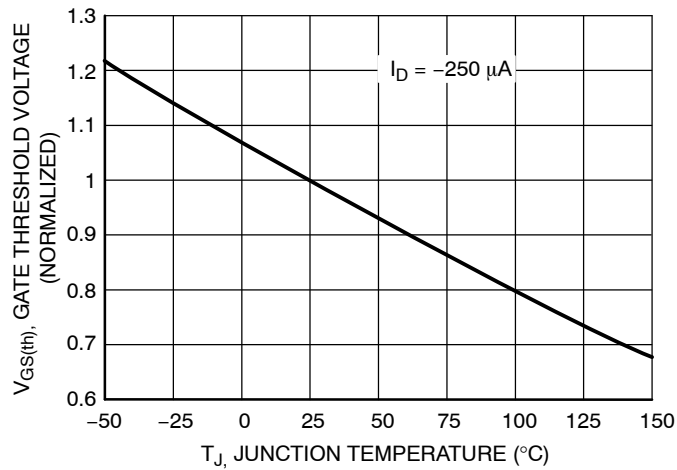


Figure 9. Gate Threshold Voltage Variation with Temperature

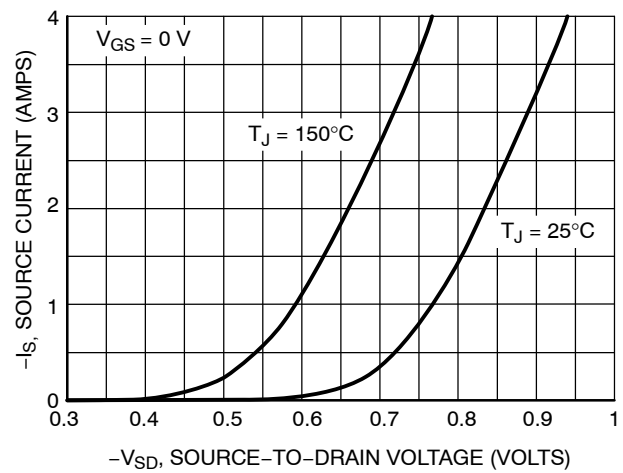


Figure 10. Diode Forward Voltage vs. Current

TYPICAL ELECTRICAL CHARACTERISTICS

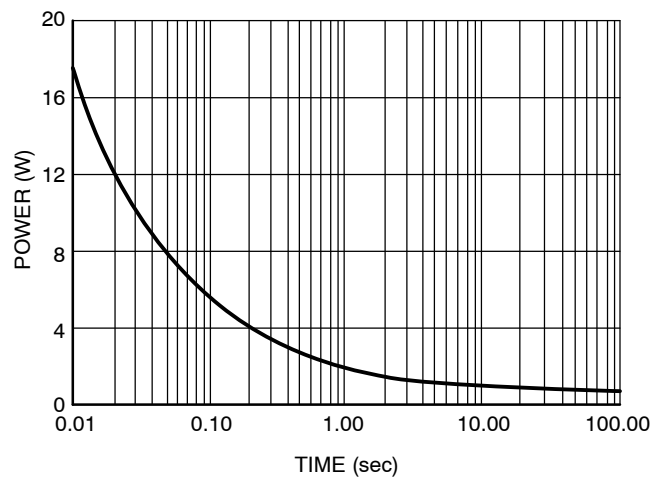


Figure 11. Single Pulse Power

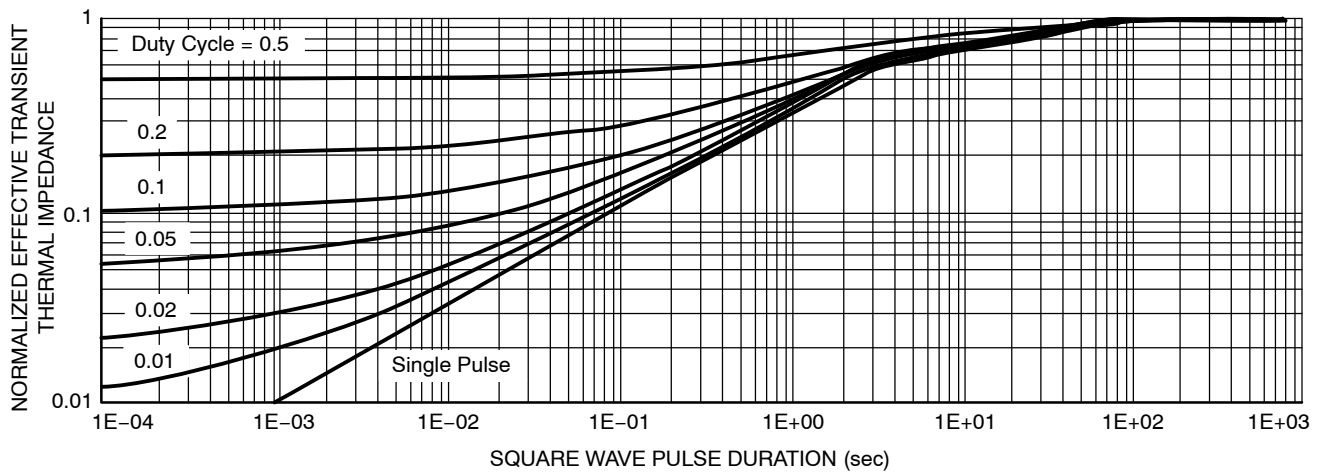


Figure 12. Normalized Thermal Transient Impedance, Junction-to-Ambient

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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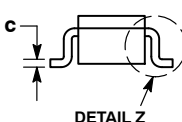
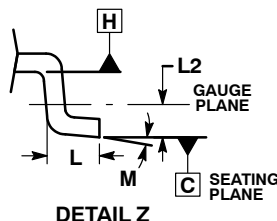
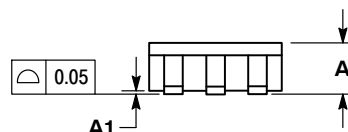
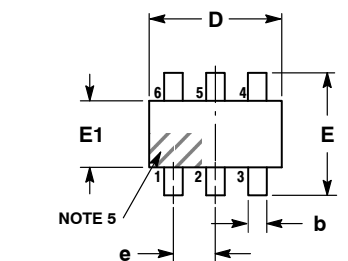
SCALE 2:1

### 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°

#### STYLE 1:

- PIN 1. DRAIN
- PIN 2. DRAIN
- PIN 3. GATE
- PIN 4. SOURCE
- PIN 5. DRAIN
- PIN 6. DRAIN

#### STYLE 2:

- PIN 1. EMITTER 2
- PIN 2. BASE 1
- PIN 3. COLLECTOR 1
- PIN 4. EMITTER 1
- PIN 5. BASE 2
- PIN 6. COLLECTOR 2

#### STYLE 3:

- PIN 1. ENABLE
- PIN 2. N/C
- PIN 3. R BOOST
- PIN 4. Vz
- PIN 5. V in
- PIN 6. V out

#### STYLE 4:

- PIN 1. N/C
- PIN 2. V in
- PIN 3. NOT USED
- PIN 4. GROUND
- PIN 5. ENABLE
- PIN 6. LOAD

#### STYLE 5:

- PIN 1. EMITTER 2
- PIN 2. BASE 2
- PIN 3. COLLECTOR 1
- PIN 4. EMITTER 1
- PIN 5. BASE 1
- PIN 6. COLLECTOR 2

#### STYLE 6:

- PIN 1. COLLECTOR
- PIN 2. COLLECTOR
- PIN 3. BASE
- PIN 4. EMITTER
- PIN 5. COLLECTOR
- PIN 6. COLLECTOR

#### STYLE 7:

- PIN 1. COLLECTOR
- PIN 2. COLLECTOR
- PIN 3. BASE
- PIN 4. N/C
- PIN 5. COLLECTOR
- PIN 6. EMITTER

#### STYLE 8:

- PIN 1. Vbus
- PIN 2. D(in)
- PIN 3. D(in)+
- PIN 4. D(out)+
- PIN 5. D(out)
- PIN 6. GND

#### STYLE 9:

- PIN 1. LOW VOLTAGE GATE
- PIN 2. DRAIN
- PIN 3. SOURCE
- PIN 4. DRAIN
- PIN 5. DRAIN
- PIN 6. HIGH VOLTAGE GATE

#### STYLE 10:

- PIN 1. D(OUT)+
- PIN 2. GND
- PIN 3. D(OUT)-
- PIN 4. D(IN)-
- PIN 5. VBUS
- PIN 6. D(IN)+

#### STYLE 11:

- PIN 1. SOURCE 1
- PIN 2. DRAIN 2
- PIN 3. DRAIN 2
- PIN 4. SOURCE 2
- PIN 5. GATE 1
- PIN 6. DRAIN 1/GATE 2

#### STYLE 12:

- PIN 1. I/O
- PIN 2. GROUND
- PIN 3. I/O
- PIN 4. I/O
- PIN 5. VCC
- PIN 6. I/O

#### STYLE 13:

- PIN 1. GATE 1
- PIN 2. SOURCE 2
- PIN 3. GATE 2
- PIN 4. DRAIN 2
- PIN 5. SOURCE 1
- PIN 6. DRAIN 1

#### STYLE 14:

- PIN 1. ANODE
- PIN 2. SOURCE
- PIN 3. GATE
- PIN 4. CATHODE/DRAIN
- PIN 5. CATHODE/DRAIN
- PIN 6. CATHODE/DRAIN

#### STYLE 15:

- PIN 1. ANODE
- PIN 2. SOURCE
- PIN 3. GATE
- PIN 4. DRAIN
- PIN 5. N/C
- PIN 6. CATHODE

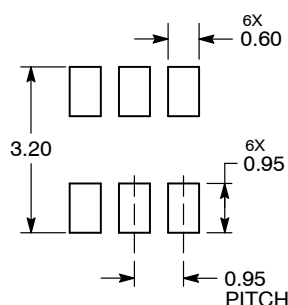
#### STYLE 16:

- PIN 1. ANODE/CATHODE
- PIN 2. BASE
- PIN 3. EMITTER
- PIN 4. COLLECTOR
- PIN 5. ANODE
- PIN 6. CATHODE

#### STYLE 17:

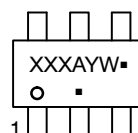
- PIN 1. EMITTER
- PIN 2. BASE
- PIN 3. ANODE/CATHODE
- PIN 4. ANODE
- PIN 5. CATHODE
- PIN 6. COLLECTOR

### RECOMMENDED SOLDERING FOOTPRINT\*

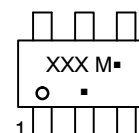


DIMENSIONS: MILLIMETERS

### GENERIC MARKING DIAGRAM\*



IC



STANDARD

XXX = Specific Device Code  
A = Assembly Location  
Y = Year  
W = Work Week  
▪ = Pb-Free Package

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

\*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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