

# NTGS3447P

## Power MOSFET

-12 V, -5.3 A, Single P-Channel, TSOP-6

### Features

- Low  $R_{DS(on)}$  in TSOP-6 Package
- 1.8 V Gate Rating
- This is a Pb-Free Device

### Applications

- Battery Switch and Load Management Applications in Portable Equipment
- High Side Load Switch
- PA Switch

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

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		$V_{DS}$	-12	V
Gate-to-Source Voltage		$V_{GS}$	$\pm 8$	V
Continuous Drain Current (Note 1)	Steady State	$I_D$	$T_A = 25^\circ\text{C}$	A
			$T_A = 85^\circ\text{C}$	
	$t \leq 5 \text{ s}$		$T_A = 25^\circ\text{C}$	
Power Dissipation (Note 1)	Steady State	$P_D$	$T_A = 25^\circ\text{C}$	W
	$t \leq 5 \text{ s}$			
Continuous Drain Current (Note 2)	Steady State	$I_D$	$T_A = 25^\circ\text{C}$	A
			$T_A = 85^\circ\text{C}$	
Power Dissipation (Note 2)	Steady State	$P_D$	$T_A = 25^\circ\text{C}$	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	-19	A
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	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. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)
2. Surface-mounted on FR4 board using the minimum recommended pad size.

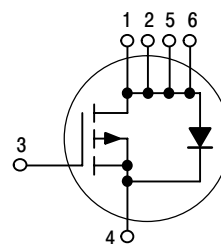


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$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
-12 V	40 m $\Omega$ @ -4.5 V	-4.7 A
	53 m $\Omega$ @ -2.5 V	-4.1 A
	72 m $\Omega$ @ -1.8 V	-2.0 A

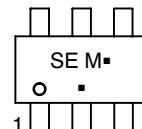
### P-Channel



### MARKING DIAGRAM

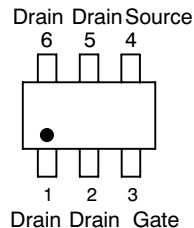


TSOP-6  
CASE 318G  
STYLE 1



SE = Device Code  
M = Date Code  
■ = Pb-Free Package  
(Note: Microdot may be in either location)

### PIN ASSIGNMENT



### ORDERING INFORMATION

Device	Package	Shipping†
NTGS3447PT1G	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.

# NTGS3447P

## THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	100	°C/W
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	78	
Junction-to-Ambient – Minimum Pad (Note 4)	$R_{\theta JA}$	188	

3. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)  
4. Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 0.0775 in sq).

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-12			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = -12\text{ V}$			-1.0	$\mu\text{A}$
					-5.0	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			$\pm 0.1$	$\mu\text{A}$

### ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$	-0.45		-1.0	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -4.7\text{ A}$		30	40	$\text{m}\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -4.1\text{ A}$		40	53	
		$V_{GS} = -1.8\text{ V}, I_D = -2.0\text{ A}$		53	72	
Forward Transconductance	$g_{FS}$	$V_{DS} = -5\text{ V}, I_D = -4.7\text{ A}$		12		S

### CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = -6\text{ V}$		1053		$\text{pF}$
Output Capacitance	$C_{OSS}$			254		
Reverse Transfer Capacitance	$C_{RSS}$			129		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -6\text{ V}; I_D = -4.7\text{ A}$		10.4	15	$\text{nC}$
Threshold Gate Charge	$Q_{G(TH)}$			1.0		
Gate-to-Source Charge	$Q_{GS}$			1.7		
Gate-to-Drain Charge	$Q_{GD}$			0.4		

### SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 6)

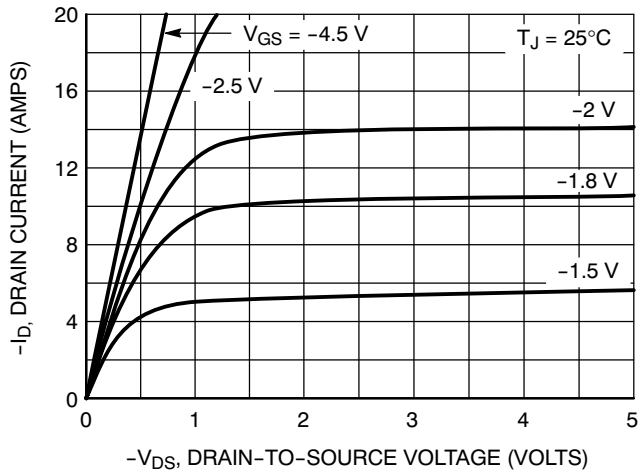
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -6\text{ V}, I_D = -1.0\text{ A}, R_G = 6.0\text{ }\Omega$		7	11	$\text{ns}$
Rise Time	$t_r$			14	22	
Turn-Off Delay Time	$t_{d(OFF)}$			78	117	
Fall Time	$t_f$			47	71	

### DRAIN-SOURCE DIODE CHARACTERISTICS

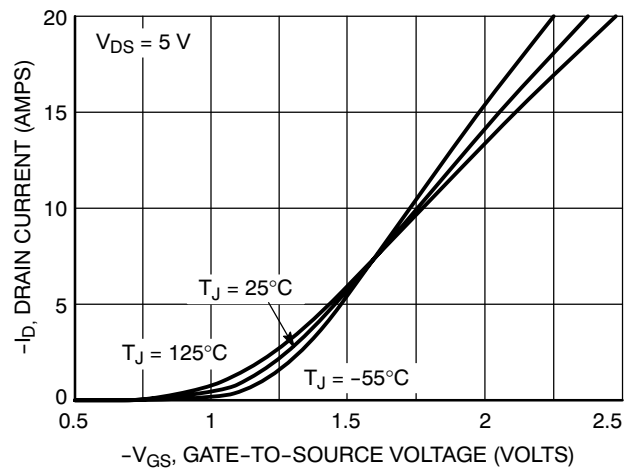
Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = -1.7\text{ A}$	$T_J = 25^\circ\text{C}$		-0.7	-1.2	V
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dI_{SD}/dt = 100\text{ A}/\mu\text{s}, I_S = -1.7\text{ A}$			33	66	ns

5. Pulse Test: pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$   
6. Switching characteristics are independent of operating junction temperatures

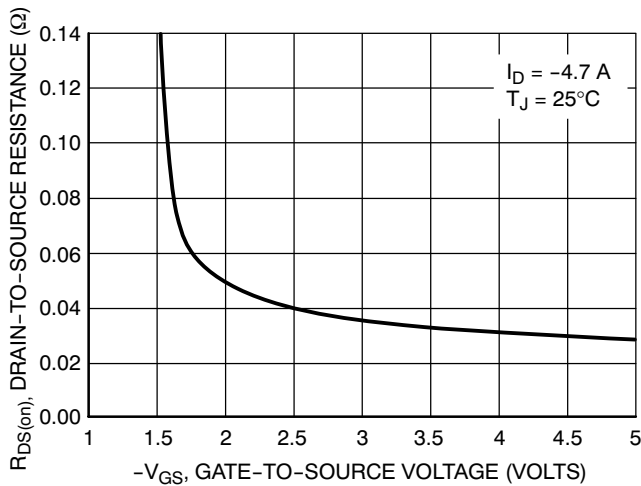
**TYPICAL PERFORMANCE CURVES** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)



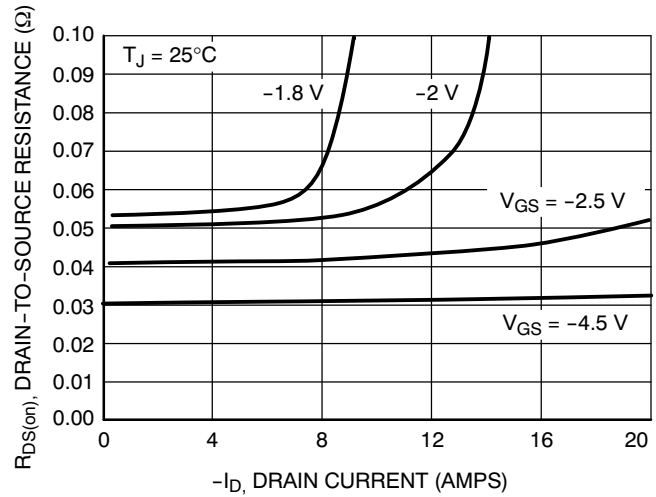
**Figure 1. On-Region Characteristics**



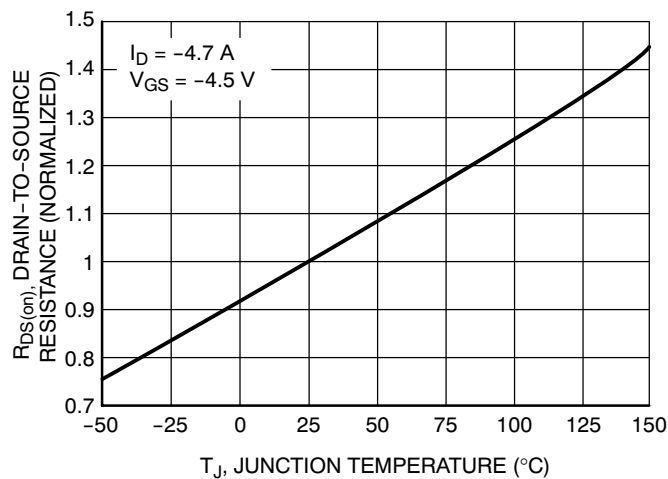
**Figure 2. Transfer Characteristics**



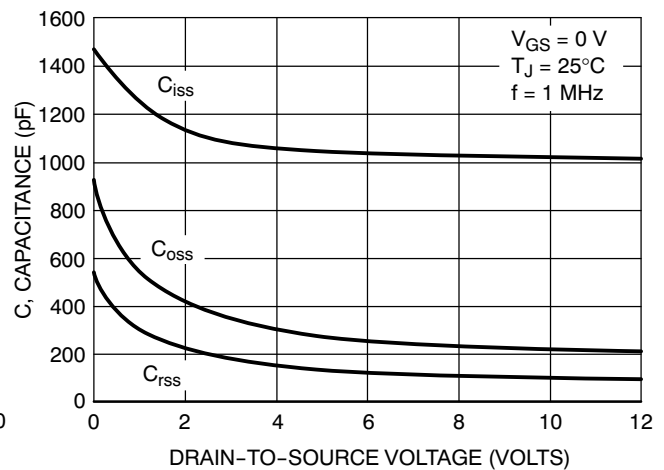
**Figure 3. On-Resistance vs. Gate-to-Source Voltage**



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



**Figure 5. On-Resistance Variation with Temperature**



**Figure 6. Capacitance Variation**

TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

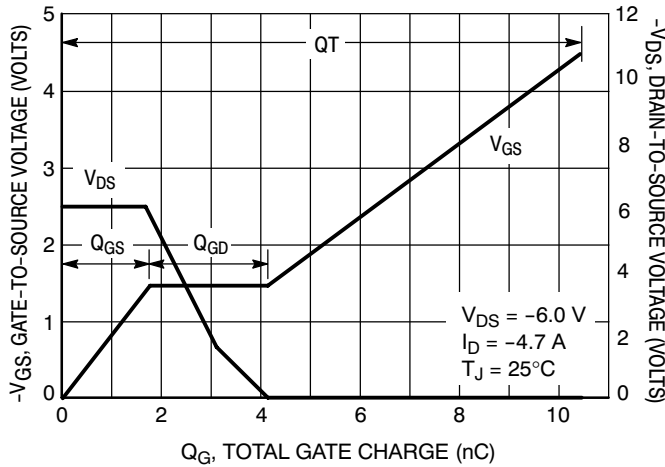


Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

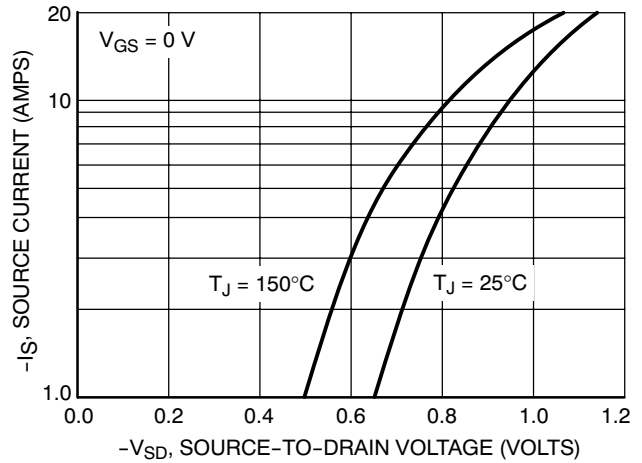


Figure 8. Diode Forward Voltage vs. Current

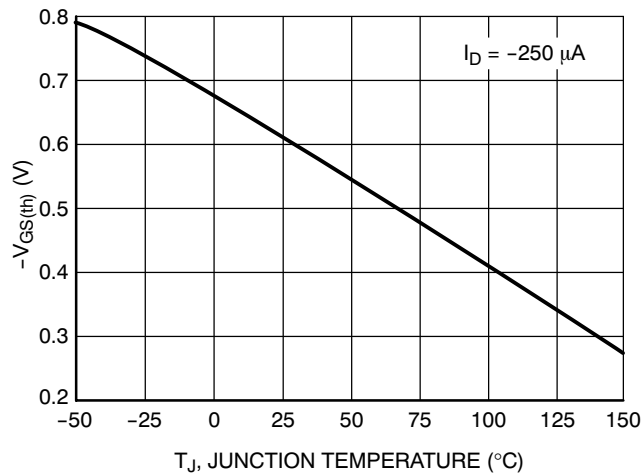


Figure 9. Threshold Voltage

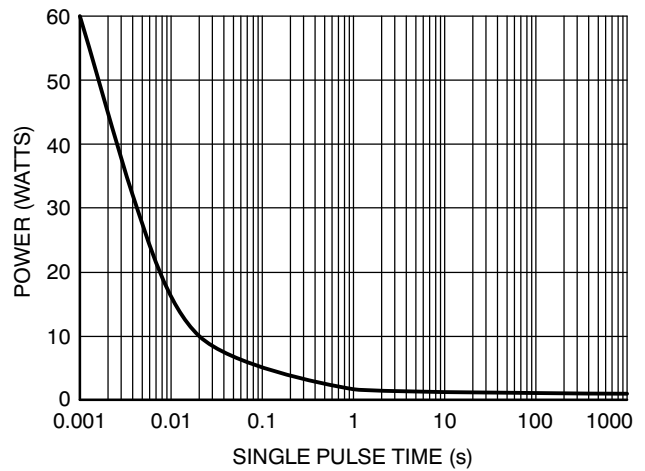


Figure 10. Single Pulse Maximum Power Dissipation

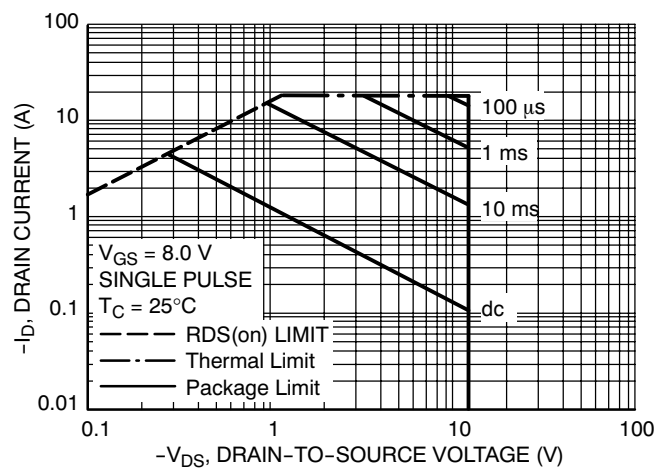


Figure 11. Maximum Rated Forward Biased Safe Operating Area

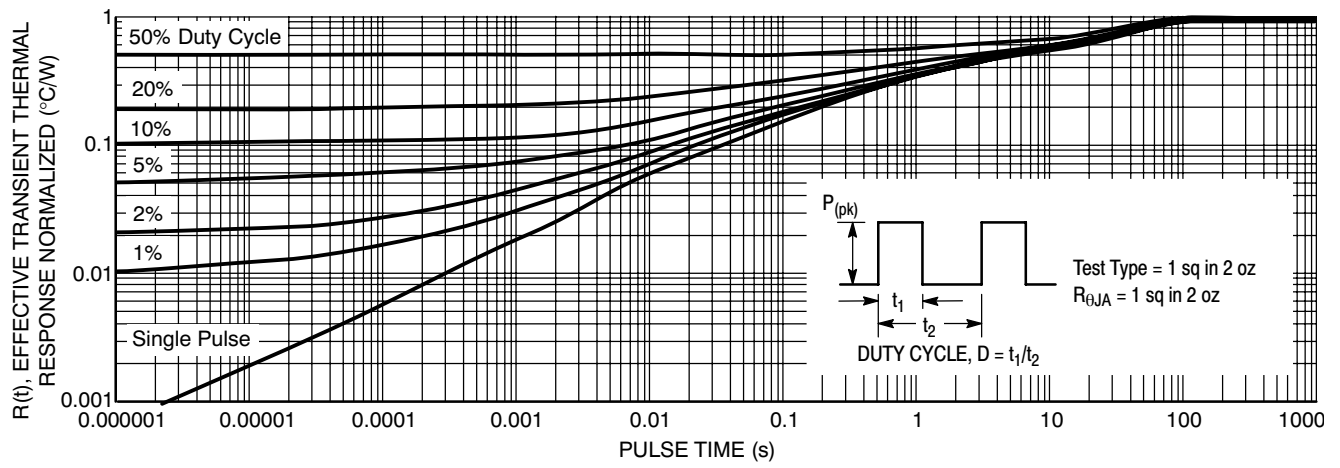
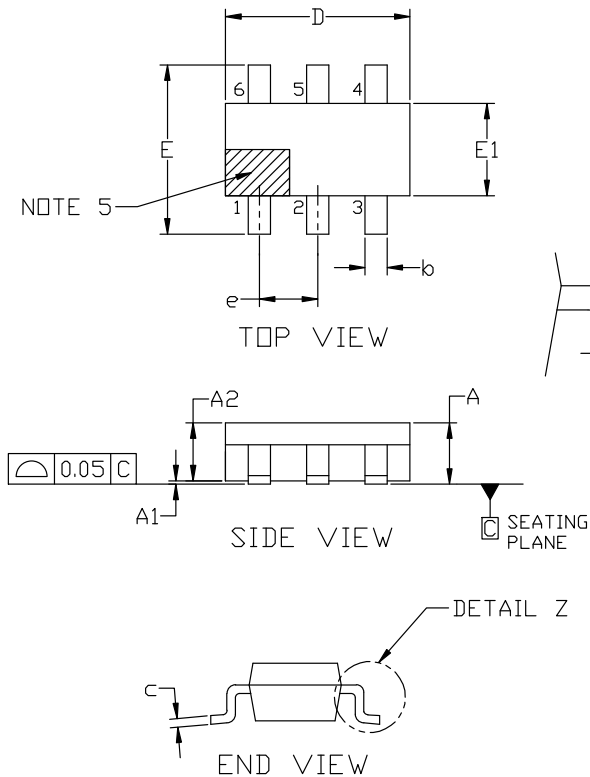


Figure 12. FET Thermal Response


**TSOP-6 3.00x1.50x0.90, 0.95P**  
**CASE 318G**  
**ISSUE W**

DATE 26 FEB 2024

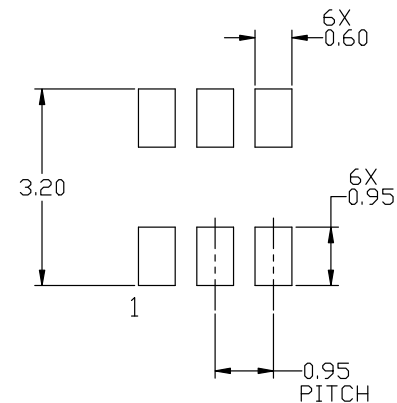


## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
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 1 INDICATOR MUST BE LOCATED IN THE INDICATED ZONE

## MILLIMETERS

DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
A2	0.80	0.90	1.00
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°



## 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.

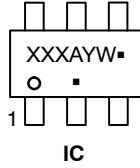
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TSOP-6 3.00x1.50x0.90, 0.95P  
CASE 318G  
ISSUE W

DATE 26 FEB 2024

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

\*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.

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

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