NTGD3147F

Power MOSFET and Schottky Diode

−20 V, −2.5 A, P−Channel with Schottky Barrier Diode, TSOP−6

ON Semiconductor®

http://onsemi.com

Features

- Fast Switching
- Low Gate Change
- Low $R_{DS(on)}$
- Low V_F Schottky Diode
- Independently Connected Devices to Provide Design Flexibility
- This is a Pb−Free Device

Applications

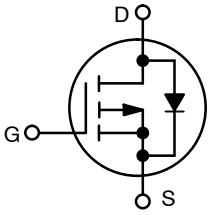
- DC−DC Converters
- Portable Devices like PDA's, Cellular Phones, and Hard Drives

P−CHANNEL MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ Max	I_D Max
−20 V	145 mΩ @ −4.5 V	−2.2 A
	200 mΩ @ −2.5 V	−1.6 A

SCHOTTKY DIODE

V_R Max	V_F Max	I_F Max
20 V	0.45 V	1.0 A



P−Channel MOSFET

Schottky Diode

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	−20	V
Gate−to−Source Voltage			V_{GS}	±12	V
Continuous Drain Current (Note 1)	Steady State	T_A = 25°C T_A = 85°C	I_D	−2.2 −1.6	A
	t ≤ 5 s	T_A = 25°C		−2.5	
Power Dissipation (Note 1)	Steady State	T_A = 25°C	P_D	1.0	W
	t ≤ 5 s			1.3	
Pulsed Drain Current		t_p = 10 μs	I_{DM}	−7.5	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−25 to 150	°C
Source Current (Body Diode)			I_S	−0.8	A
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

SCHOTTKY MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter	Symbol	Value	Unit
Peak Repetitive Reverse Voltage	V_{RRM}	20	V
DC Blocking Voltage	V_R	20	V
Average Rectified Forward Current	I_F	1	A

THERMAL RESISTANCE RATINGS

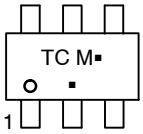
Parameter	Symbol	Value	Unit
Junction−to−Ambient − Steady−State (Note 1)	$R_{\theta JA}$	125	°C/W
Junction−to−Ambient − t ≤ 5 s (Note 1)	$R_{\theta JA}$	100	°C/W
Junction−to−Ambient Steady−State (Note 2)	$R_{\theta JA}$	235	°C/W

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 (Cu area = 30 mm^2 [2 oz] including traces).

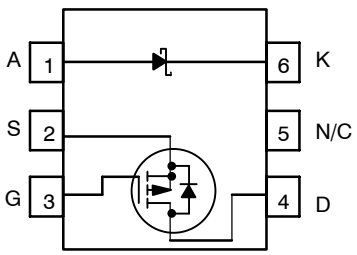
TSOP−6
CASE 318G
STYLE 15

MARKING DIAGRAM



TC = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

PIN CONNECTION



(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

MOSFET ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristic	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		−20			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				14.2		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = −16 V	T_J = 25°C			−1.0	μA
			T_J = 85°C			−10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±12 V				±100	nA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −250 μA		−0.5	−0.95	−1.5	V
Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				3.0		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = −4.5 V	I_D = −2.2 A		90	145	mΩ
		V_{GS} = −2.5 V	I_D = −1.6 A		140	200	
Forward Transconductance	g_{FS}	V_{DS} = −5.0 V, I_D = −2.2 A			4.5		S
CHARGES, CAPACITANCES AND GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = −10 V			400		pF
Output Capacitance	C_{OSS}				75		
Reverse Transfer Capacitance	C_{RSS}				40		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −4.5 V, V_{DS} = −10 V, I_D = −2.2 A			3.8	5.5	nC
Threshold Gate Charge	$Q_{G(TH)}$				0.5		
Gate−to−Source Charge	Q_{GS}				0.9		
Gate−to−Drain Charge	Q_{GD}				1.0		
SWITCHING CHARACTERISTICS (Note 4)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −4.5 V, V_{DS} = −10 V, I_D = −1.0 A, R_G = 6.0 Ω			7.5		ns
Rise Time	t_r				6.2		
Turn−Off Delay Time	$t_{d(OFF)}$				14.5		
Fall Time	t_f				18.4		
DRAIN−TO−SOURCE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_D = −0.8 A	T_J = 25°C		−0.8	1.2	V
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, d_{IS}/d_t = 100 A/μs, I_S = −0.8 A			12		ns
Charge Time	T_a				8.0		
Discharge Time	T_b				4.0		
Reverse Recovery Time	Q_{RR}				4.0		nC

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	V_F	I_F = 0.5 A		0.32	0.4	V
		I_F = 1.0 A		0.36	0.45	
Maximum Instantaneous Reverse Current	I_R	V_R = 10 V		0.04	1.0	mA
		V_R = 20 V		0.21	5.0	

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 75°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	V_F	I_F = 0.5 A		0.27		V
		I_F = 1.0 A		0.31		
Maximum Instantaneous Reverse Current	I_R	V_R = 10 V		0.77		mA
		V_R = 20 V		2.65		

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 125°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	V_F	I_F = 0.5 A		0.22		V
		I_F = 1.0 A		0.27		
Maximum Instantaneous Reverse Current	I_R	V_R = 10 V		8.75		mA
		V_R = 20 V		37.37		

TYPICAL PERFORMANCE CHARACTERISTICS

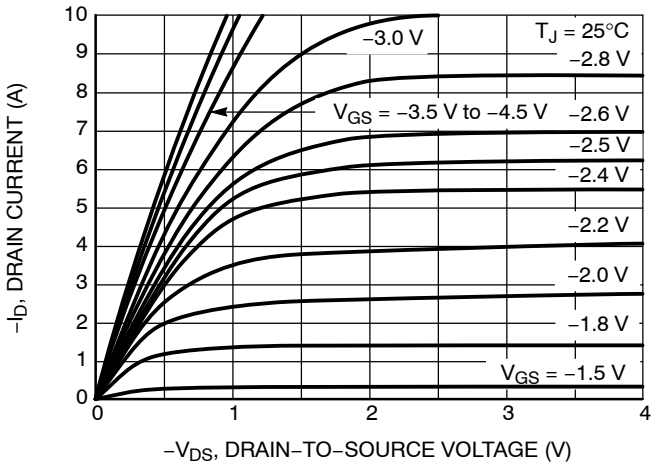


Figure 1. On−Region Characteristics

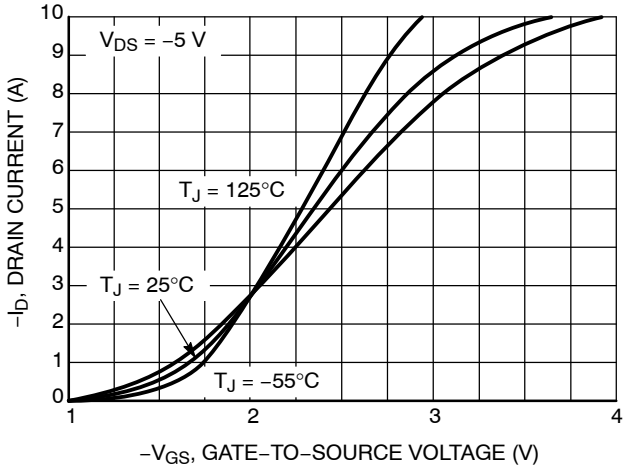


Figure 2. Transfer Characteristics

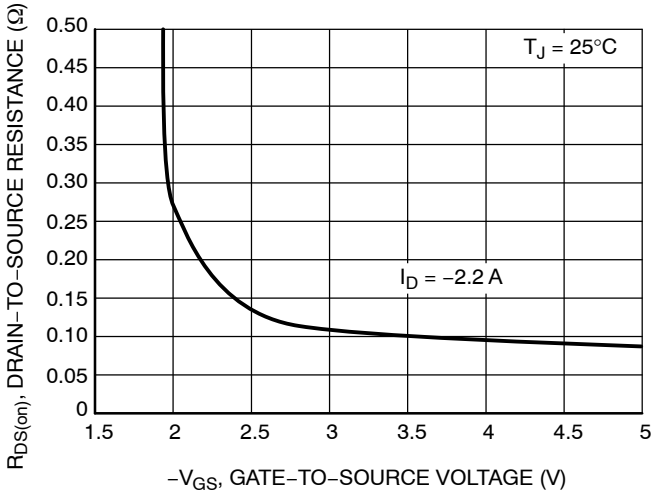


Figure 3. On−Resistance versus Gate−to−Source Voltage

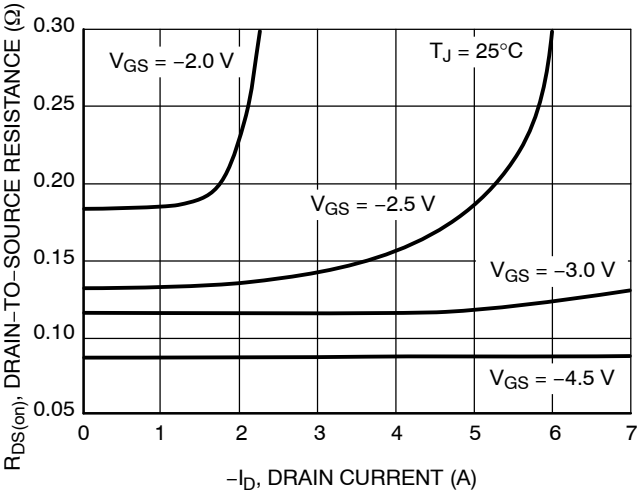


Figure 4. On−Resistance versus Drain Current and Gate Voltage

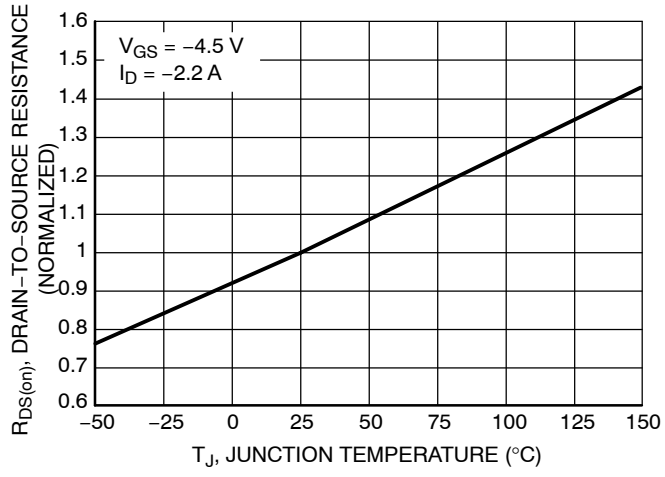


Figure 5. On−Resistance Variation with Temperature

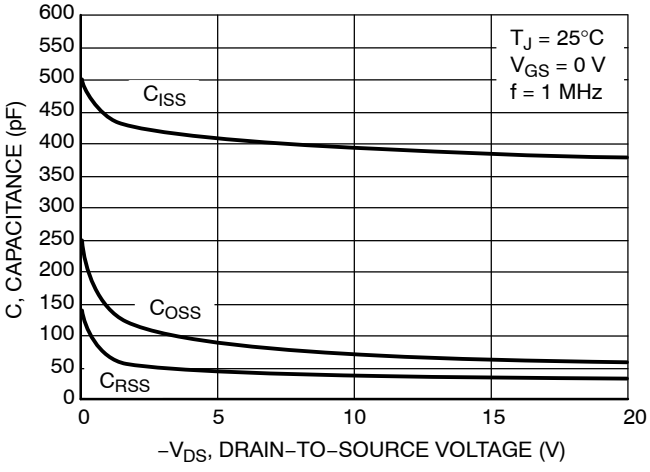


Figure 6. Capacitance Variation

TYPICAL PERFORMANCE CHARACTERISTICS

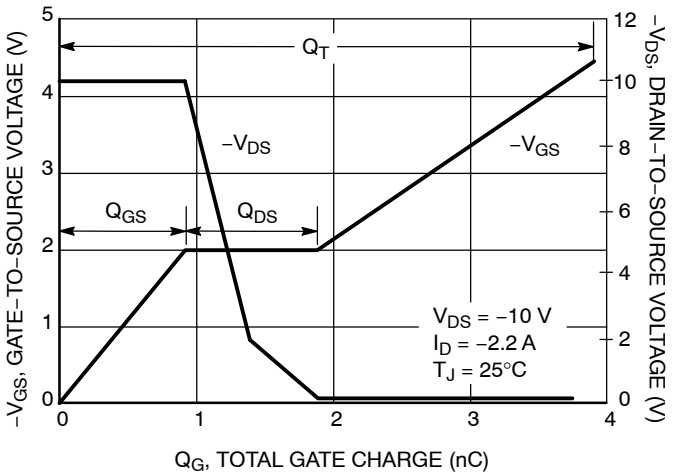


Figure 7. Gate−to−Source and Drain−to−Source Voltage versus Total Charge

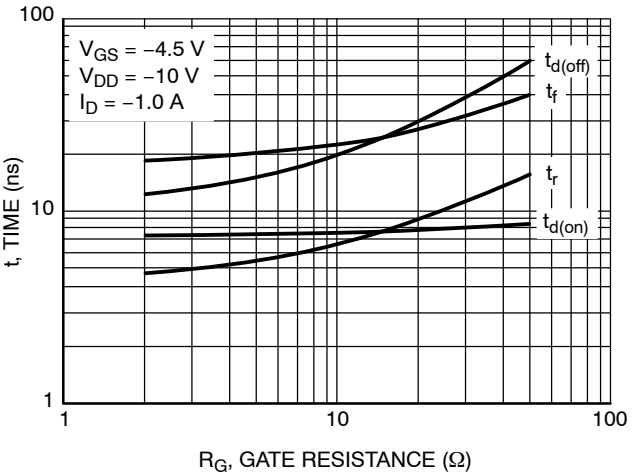


Figure 8. Resistive Switching Time Variation versus Gate Resistance

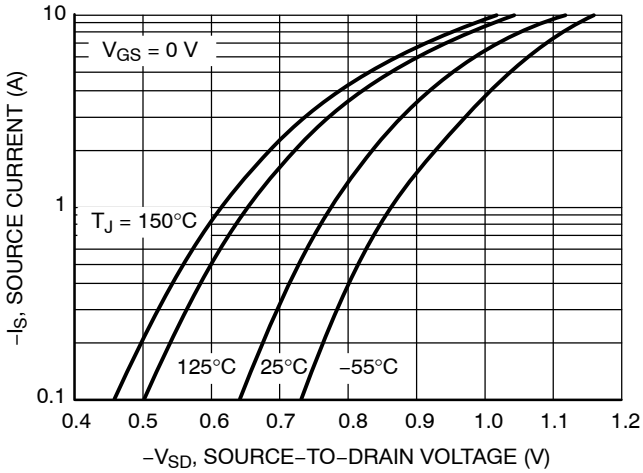


Figure 9. Diode Forward Voltage versus Current

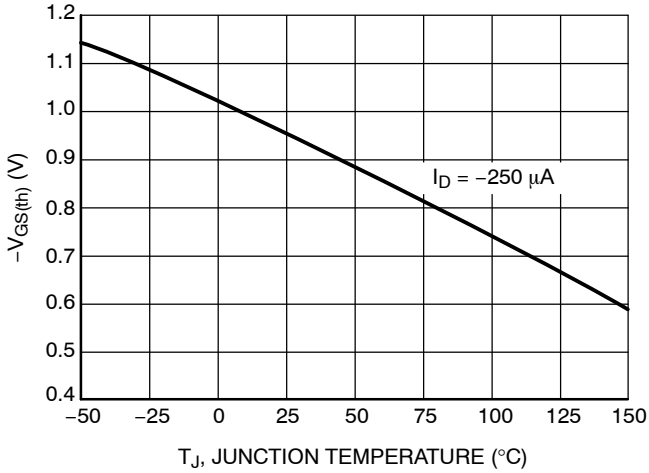


Figure 10. Threshold Voltage

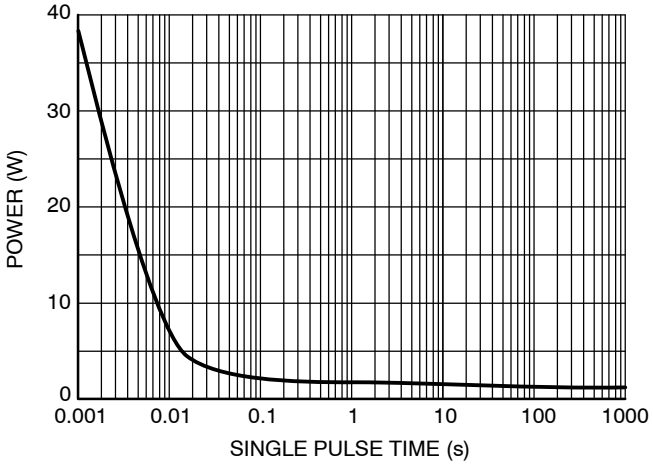


Figure 11. Single Pulse Maximum Power Dissipation

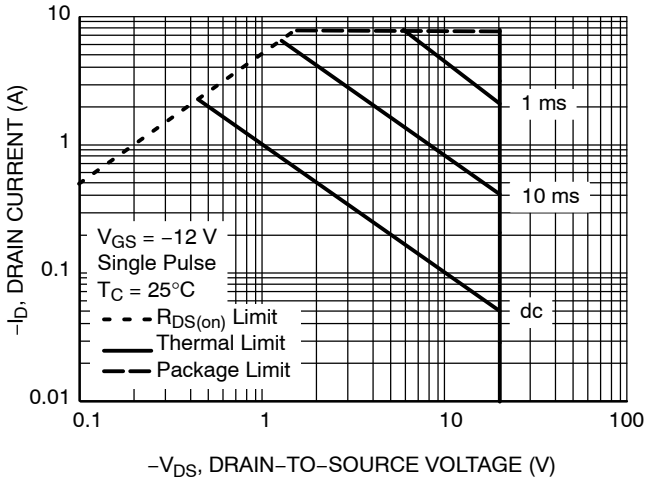


Figure 12. Maximum Rated Forward Biased Safe Operating Area

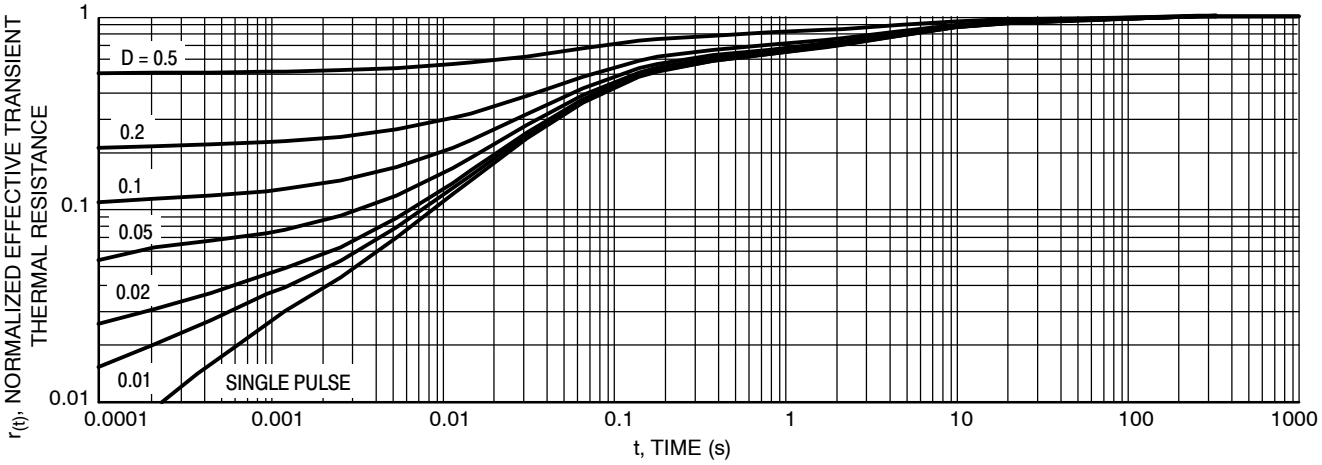


Figure 13. Thermal Response

TYPICAL SCHOTTKY CHARACTERISTICS

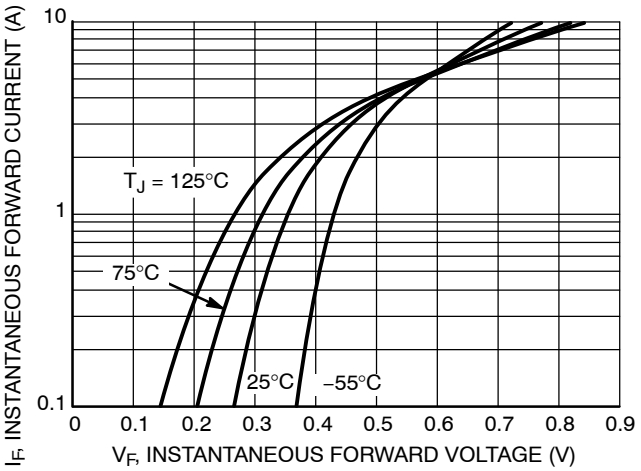


Figure 14. Typical Forward Voltage

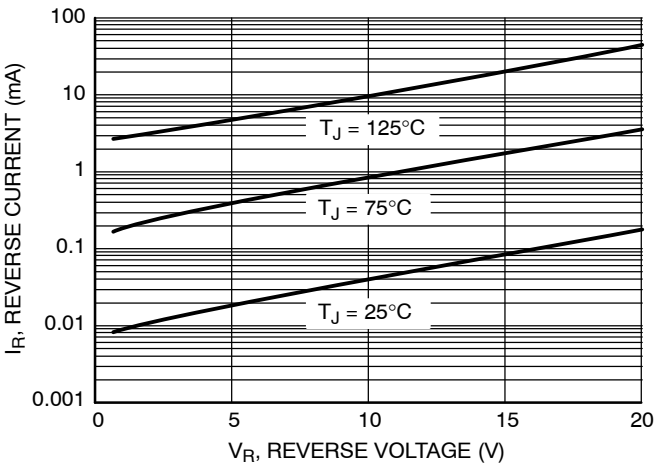


Figure 15. Typical Reverse Current

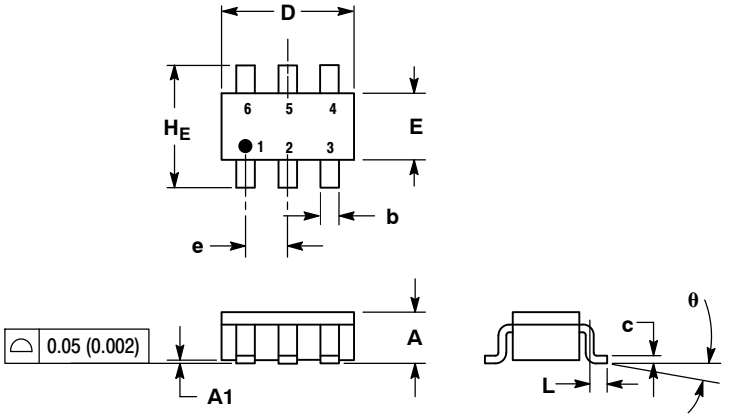
ORDERING INFORMATION

Device	Package	Shipping†
NTGD3147FT1G	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.

PACKAGE DIMENSIONS

TSOP−6
CASE 318G−02
ISSUE S

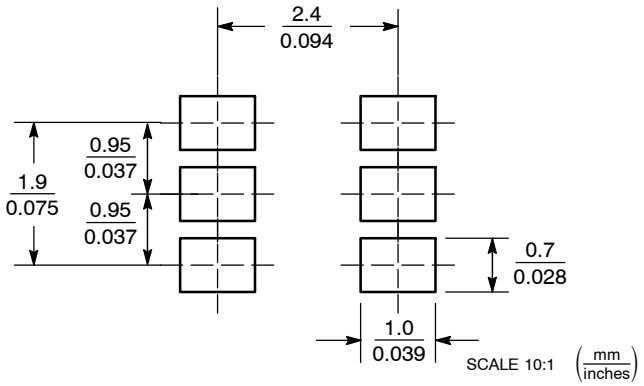


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.38	0.50	0.010	0.014	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
H_E	2.50	2.75	3.00	0.099	0.108	0.118
θ	0°	–	10°	0°	–	10°

STYLE 15:
PIN 1. ANODE
2. SOURCE
3. GATE
4. DRAIN
5. N/C
6. CATHODE

SOLDERING 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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
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