NTMSD2P102LR2

FETKY™

Power MOSFET and Schottky Diode Dual SO−8 Package

Features

- High Efficiency Components in a Single SO−8 Package
- High Density Power MOSFET with Low $R_{DS(on)}$, Schottky Diode with Low V_F
- Logic Level Gate Drive
- Independent Pin−Outs for MOSFET and Schottky Die Allowing for Flexibility in Application Use
- Less Component Placement for Board Space Savings
- SO−8 Surface Mount Package, Mounting Information for SO−8 Package Provided
- Pb−Free Package is Available

Applications

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

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

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	−20	V
Gate−to−Source Voltage − Continuous	V_{GS}	±10	V
Thermal Resistance, Junction−to−Ambient (Note 1) Total Power Dissipation @ T_A = 25°C Continuous Drain Current @ T_A = 25°C Continuous Drain Current @ T_A = 100°C Pulsed Drain Current (Note 4)	$R_{\theta JA}$ P_D I_D I_D I_{DM}	175 0.71 −2.3 −1.45 −9.0	°C/W W A A A
Thermal Resistance, Junction−to−Ambient (Note 2) Total Power Dissipation @ T_A = 25°C Continuous Drain Current @ T_A = 25°C Continuous Drain Current @ T_A = 100°C Pulsed Drain Current (Note 4)	$R_{\theta JA}$ P_D I_D I_D I_{DM}	105 1.19 −2.97 −1.88 −12	°C/W W A A A
Thermal Resistance, Junction−to−Ambient (Note 3) Total Power Dissipation @ T_A = 25°C Continuous Drain Current @ T_A = 25°C Continuous Drain Current @ T_A = 100°C Pulsed Drain Current (Note 4)	$R_{\theta JA}$ P_D I_D I_D I_{DM}	62.5 2.0 −3.85 −2.43 −15	°C/W W A A A
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C
Single Pulse Drain−to−Source Avalanche Energy − Starting T_J = 25°C (V_{DD} = −20 Vdc, V_{GS} = −4.5 Vdc, Peak I_L = −5.0 Apk, L = 28 mH, R_G = 25 Ω)	E_{AS}	350	mJ
Maximum Lead Temperature for Soldering Purposes, 1/8″ from Case for 10 Seconds	T_L	260	°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, Steady State.
2. Mounted onto a 2″ square FR−4 Board (1″ sq. 2 oz Cu 0.06″ thick single sided), Steady State.
3. Mounted onto a 2″ square FR−4 Board (1″ sq. 2 oz Cu 0.06″ thick single sided), t ≤ 10 seconds.
4. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2%.

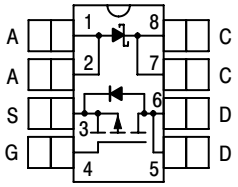
ON Semiconductor®

http://onsemi.com

MOSFET
−2.3 AMPERES, −20 VOLTS
90 mΩ @ V_{GS} = −4.5 V

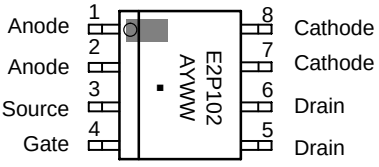
SCHOTTKY DIODE
2.0 AMPERES, 20 VOLTS
580 mV @ I_F = 2.0 A

SO−8
CASE 751
STYLE 18



TOP VIEW

MARKING DIAGRAM & PIN ASSIGNMENTS



(Top View)

E2P102 = Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package

ORDERING INFORMATION

Device	Package	Shipping†
NTMSD2P102LR2	SO−8	2500/Tape & Reel
NTMSD2P102LR2G	SO−8 (Pb−Free)	2500/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage DC Blocking Voltage	V_{RRM} V_R	20	V
Average Forward Current (Note 5) (Rated V_R, T_A = 100°C)	I_O	1.0	A
Peak Repetitive Forward Current (Note 5) (Rated V_R, Square Wave, 20 kHz, T_A = 105°C)	I_{FRM}	2.0	A
Non−Repetitive Peak Surge Current (Note 5) (Surge Applied at Rated Load Conditions, Half−Wave, Single Phase, 60 Hz)	I_{FSM}	20	A

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (Note 6)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain−to−Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D = −250 μAdc) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	 −20 −	 − −12.7	 − −	Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = −16 Vdc, V_{GS} = 0 Vdc, T_J = 25°C) (V_{DS} = −16 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)	I_{DSS}	 − −	 − −	 −1.0 −25	μAdc
Zero Gate Voltage Drain Current (V_{GS} = 0 Vdc, V_{DS} = −20 Vdc, T_J = 25°C)	I_{DSS}	−	−	−2.0	μAdc
Gate−Body Leakage Current (V_{GS} = −10 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	−	−	−100	nAdc
Gate−Body Leakage Current (V_{GS} = +10 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	−	−	100	nAdc
ON CHARACTERISTICS					
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = −250 μAdc) Temperature Coefficient (Negative)	$V_{GS(th)}$	−0.5 −	−0.90 2.5	−1.5 −	Vdc mV/°C
Static Drain−to−Source On−State Resistance (V_{GS} = −4.5 Vdc, I_D = −2.4 Adc) (V_{GS} = −2.7 Vdc, I_D = −1.2 Adc) (V_{GS} = −2.5 Vdc, I_D = −1.2 Adc)	$R_{DS(on)}$	 − − −	 0.070 0.100 0.110	 0.090 0.130 0.150	Ω
Forward Transconductance (V_{DS} = −10 Vdc, I_D = −1.2 Adc)	g_{FS}	−	4.2	−	Mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance	(V_{DS} = −16 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)	C_{iss}	−	550	750	pF
Output Capacitance		C_{oss}	−	200	300	
Reverse Transfer Capacitance		C_{rss}	−	100	175	

5. Mounted onto a 2″ square FR−4 Board (1″ sq. 2 oz Cu 0.06″ thick single sided), t ≤ 10 seconds.
6. Handling precautions to protect against electrostatic discharge is mandatory.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued) (Note 7)

Characteristic		Symbol	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Notes 8 & 9)						
Turn−On Delay Time	(V_{DD} = −10 Vdc, I_D = −2.4 Adc, V_{GS} = −4.5 Vdc, R_G = 6.0 Ω)	$t_{d(on)}$	−	10	20	ns
Rise Time		t_r	−	35	65	
Turn−Off Delay Time		$t_{d(off)}$	−	33	60	
Fall Time		t_f	−	29	55	
Turn−On Delay Time	(V_{DD} = −10 Vdc, I_D = −1.2 Adc, V_{GS} = −2.7 Vdc, R_G = 6.0 Ω)	$t_{d(on)}$	−	15	−	ns
Rise Time		t_r	−	40	−	
Turn−Off Delay Time		$t_{d(off)}$	−	35	−	
Fall Time		t_f	−	35	−	
Total Gate Charge	(V_{DS} = −16 Vdc, V_{GS} = −4.5 Vdc, I_D = −2.4 Adc)	Q_{tot}	−	10	18	nC
Gate−Source Charge		Q_{gs}	−	1.5	−	
Gate−Drain Charge		Q_{gd}	−	5.0	−	
BODY−DRAIN DIODE RATINGS (Note 8)						
Diode Forward On−Voltage	(I_S = −2.4 Adc, V_{GS} = 0 Vdc) (I_S = −2.4 Adc, V_{GS} = 0 Vdc, T_J = 125°C)	V_{SD}	− −	−0.88 −0.75	−1.0 −	Vdc
Reverse Recovery Time	(I_S = −2.4 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs)	t_{rr}	−	37	−	ns
		t_a	−	16	−	
		t_b	−	21	−	
Reverse Recovery Stored Charge		Q_{RR}	−	0.025	−	μC

SCHOTTKY RECTIFIER ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (Note 8)

Maximum Instantaneous Forward Voltage	V_F	**T_J = 25°C**	**T_J = 125°C**	V
I_F = 1.0 Adc I_F = 2.0 Adc		0.47 0.58	0.39 0.53	
Maximum Instantaneous Reverse Current	I_R	**T_J = 25°C**	**T_J = 125°C**	mA
V_R = 20 Vdc		0.05	10	
Maximum Voltage Rate of Change V_R = 20 Vdc	dV/dt	10,000		V/μs

7. Handling precautions to protect against electrostatic discharge is mandatory.
8. Indicates Pulse Test: Pulse Width = 300 μs max, Duty Cycle = 2%.
9. Switching characteristics are independent of operating junction temperature.

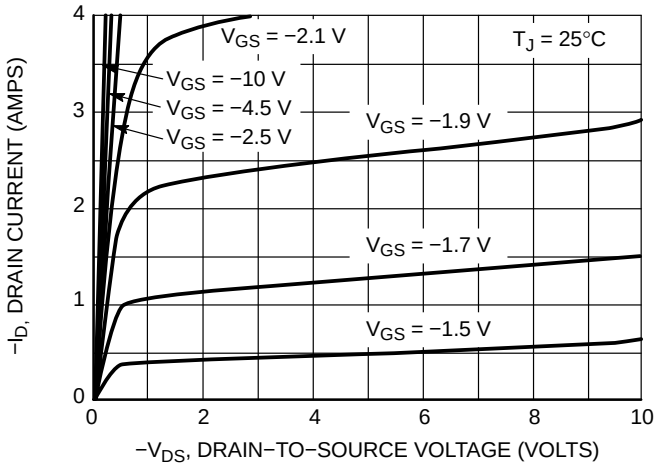


Figure 1. On−Region Characteristics.

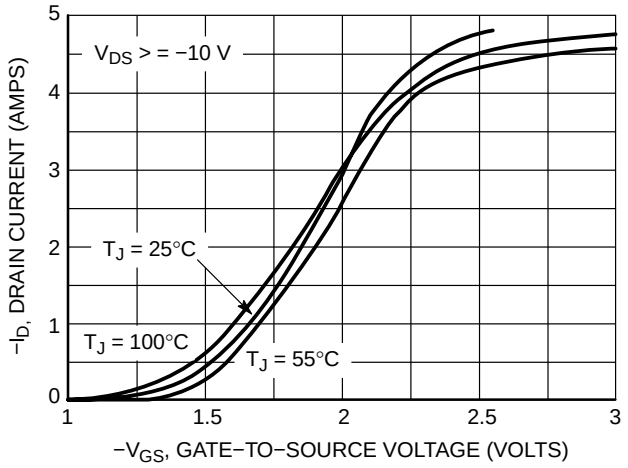


Figure 2. Transfer Characteristics.

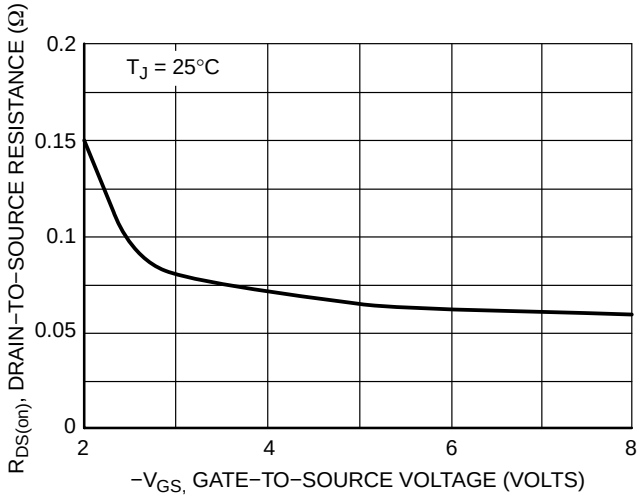


Figure 3. On−Resistance vs. Gate−to−Source Voltage.

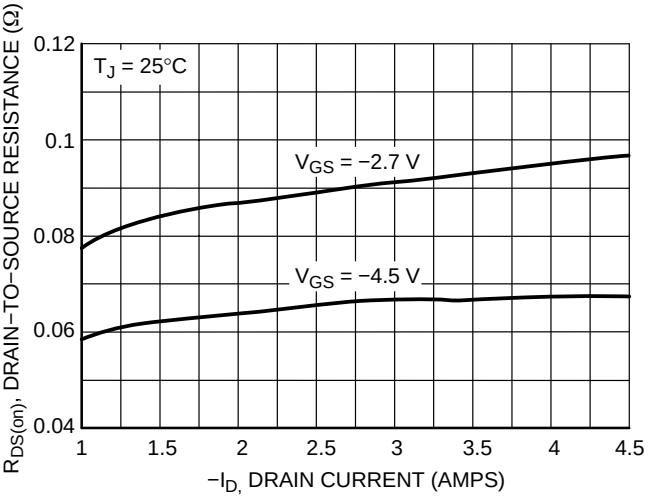


Figure 4. On−Resistance vs. Drain Current and Gate Voltage.

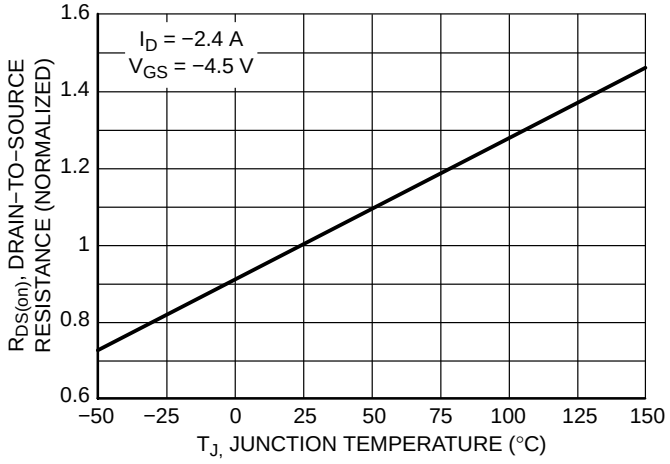


Figure 5. On−Resistance Variation with Temperature.

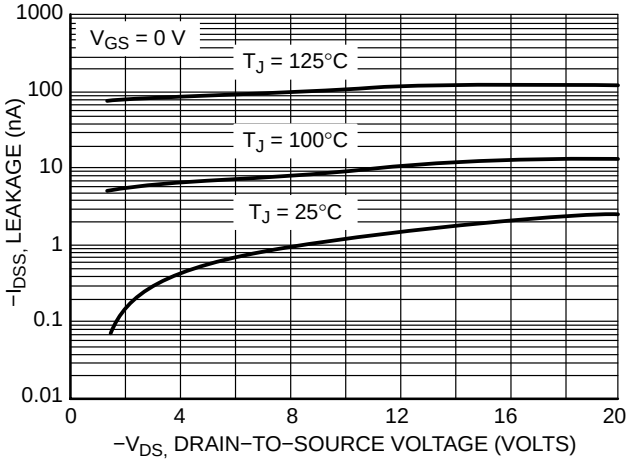


Figure 6. Drain−to−Source Leakage Current vs. Voltage.

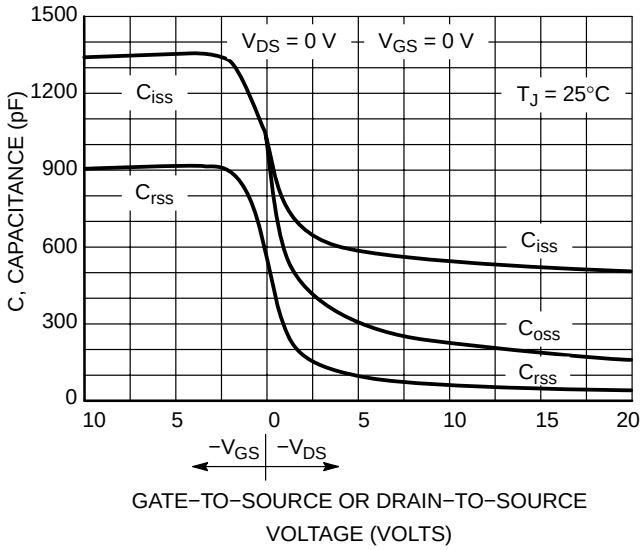


Figure 7. Capacitance Variation

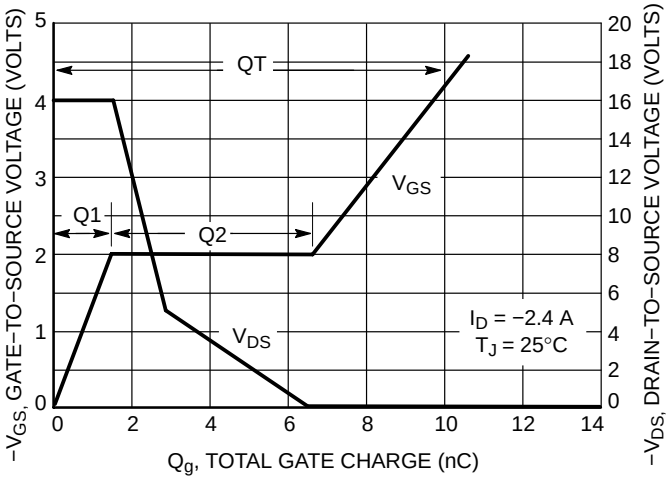


Figure 8. Gate−to−Source and Drain−to−Source Voltage versus Total Charge

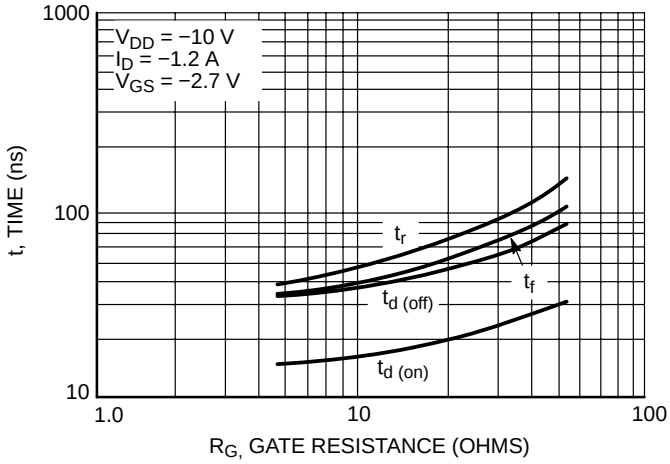


Figure 9. Resistive Switching Time Variation versus Gate Resistance

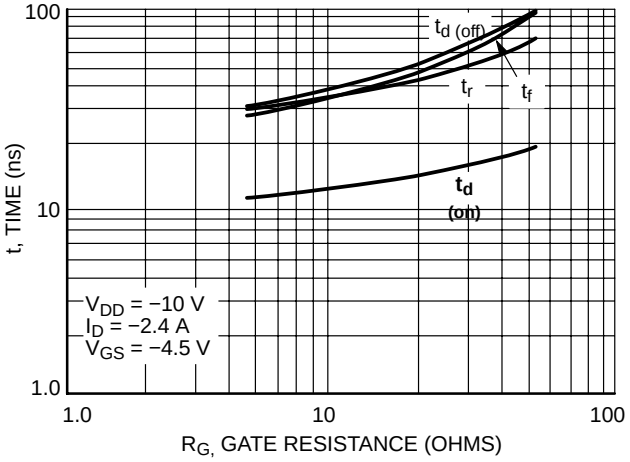


Figure 10. Resistive Switching Time Variation versus Gate Resistance

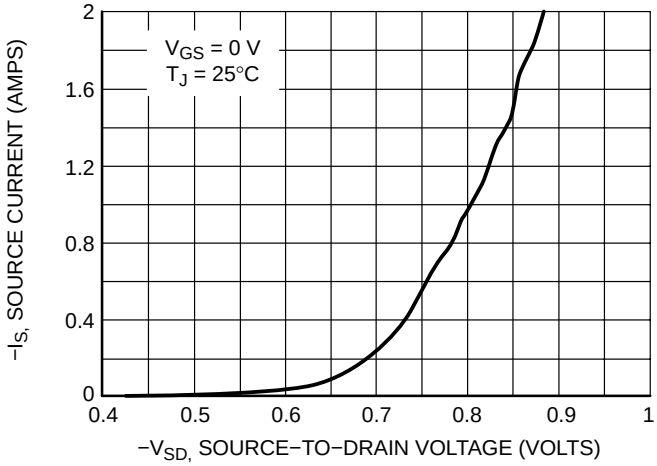


Figure 11. Diode Forward Voltage versus Current

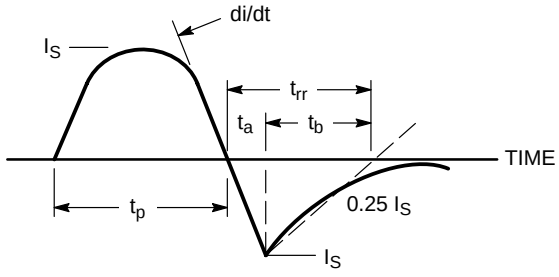


Figure 12. Diode Reverse Recovery Waveform

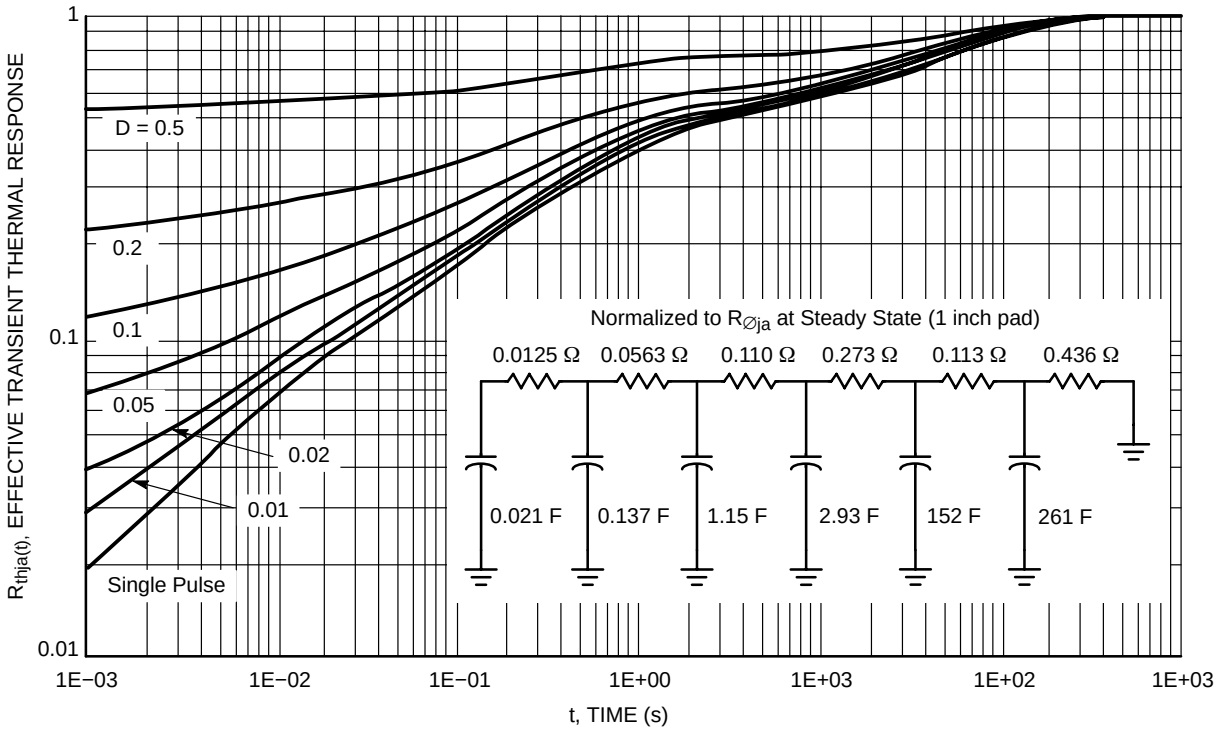


Figure 13. FET Thermal Response

TYPICAL SCHOTTKY ELECTRICAL CHARACTERISTICS

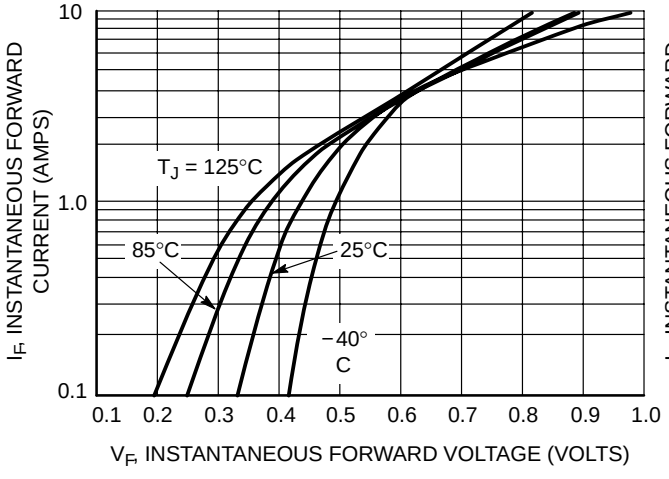


Figure 14. Typical Forward Voltage

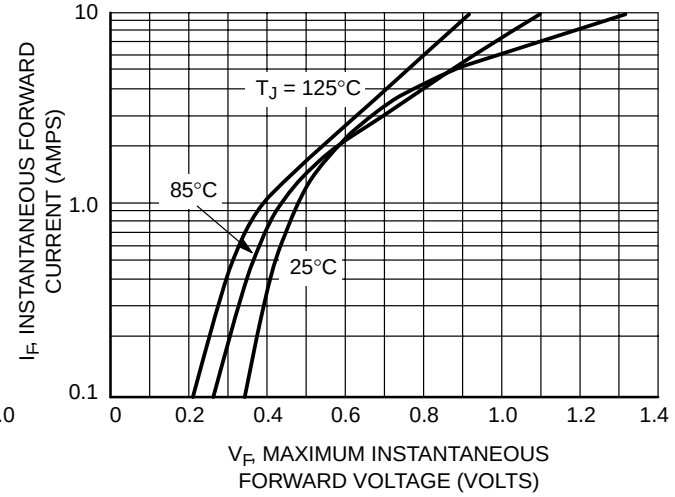


Figure 15. Maximum Forward Voltage

TYPICAL SCHOTTKY ELECTRICAL CHARACTERISTICS

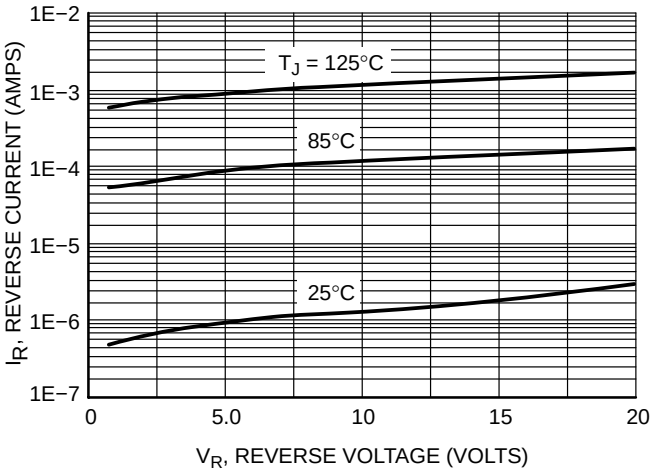


Figure 16. Typical Reverse Current

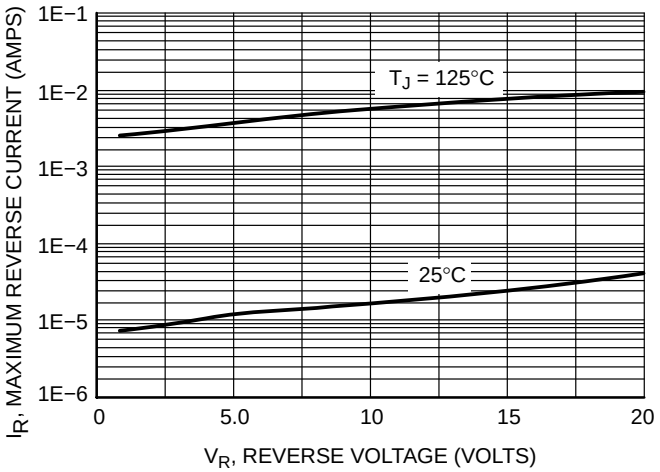


Figure 17. Maximum Reverse Current

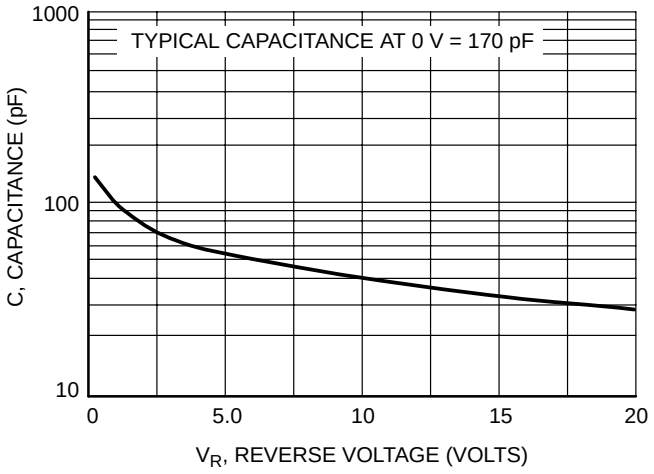


Figure 18. Typical Capacitance

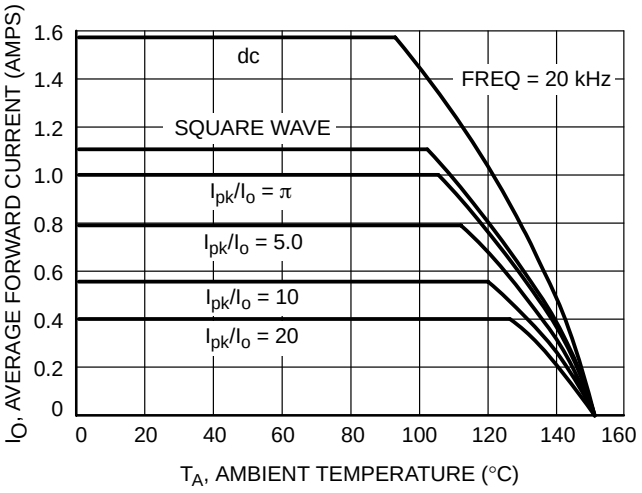


Figure 19. Current Derating

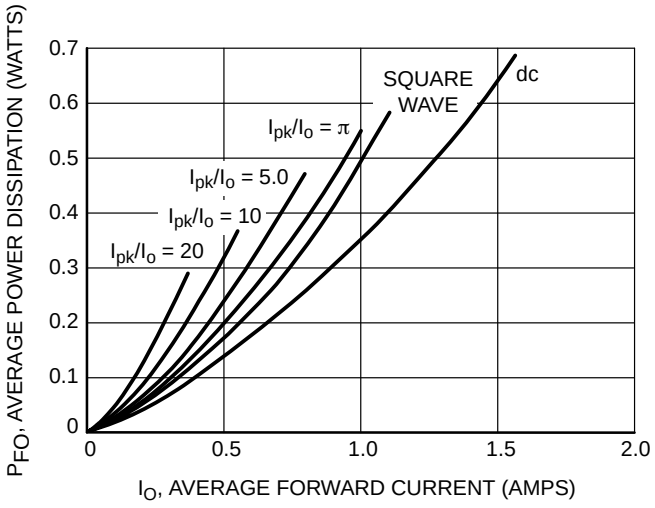


Figure 20. Forward Power Dissipation

TYPICAL SCHOTTKY ELECTRICAL CHARACTERISTICS

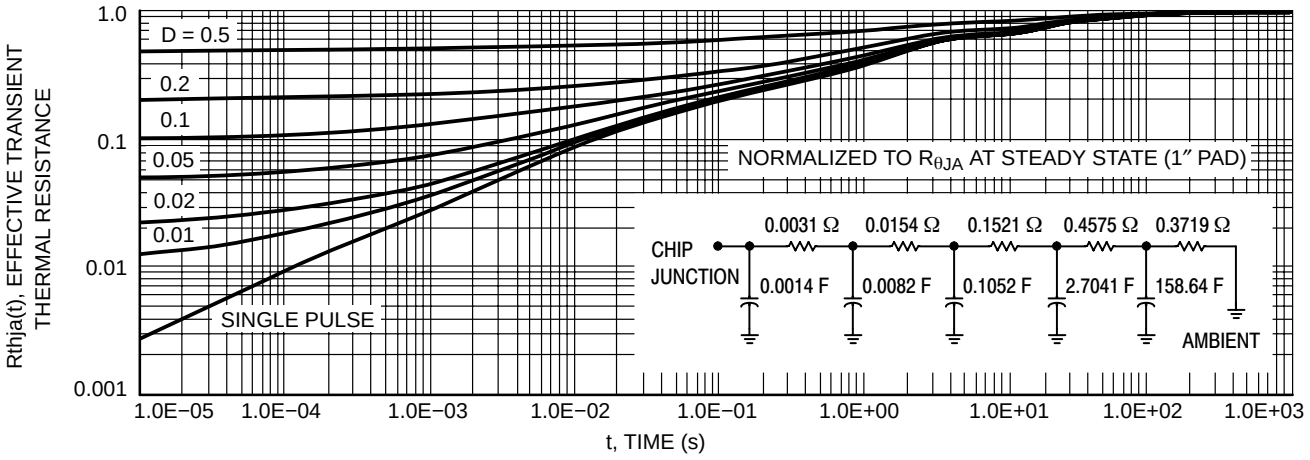
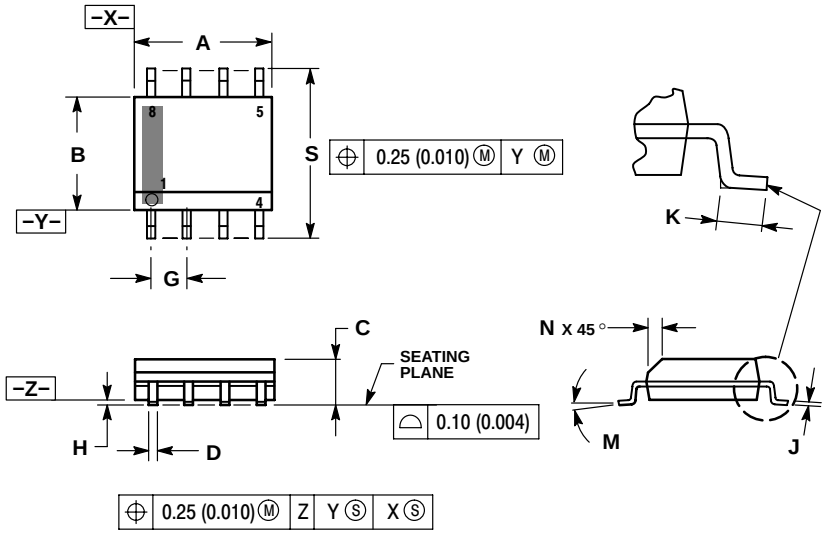


Figure 21. Schottky Thermal Response

PACKAGE DIMENSIONS

SOIC−8 NB
CASE 751−07
ISSUE AH

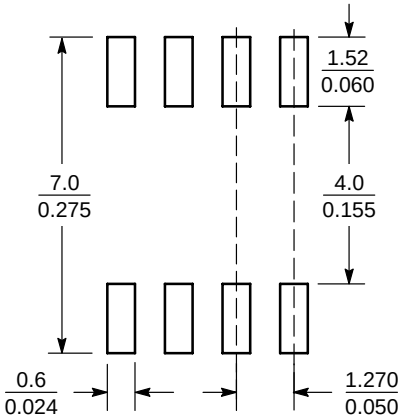


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

STYLE 18:
PIN 1. ANODE
2. ANODE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. CATHODE
8. CATHODE

SOLDERING FOOTPRINT*



SCALE 6:1 (mm / inches)

*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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PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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