NTMSD3P102R2

FETKY™

P−Channel Enhancement−Mode 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
- 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 Packages are Available

Applications

- DC−DC Converters
- Low Voltage Motor Control
- 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}	±20	V
Thermal Resistance − Junction−to−Ambient (Note 1)	$R_{\theta JA}$	171	°C/W
Total Power Dissipation @ T_A = 25°C	P_D	0.73	W
Continuous Drain Current @ T_A = 25°C	I_D	−2.34	A
Continuous Drain Current @ T_A = 70°C	I_D	−1.87	A
Pulsed Drain Current (Note 4)	I_{DM}	−8.0	A
Thermal Resistance − Junction−to−Ambient (Note 2)	$R_{\theta JA}$	100	°C/W
Total Power Dissipation @ T_A = 25°C	P_D	1.25	W
Continuous Drain Current @ T_A = 25°C	I_D	−3.05	A
Continuous Drain Current @ T_A = 70°C	I_D	−2.44	A
Pulsed Drain Current (Note 4)	I_{DM}	−12	A
Thermal Resistance − Junction−to−Ambient (Note 3)	$R_{\theta JA}$	62.5	°C/W
Total Power Dissipation @ T_A = 25°C	P_D	2.0	W
Continuous Drain Current @ T_A = 25°C	I_D	−3.86	A
Continuous Drain Current @ T_A = 70°C	I_D	−3.10	A
Pulsed Drain Current (Note 4)	I_{DM}	−15	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 = −7.5 Apk, L = 5 mH, R_G = 25 Ω)	E_{AS}	140	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.

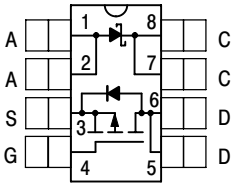
1. Minimum FR−4 or G−10 PCB, Steady State.
2. Mounted onto a 2″ square FR−4 Board (1 in sq, 2 oz Cu 0.06″ thick single−sided), Steady State.
3. Mounted onto a 2″ square FR−4 Board (1 in sq, 2 oz Cu 0.06″ thick single sided), t ≤ 10 seconds.
4. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2%.

ON Semiconductor®

http://onsemi.com

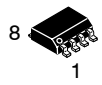
MOSFET
−3.05 AMPERES
−20 VOLTS
0.085 Ω @ V_{GS} = −10 V

SCHOTTKY DIODE
1.0 AMPERE
20 VOLTS
470 mV @ I_F = 1.0 A

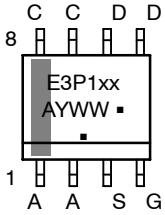


(TOP VIEW)

MARKING DIAGRAM & PIN ASSIGNMENT



SO−8
CASE 751
STYLE 18



E3P1	= Device Code
xx	= 02 or S
A	= Assembly Location
Y	= Year
WW	= Work Week
▪	= Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NTMSD3P102R2	SO−8	2500/Tape & Reel
NTMSD3P102R2G	SO−8 (Pb−Free)	2500/Tape & Reel
NTMSD3P102R2SG	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
Thermal Resistance – Junction–to–Ambient (Note 5)	$R_{\theta JA}$	204	°C/W
Thermal Resistance – Junction–to–Ambient (Note 6)	$R_{\theta JA}$	122	°C/W
Thermal Resistance – Junction–to–Ambient (Note 7)	$R_{\theta JA}$	83	°C/W
Average Forward Current (Note 7) (Rated V_R, T_A = 100°C)	I_O	1.0	A
Peak Repetitive Forward Current (Note 7) (Rated V_R, Square Wave, 20 kHz, T_A = 105°C)	I_{FRM}	2.0	A
Non–Repetitive Peak Surge Current (Note 7) (Surge Applied at Rated Load Conditions, Half–Wave, Single Phase, 60 Hz)	I_{FSM}	20	A

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.

5. Minimum FR–4 or G–10 PCB, Steady State.
6. Mounted onto a 2″ square FR–4 Board (1 in sq, 2 oz Cu 0.06″ thick single–sided), Steady State.
7. Mounted onto a 2″ square FR–4 Board (1 in sq, 2 oz Cu 0.06″ thick single sided), t ≤ 10 seconds.

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

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

8. Indicates Pulse Test: Pulse Width = 300 μs max, Duty Cycle = 2%.

MOSFET ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (Note 9)

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 −	 − −30	 − −	Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = −20 Vdc, V_{GS} = 0 Vdc, T_J = 25°C) (V_{DS} = −20 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)	I_{DSS}	 − −	 − −	 −1.0 −25	μAdc
Gate−Body Leakage Current (V_{GS} = −20 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	−	−	−100	nAdc
Gate−Body Leakage Current (V_{GS} = +20 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)	$V_{GS(th)}$	 −1.0 −	 −1.7 3.6	 −2.5 −	Vdc
Static Drain−to−Source On−State Resistance (V_{GS} = −10 Vdc, I_D = −3.05 Adc) (V_{GS} = −4.5 Vdc, I_D = −1.5 Adc)	$R_{DS(on)}$	 − −	 0.063 0.090	 0.085 0.125	Ω
Forward Transconductance (V_{DS} = −15 Vdc, I_D = −3.05 Adc)	g_{FS}	−	5.0	−	Mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance	(V_{DS} = −16 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)	C_{iss}	−	518	750	pF
Output Capacitance		C_{oss}	−	190	350	
Reverse Transfer Capacitance		C_{rss}	−	70	135	
SWITCHING CHARACTERISTICS (Notes 10 & 11)						
Turn−On Delay Time	(V_{DD} = −20 Vdc, I_D = −3.05 Adc, V_{GS} = −10 Vdc, R_G = 6.0 Ω)	$t_{d(on)}$	−	12	22	ns
Rise Time		t_r	−	16	30	
Turn−Off Delay Time		$t_{d(off)}$	−	45	80	
Fall Time		t_f	−	45	80	
Turn−On Delay Time	(V_{DD} = −20 Vdc, I_D = −1.5 Adc, V_{GS} = −4.5 Vdc, R_G = 6.0 Ω)	$t_{d(on)}$	−	16	−	ns
Rise Time		t_r	−	42	−	
Turn−Off Delay Time		$t_{d(off)}$	−	32	−	
Fall Time		t_f	−	35	−	
Total Gate Charge	(V_{DS} = −20 Vdc, V_{GS} = −10 Vdc, I_D = −3.05 Adc)	Q_{tot}	−	16	25	nC
Gate−Source Charge		Q_{gs}	−	2.0	−	
Gate−Drain Charge		Q_{gd}	−	4.5	−	
BODY−DRAIN DIODE RATINGS (Note 10)						
Diode Forward On−Voltage	(I_S = −3.05 Adc, V_{GS} = 0 Vdc) (I_S = −3.05 Adc, V_{GS} = 0 Vdc, T_J = 125°C)	V_{SD}	 −	 −0.96 −0.78	 −1.25 −	Vdc
Reverse Recovery Time	(I_S = −3.05 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs)	t_{rr}	−	34	−	ns
		t_a	−	18	−	
		t_b	−	16	−	
Reverse Recovery Stored Charge		Q_{RR}	−	0.03	−	μC

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

TYPICAL MOSFET ELECTRICAL CHARACTERISTICS

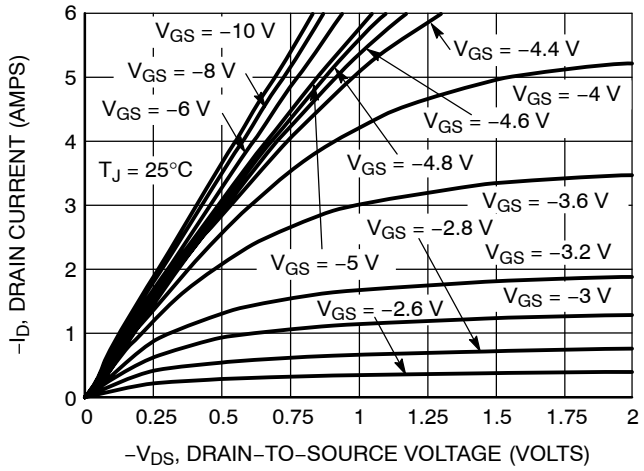


Figure 1. On−Region Characteristics

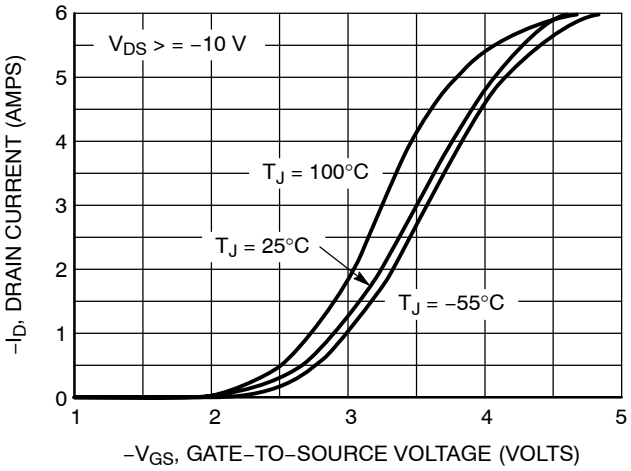


Figure 2. Transfer Characteristics

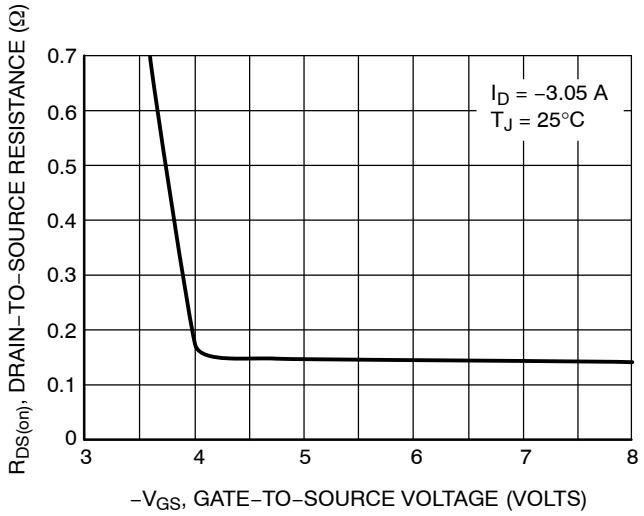


Figure 3. On−Resistance vs. Gate−to−Source Voltage

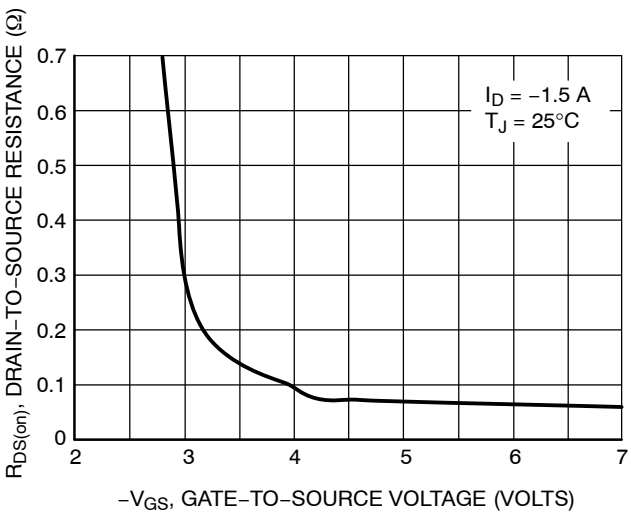


Figure 4. On−Resistance vs. Gate−to−Source Voltage

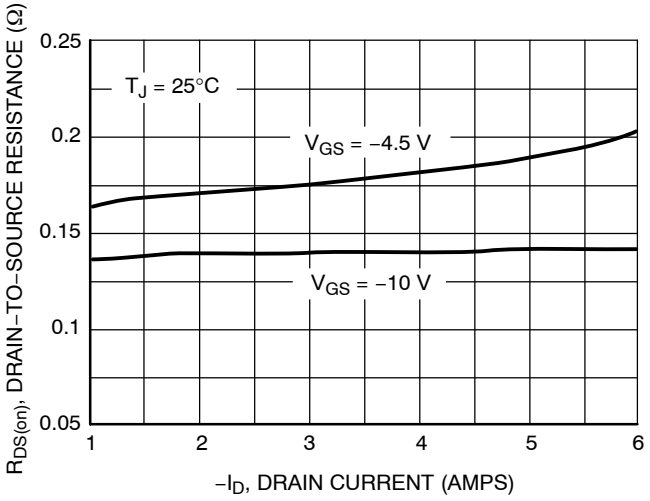


Figure 5. On−Resistance vs. Drain Current and Gate Voltage

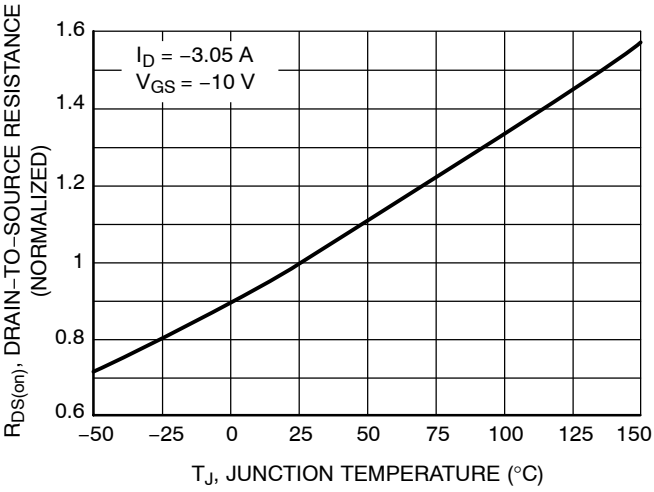


Figure 6. On Resistance Variation with Temperature

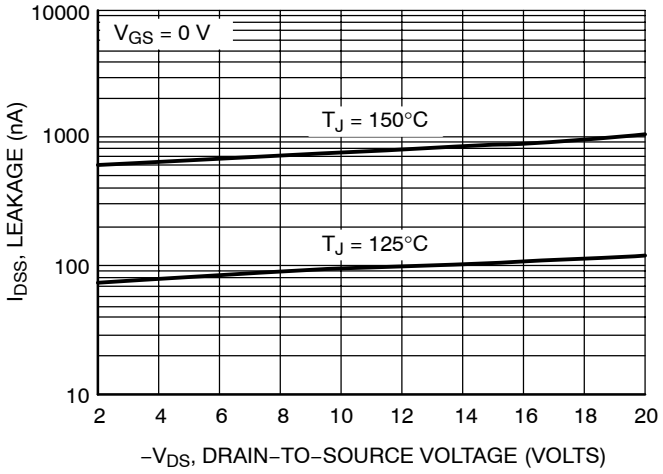


Figure 7. Drain−to−Source Leakage Current vs. Voltage

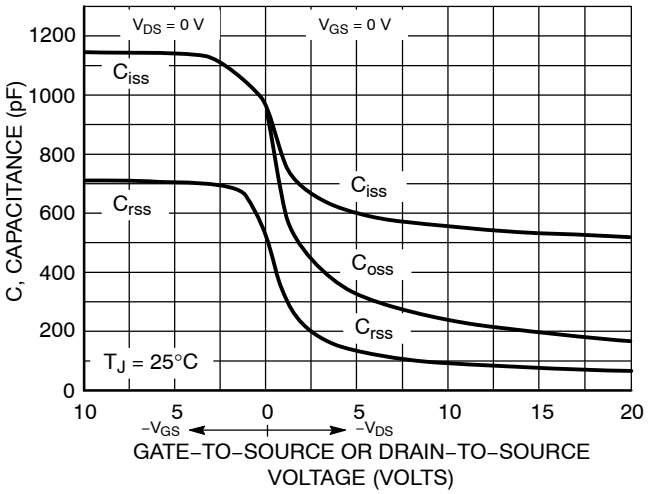


Figure 8. Capacitance Variation

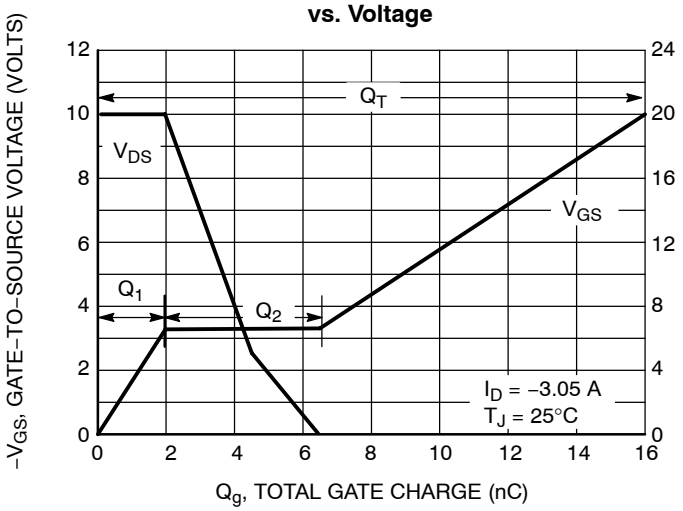


Figure 9. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

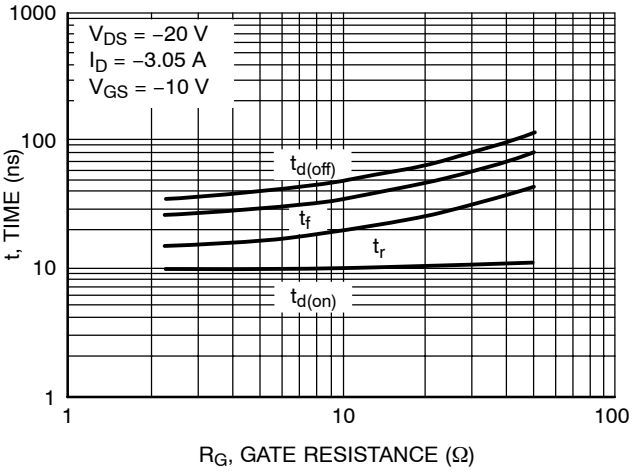


Figure 10. Resistive Switching Time Variation vs. Gate Resistance

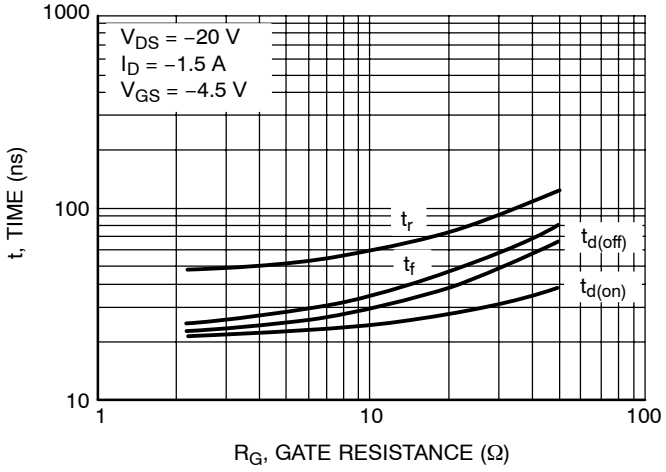


Figure 11. Resistive Switching Time Variation vs. Gate Resistance

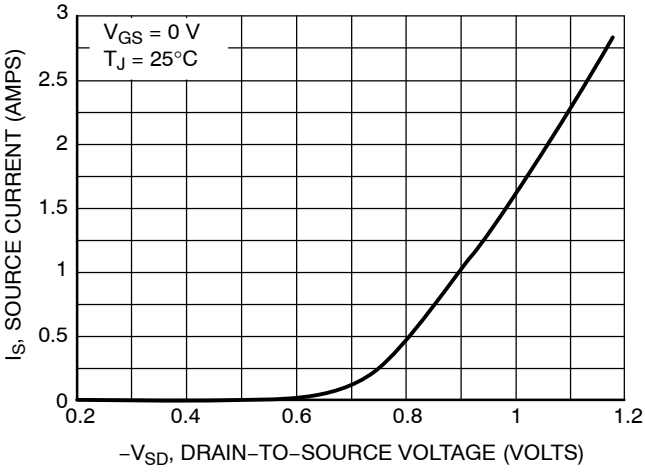


Figure 12. Diode Forward Voltage vs. Current

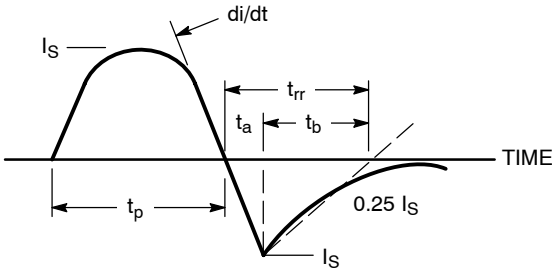


Figure 13. Diode Reverse Recovery Waveform

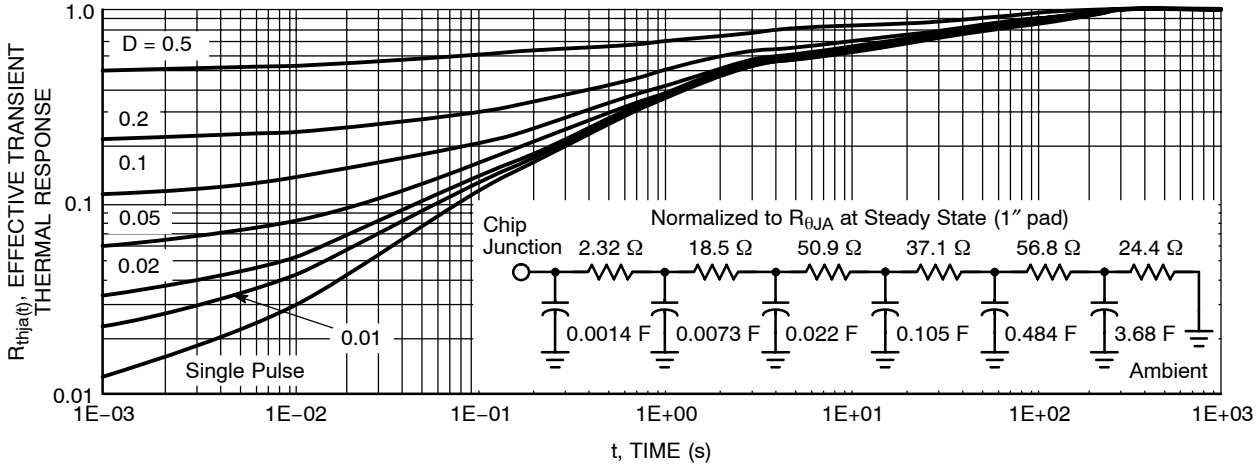


Figure 14. FET Thermal Response

TYPICAL SCHOTTKY ELECTRICAL CHARACTERISTICS

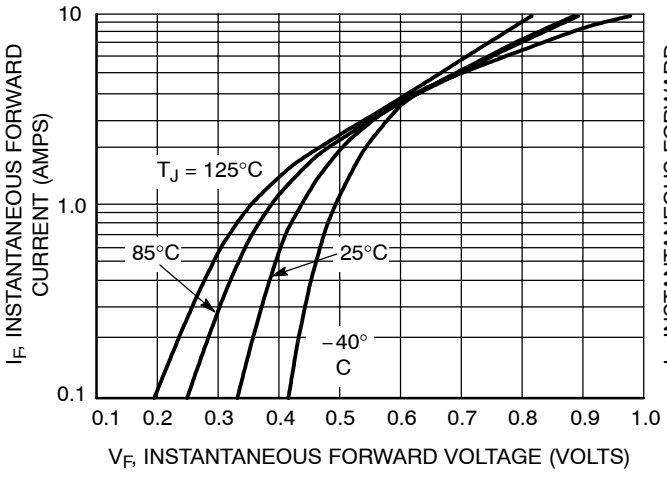


Figure 15. Typical Forward Voltage

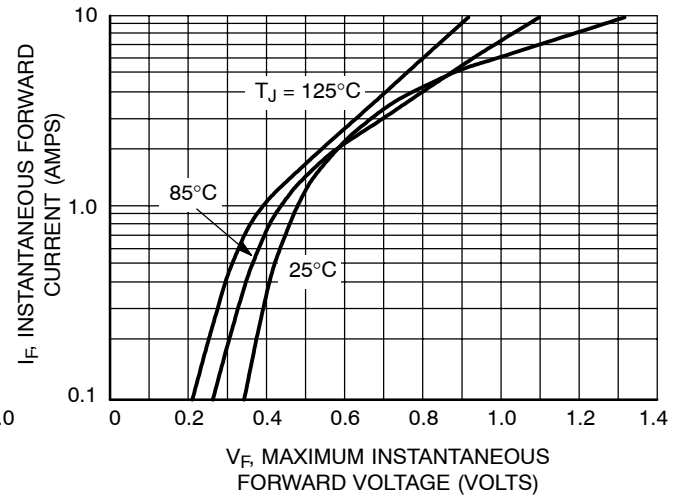


Figure 16. Maximum Forward Voltage

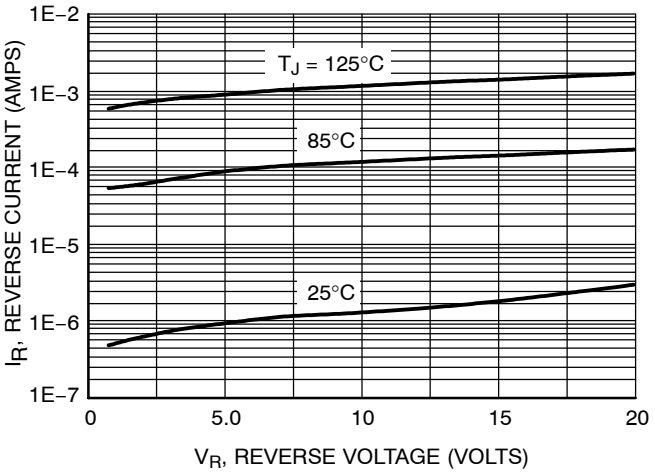


Figure 17. Typical Reverse Current

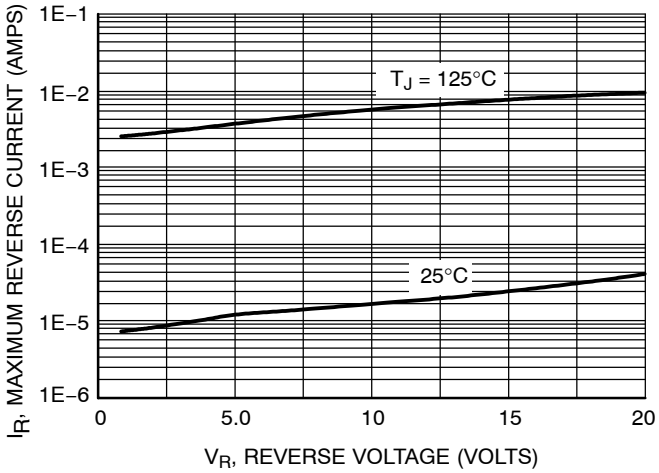


Figure 18. Maximum Reverse Current

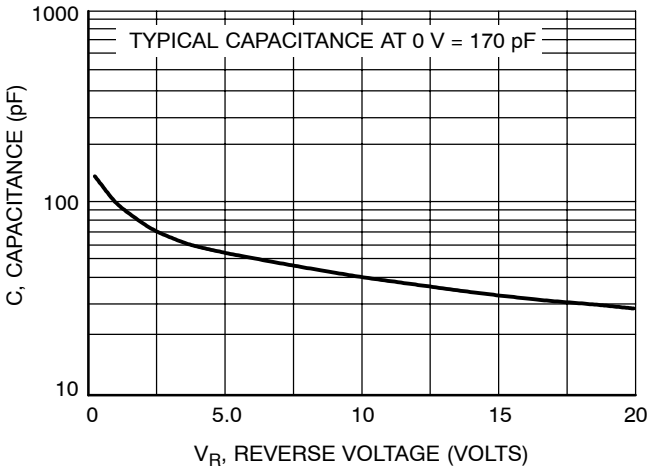


Figure 19. Typical Capacitance

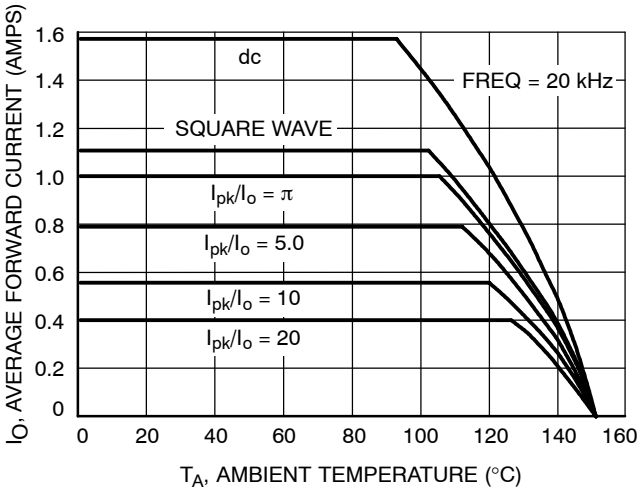


Figure 20. Current Derating

TYPICAL SCHOTTKY ELECTRICAL CHARACTERISTICS

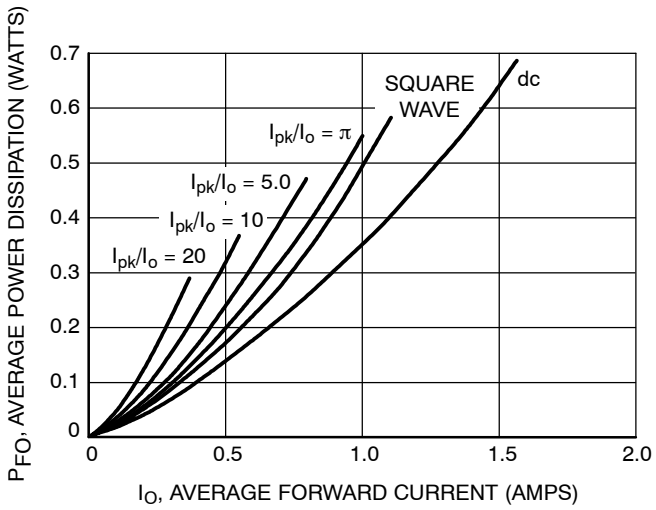


Figure 21. Forward Power Dissipation

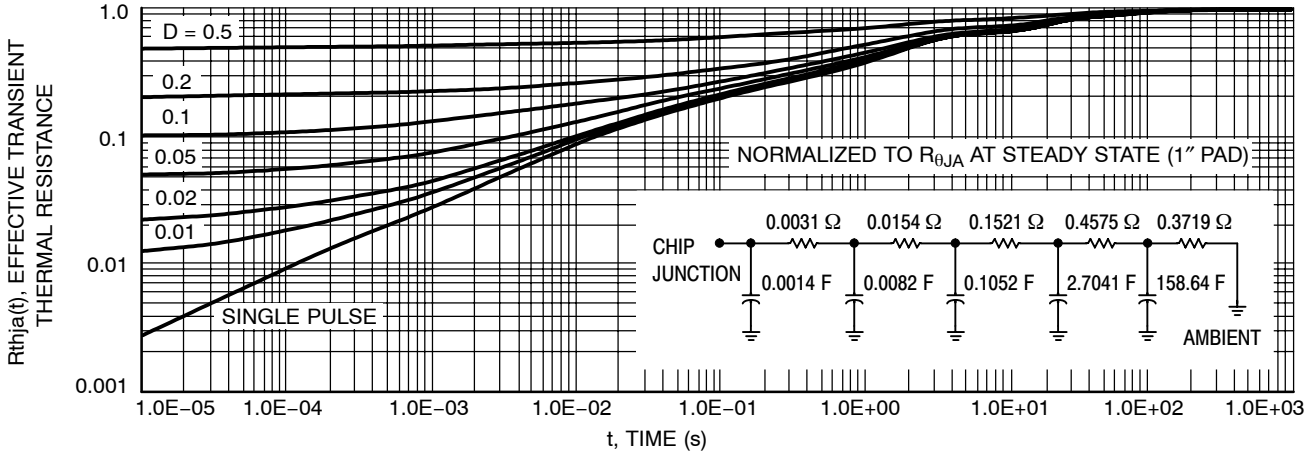
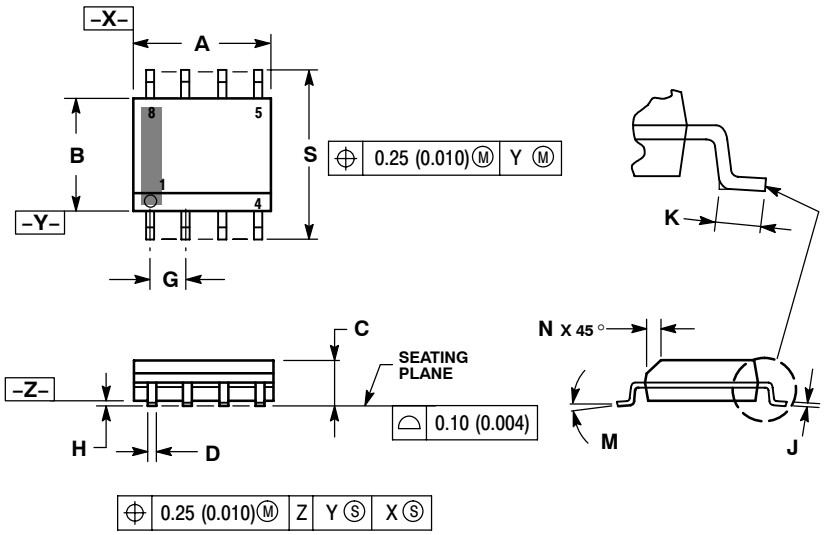


Figure 22. Schottky Thermal Response

PACKAGE DIMENSIONS

SO−8 NB
CASE 751−07
ISSUE AG

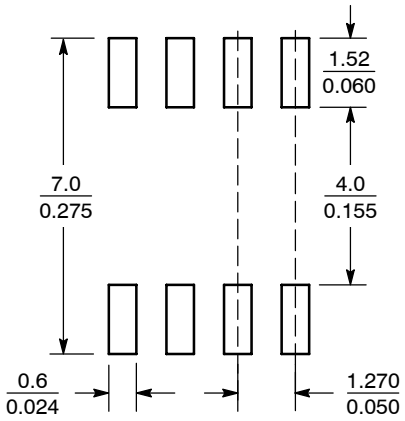


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) 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 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*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

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