NTLJF4156N

Power MOSFET and Schottky Diode

30 V, 4.0 A, N−Channel, with 1.0 A Schottky Barrier Diode, SC−88FL 2x2 mm, µCool™ Package

ON Semiconductor®

http://onsemi.com

Features

- Leadless SMD Package Featuring a MOSFET and Schottky Diode
- Better Thermal Resistance than TSOP−6 Package
- $R_{DS(on)}$ Rated at Low $V_{GS(on)}$ Levels, V_{GS} = 1.5 V
- Low V_F Schottky
- This is a Pb−Free Device

Applications

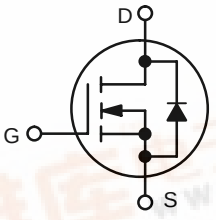
- DC−DC Converters
- Li−Ion Battery Applications in Cell Phones, PDA's, Media Players
- Color Display and Camera Flash Regulators

MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX (Note 1)
30 V	70 mΩ @ 4.5 V	4.0 A
	90 mΩ @ 2.5 V	
	125 mΩ @ 1.8 V	
	250 mΩ @ 1.5 V	

SCHOTTKY DIODE

V_R MAX	V_F TYP	I_F MAX
30 V	0.48 V	1.0 A



N−CHANNEL MOSFET

SCHOTTKY DIODE

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	30	V
Gate−to−Source Voltage			V_{GS}	±8.0	V
Continuous Drain Current (Note 1)	Steady State	T_J = 25°C	I_D	3.0	A
		T_J = 85°C		2.4	
	t ≤ 5 s	T_J = 25°C		4.0	
Power Dissipation (Note 1)	Steady State	T_J = 25°C	P_D	1.21	W
	t ≤ 5 s			2.08	
Continuous Drain Current (Note 2)	Steady State	T_J = 25°C	I_D	2.0	A
		T_J = 85°C		1.4	
Power Dissipation (Note 2)		T_J = 25°C	P_D	0.44	
Pulsed Drain Current	t_p = 10 µs		I_{DM}	17	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to 150	°C
Source Current (Body Diode) (Note 2)			I_S	2.4	A
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surface Mounted on FR4 Board using the minimum recommended pad size.

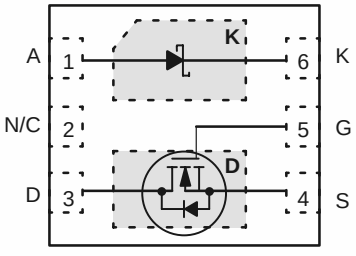
1

DFN6
CASE 506AN

MARKING DIAGRAM

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

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

Publication Order Number:

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

Parameter	Symbol	Value	Unit
Peak Repetitive Reverse Voltage	V_{RRM}	30	V
DC Blocking Voltage	V_R	30	V
Average Rectified Forward Current	I_F	1.0	A

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction−to−Ambient – Steady State (Note 3)	$R_{\theta JA}$	103	°C/W
Junction−to−Ambient – t ≤ 5 s (Note 3)	$R_{\theta JA}$	60	
Junction−to−Ambient – Steady State Min Pad (Note 4)	$R_{\theta JA}$	285	
Junction−to−Ambient − Pulsed (50/50 Duty Cycle) Minimum Pad (Note 4)	$R_{\theta JA}$	115	

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.

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

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		30			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 250 μA, Ref to 25°C			18.1		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 24 V, V_{GS} = 0 V	T_J = 25°C			1.0	μA
			T_J = 125°C			10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±8.0 V				100	nA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		0.4	0.7	1.0	V
Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				2.8		mV/°C
Drain−to−Source On−Resistance	$R_{DS(on)}$	V_{GS} = 4.5, I_D = 2.0 A			47	70	mΩ
		V_{GS} = 2.5, I_D = 2.0 A			56	90	
		V_{GS} = 1.8, I_D = 1.8 A			88	125	
		V_{GS} = 1.5, I_D = 1.5 A			133	250	
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 2.0 A			4.5		S
CHARGES, CAPACITANCES AND GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 15 V			427		pF
Output Capacitance	C_{OSS}				51		
Reverse Transfer Capacitance	C_{RSS}				32		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 2.0 A			5.4	6.5	nC
Threshold Gate Charge	$Q_{G(TH)}$				0.5		
Gate−to−Source Charge	Q_{GS}				0.8		
Gate−to−Drain Charge	Q_{GD}				1.24		
Gate Resistance	R_G				3.7		Ω

5. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

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

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DD} = 15 V, I_D = 2.0 A, R_G = 2.0 Ω			4.8		ns
Rise Time	t_r				9.2		
Turn−Off Delay Time	$t_{d(OFF)}$				14.2		
Fall Time	t_f				1.7		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Recovery Voltage	V_{SD}	V_{GS} = 0 V, IS = 2.0 A	T_J = 25°C		0.78	1.2	V
			T_J = 125°C		0.62		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, d_{ISD}/d_t = 100 A/μs, I_S = 2.0 A			10.5		ns
Charge Time	t_a				7.6		
Discharge Time	t_b				2.9		
Reverse Recovery Time	Q_{RR}				5.0		nC

5. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
6. 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 = 0.1 A		0.34	0.39	V
		I_F = 1.0 A		0.47	0.53	
Maximum Instantaneous Reverse Current	I_R	V_R = 30 V		0.006	0.093	mA
		V_R = 20 V		0.003	0.036	
		V_R = 10 A		0.002	0.018	

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 85°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	V_F	I_F = 0.1 A		0.22	0.35	V
		I_F = 1.0 A		0.40	0.52	
Maximum Instantaneous Reverse Current	I_R	V_R = 30 V		2.2	4.8	mA
		V_R = 20 V		1.3	2.5	
		V_R = 10 V		0.6	0.8	

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 = 0.1 A		0.2	0.32	V
		I_F = 1.0 A		0.4	0.53	
Maximum Instantaneous Reverse Current	I_R	V_R = 30 V		6.7	42	mA
		V_R = 20 V		2.5	10.6	
		V_R = 10 V		1.6	3.4	

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Capacitance	C	V_R = 5.0 V, f = 1.0 MHz		38		pF

7. Surface−mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
8. Surface−mounted on FR4 board using the minimum recommended pad size of 30 mm^2, 2 oz cu.
9. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤2%.
10. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

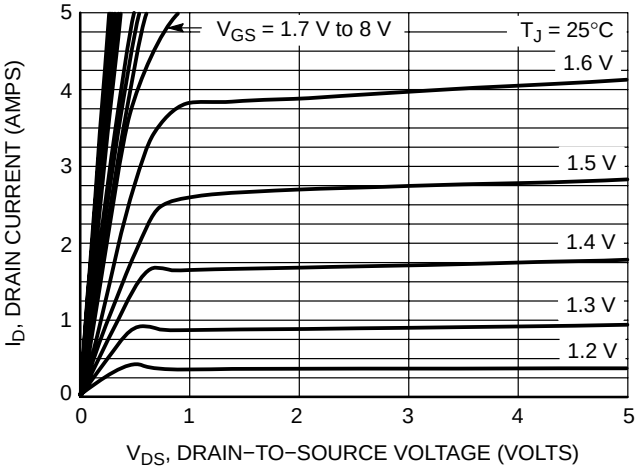


Figure 1. On−Region Characteristics

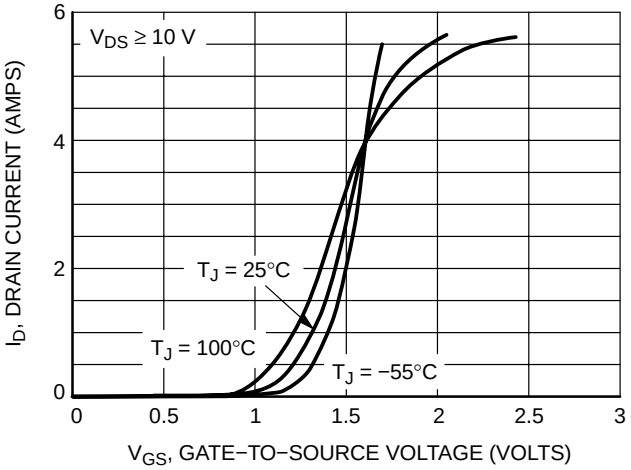


Figure 2. Transfer Characteristics

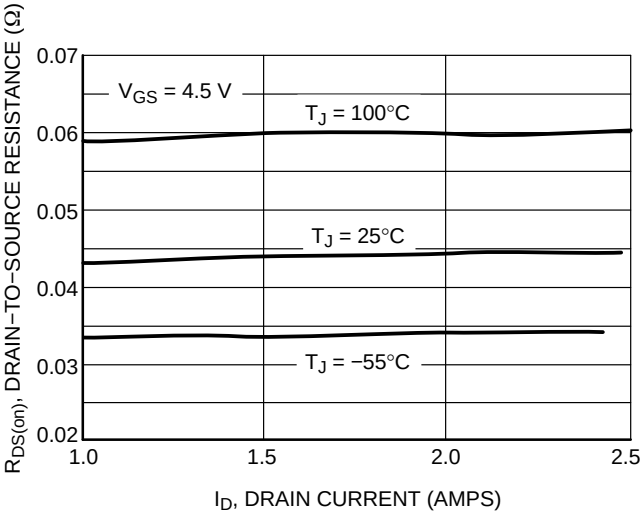


Figure 3. On−Resistance versus Drain Current

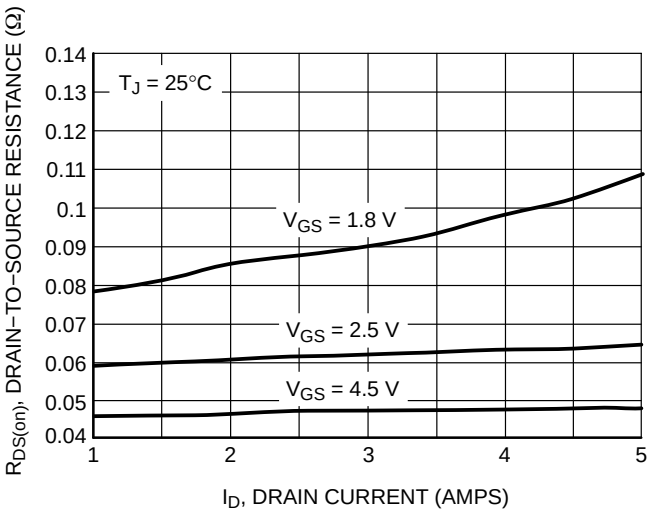


Figure 4. On−Resistance versus Drain Current and Gate Voltage

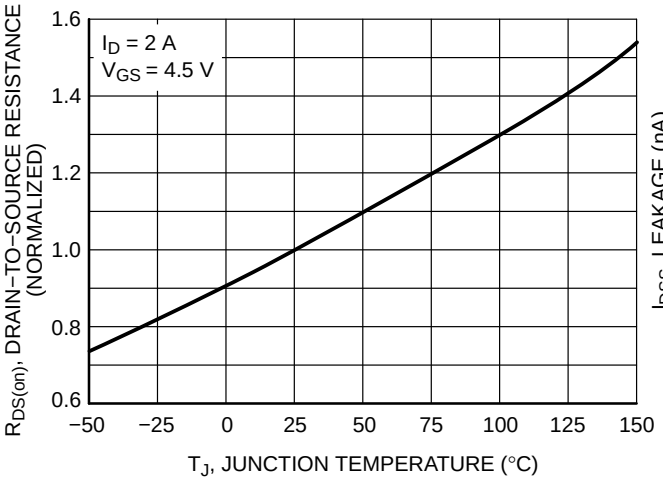


Figure 5. On−Resistance Variation with Temperature

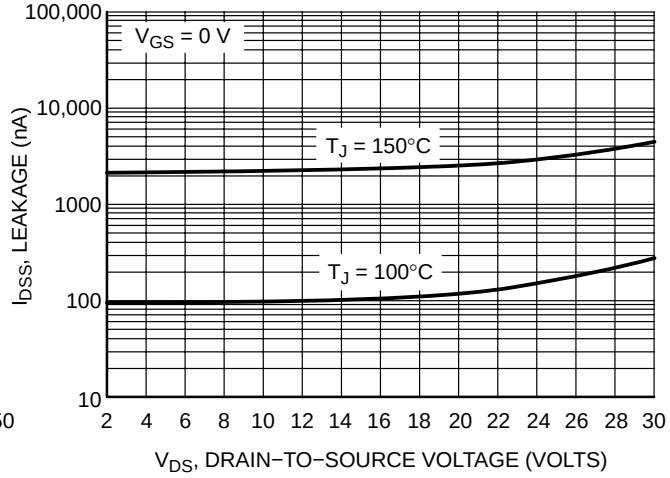


Figure 6. Drain−to−Source Leakage Current versus Voltage

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

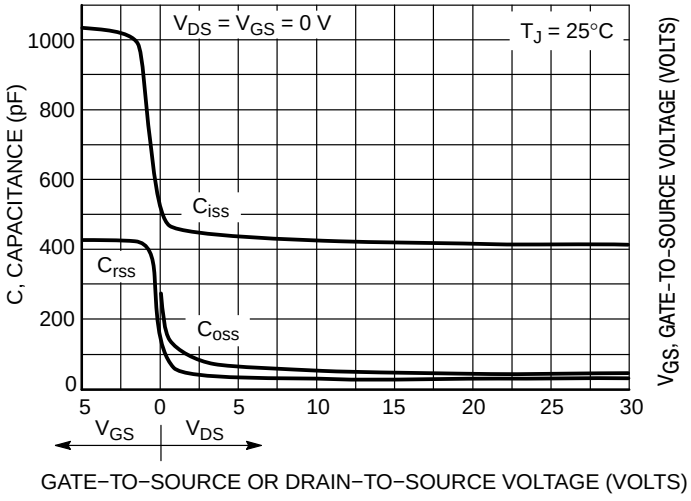


Figure 7. Capacitance Variation

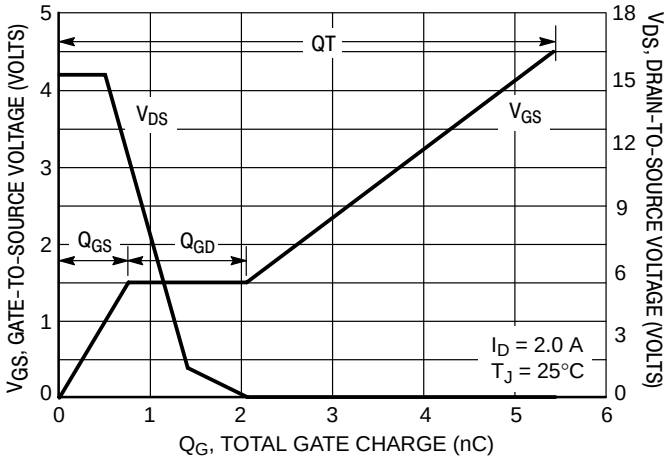


Figure 8. Gate−To−Source and Drain−To−Source Voltage versus Total Charge

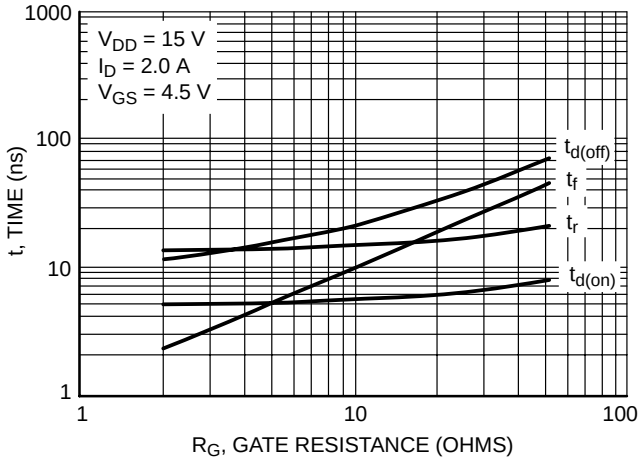


Figure 9. Resistive Switching Time Variation versus Gate Resistance

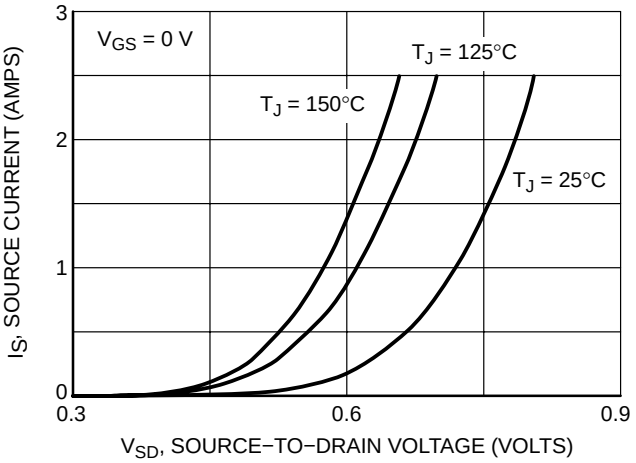


Figure 10. Diode Forward Voltage versus Current

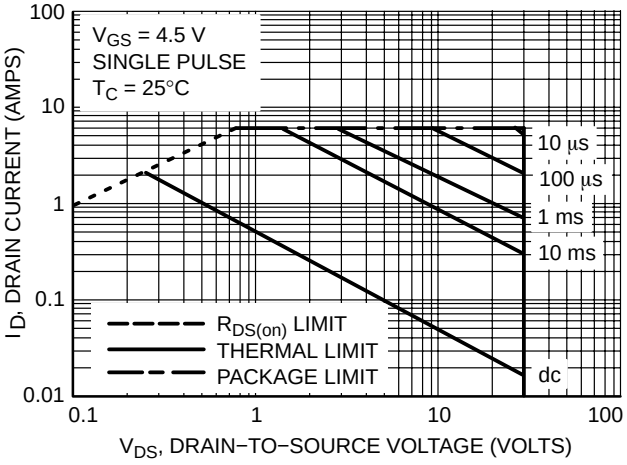


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

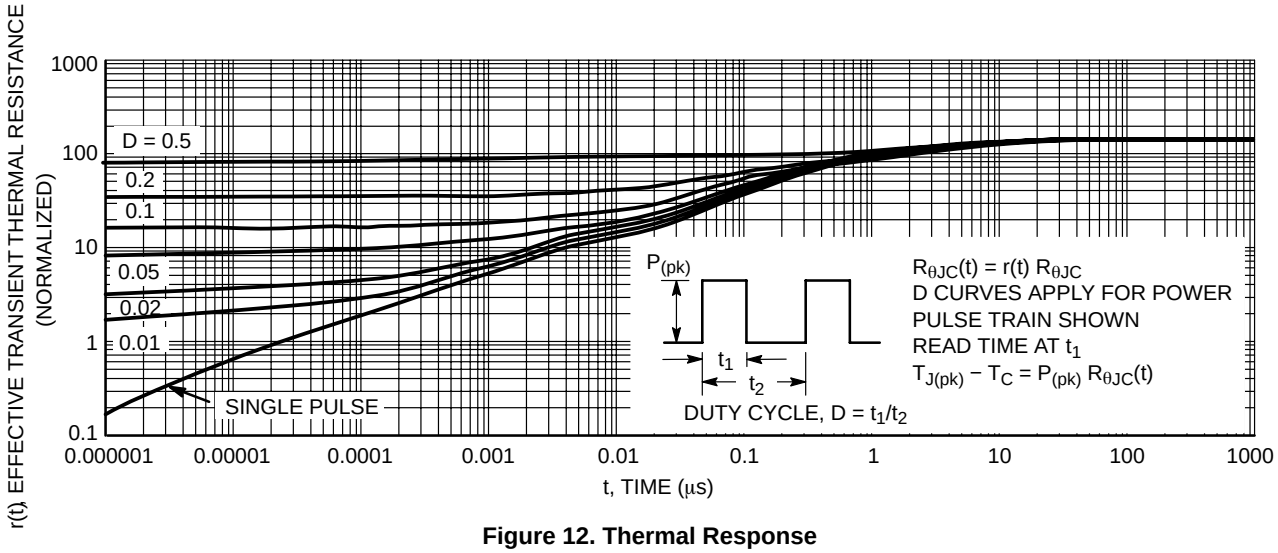


Figure 12. Thermal Response

TYPICAL SCHOTTKY PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

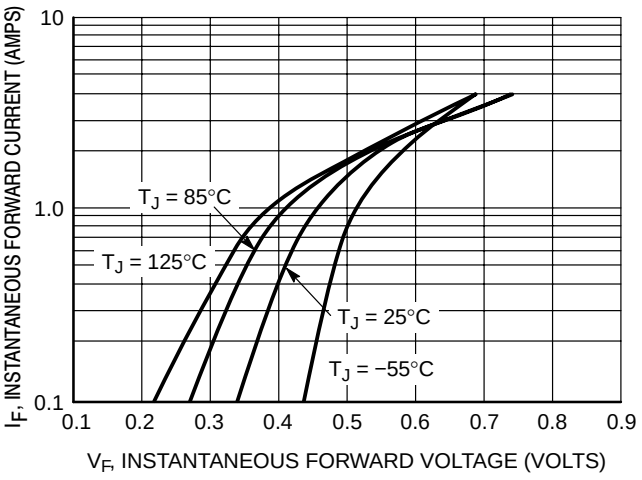


Figure 13. Typical Forward Voltage

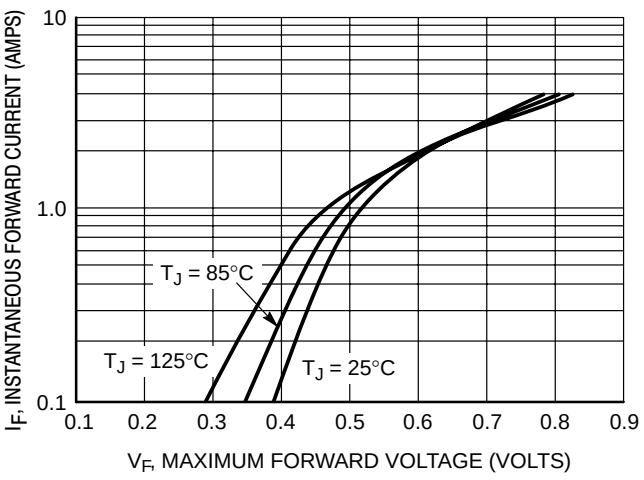


Figure 14. Maximum Forward Voltage

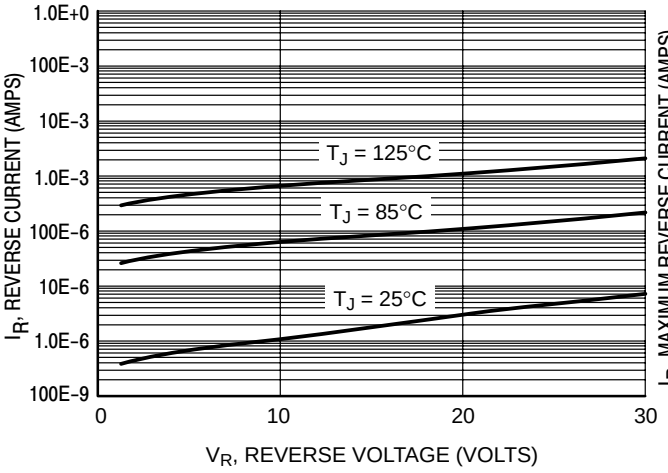


Figure 15. Typical Reverse Current

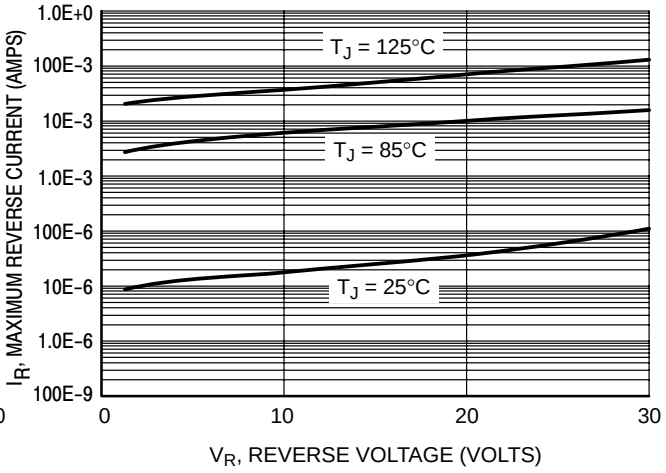


Figure 16. Maximum Reverse Current

ORDERING INFORMATION

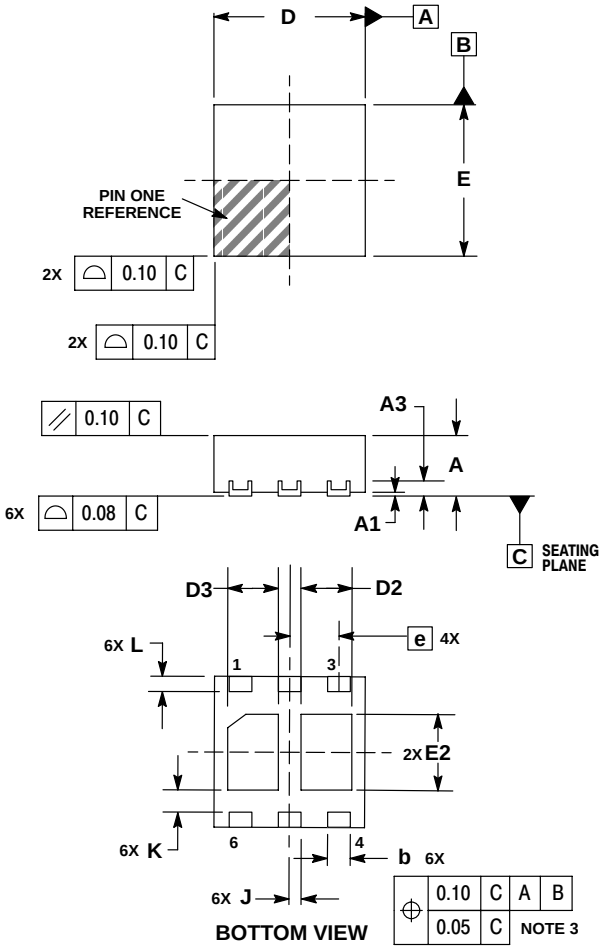
Device	Package	Shipping†
NTLJF4156NT1G	SC−88FL (Pb−Free)	3000 / Tape & Reel

†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.

NTLJF4156N

PACKAGE DIMENSIONS

DFN6
CASE 506AN−01
ISSUE A

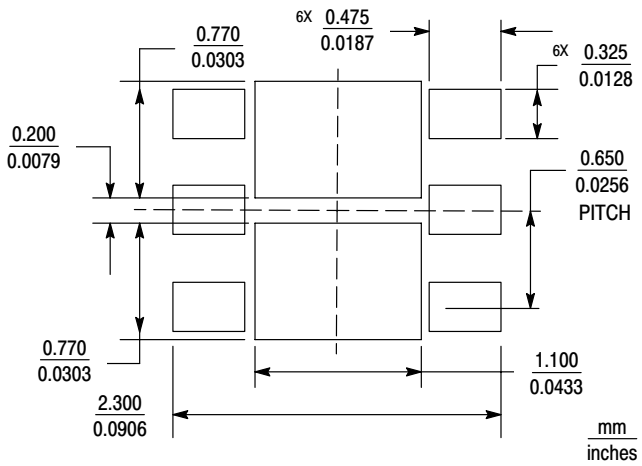


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.70	0.80
A1	0.00	0.05
A3	0.20 REF	
b	0.25	0.35
D	2.00 BSC	
D2	0.57	0.77
E	2.00 BSC	
E2	0.90	1.10
e	0.65 BSC	
K	0.25 REF	
L	0.20	0.30
J	0.15 REF	

STYLE 1:
PIN 1. SOURCE1
2. GATE1
3. DRAIN2
4. SOURCE2
5. GATE2
6. DRAIN1

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.

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PUBLICATION ORDERING INFORMATION

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