

NTLJF4156N

Power MOSFET and Schottky Diode

30 V, 4.0 A, N-Channel, with 1.0 A Schottky Barrier Diode, SC-88FL 2x2 mm, μ Cool™ 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 m Ω @ 4.5 V	4.0 A
	90 m Ω @ 2.5 V	
	125 m Ω @ 1.8 V	
	250 m Ω @ 1.5 V	

SCHOTTKY DIODE

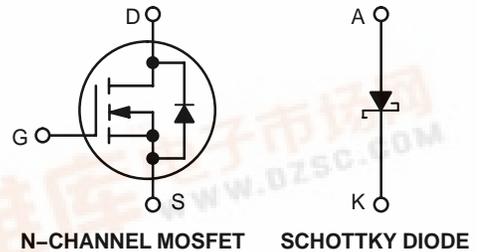
V_R MAX	V_F TYP	I_F MAX
30 V	0.48 V	1.0 A

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ 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	I_D	$T_J = 25^\circ\text{C}$	3.0	A
			$T_J = 85^\circ\text{C}$	2.4	
	$t \leq 5$ s	$T_J = 25^\circ\text{C}$	4.0		
Power Dissipation (Note 1)	Steady State	P_D	$T_J = 25^\circ\text{C}$	1.21	W
			$t \leq 5$ s	2.08	
Continuous Drain Current (Note 2)	Steady State	I_D	$T_J = 25^\circ\text{C}$	2.0	A
			$T_J = 85^\circ\text{C}$	1.4	
			$T_J = 25^\circ\text{C}$	0.44	
Power Dissipation (Note 2)		P_D	0.44		
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	17	A	
Operating Junction and Storage Temperature		T_J, T_{STG}	-55 to 150	$^\circ\text{C}$	
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	$^\circ\text{C}$	

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.



N-CHANNEL MOSFET

SCHOTTKY DIODE



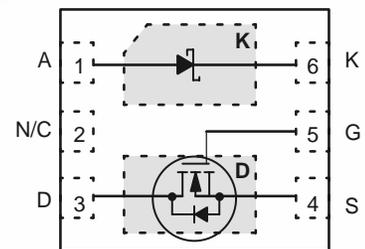
DFN6 CASE 506AN

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.



NTLJF4156N

SCHOTTKY DIODE MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ 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	$^\circ\text{C/W}$
Junction-to-Ambient – $t \leq 5$ 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 ($T_J = 25^\circ\text{C}$ 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		$\text{mV}/^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 24$ V, $V_{GS} = 0$ V	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 8.0$ 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		$\text{mV}/^\circ\text{C}$
Drain-to-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 4.5$, $I_D = 2.0$ A		47	70	$\text{m}\Omega$
		$V_{GS} = 2.5$, $I_D = 2.0$ 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 $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

NTLJF4156N

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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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, I _S = 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 _I = 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 mm², 2 oz cu.

9. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

10. Switching characteristics are independent of operating junction temperatures.

NTLJF4156N

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

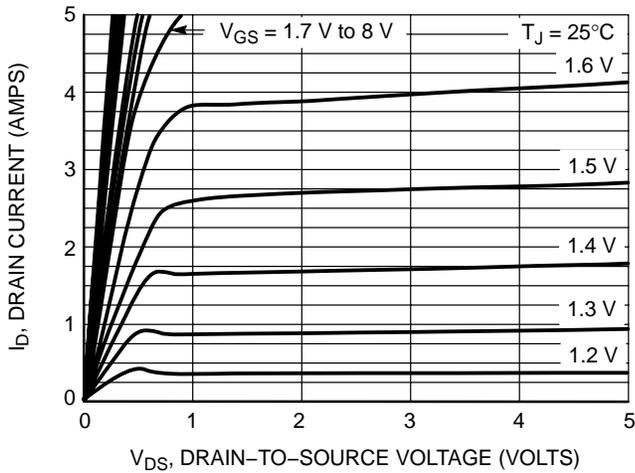


Figure 1. On-Region Characteristics

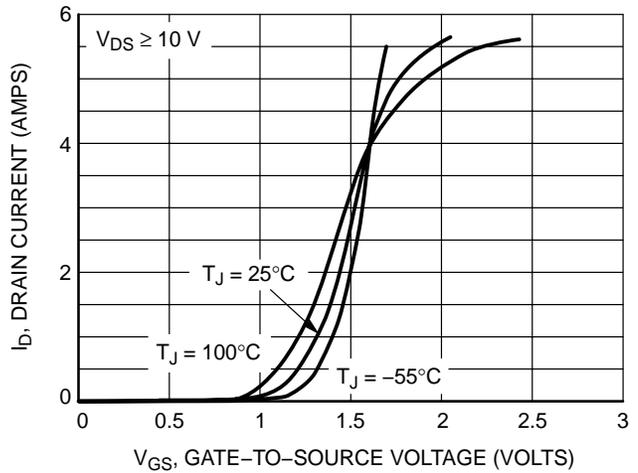


Figure 2. Transfer Characteristics

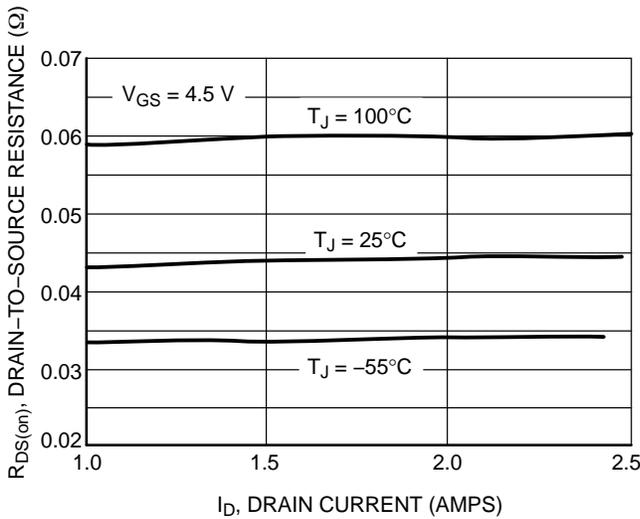


Figure 3. On-Resistance versus Drain Current

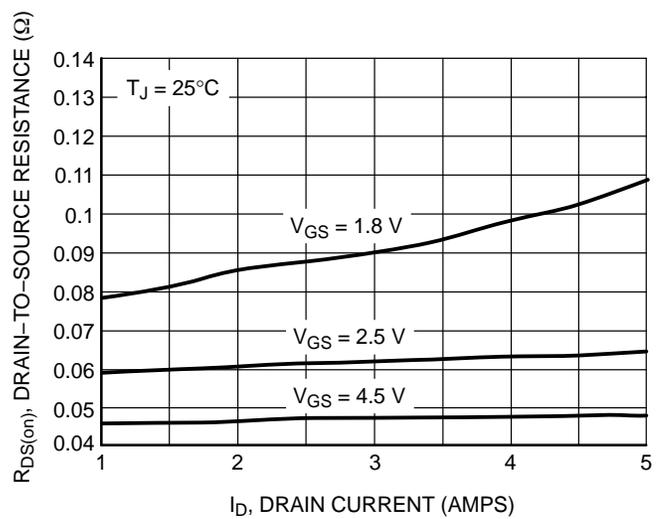


Figure 4. On-Resistance versus Drain Current and Gate Voltage

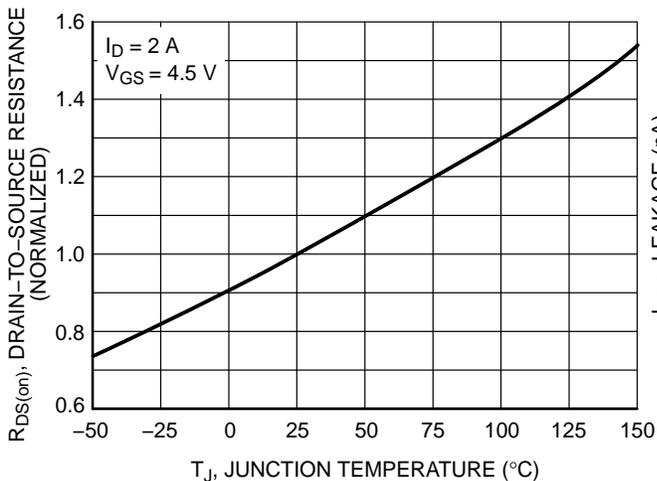


Figure 5. On-Resistance Variation with Temperature

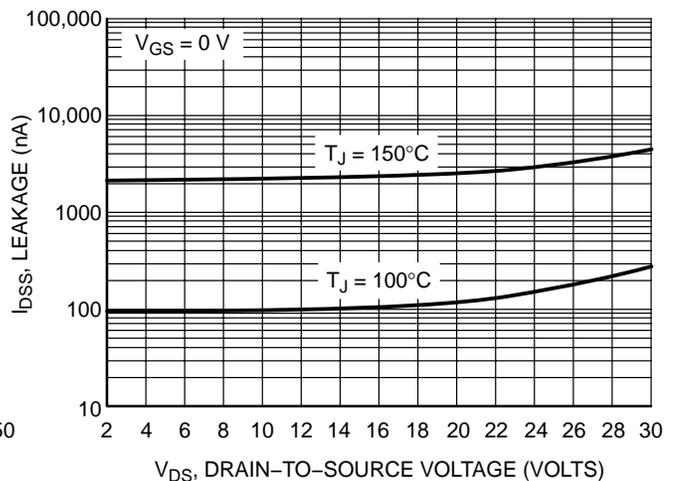


Figure 6. Drain-to-Source Leakage Current versus Voltage

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

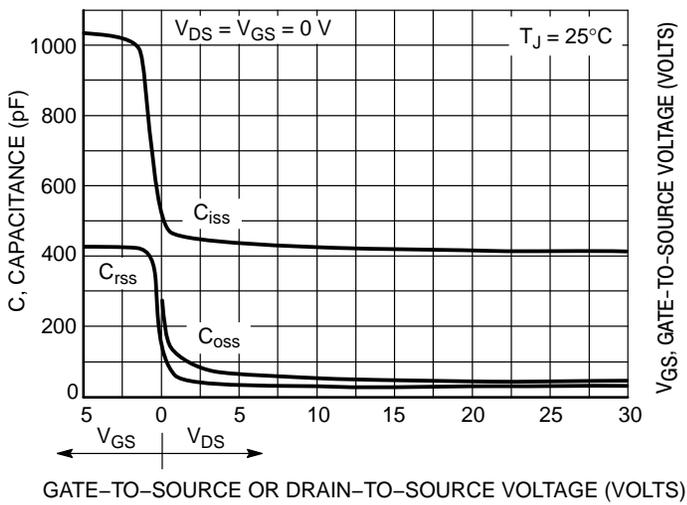


Figure 7. Capacitance Variation

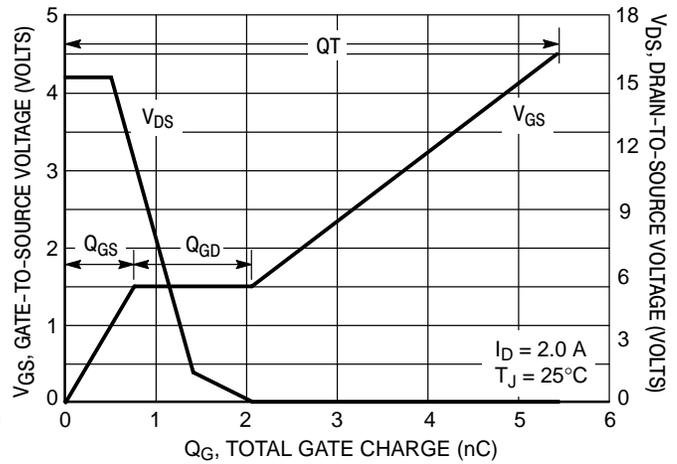


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

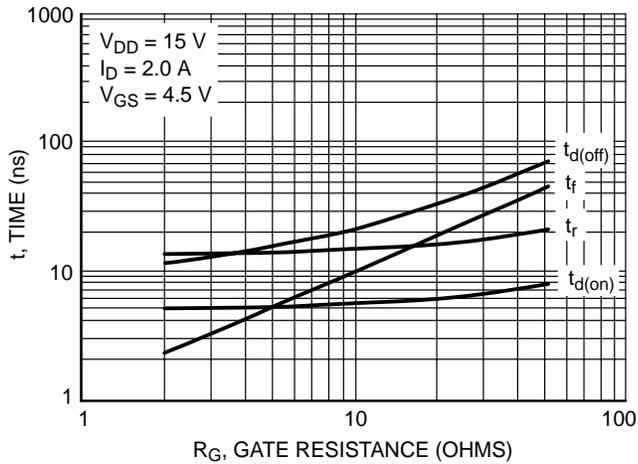


Figure 9. Resistive Switching Time Variation versus Gate Resistance

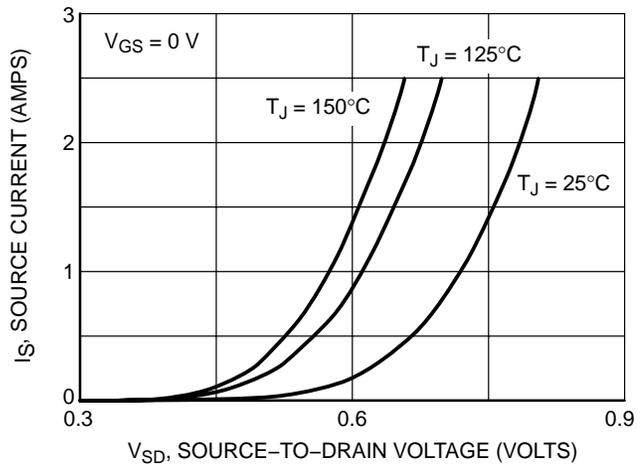


Figure 10. Diode Forward Voltage versus Current

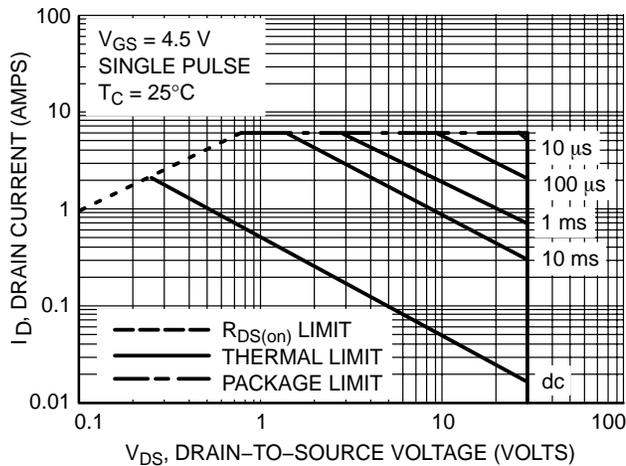


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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

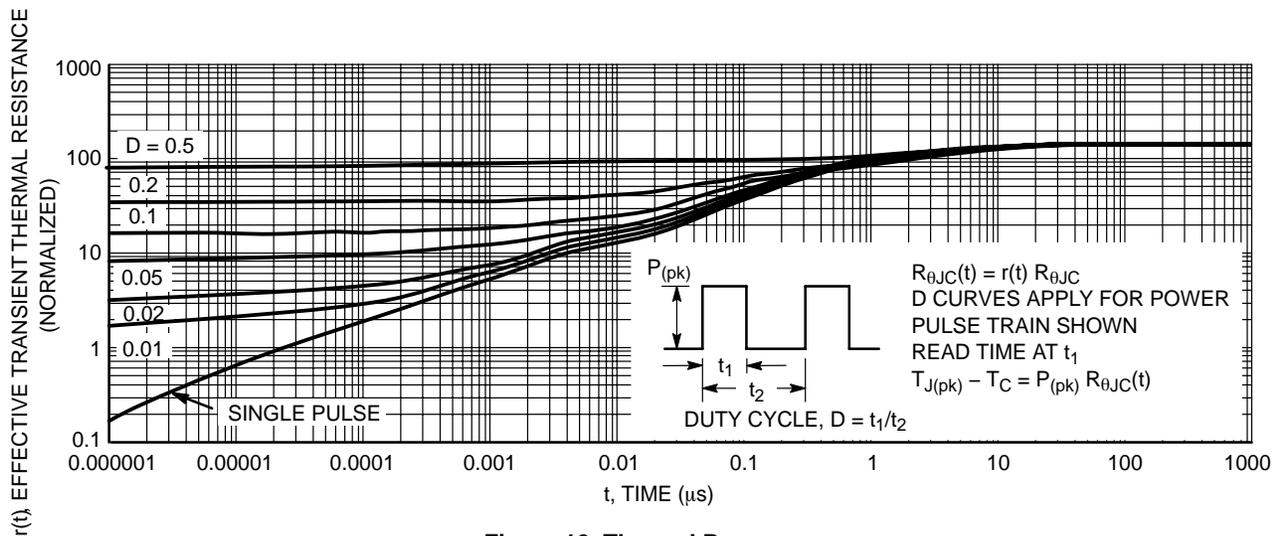


Figure 12. Thermal Response

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

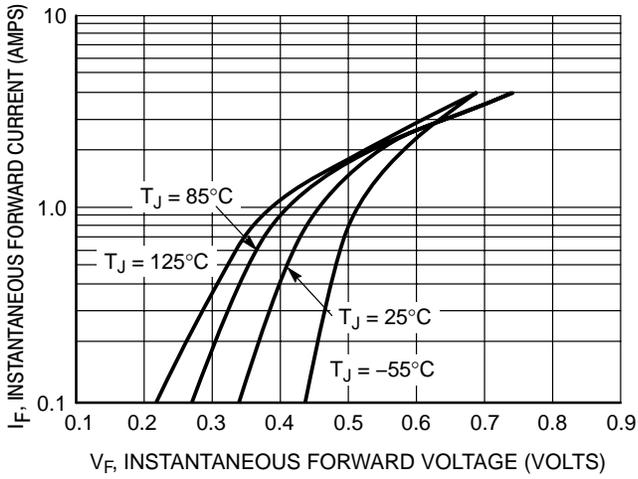


Figure 13. Typical Forward Voltage

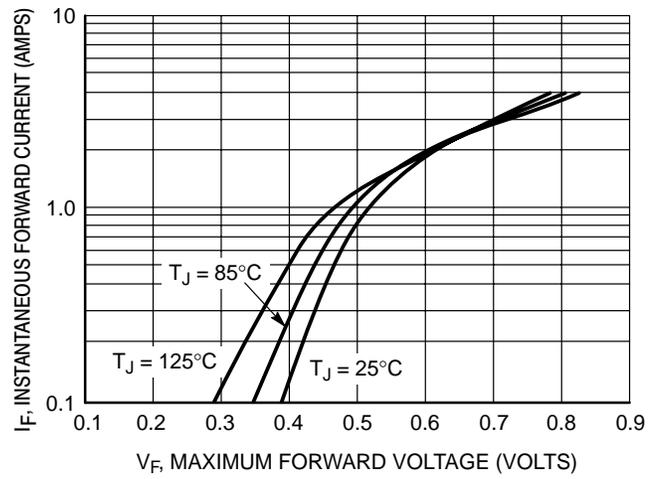


Figure 14. Maximum Forward Voltage

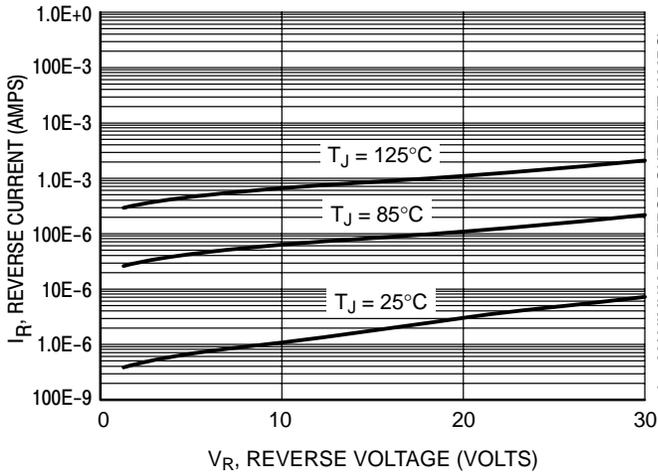


Figure 15. Typical Reverse Current

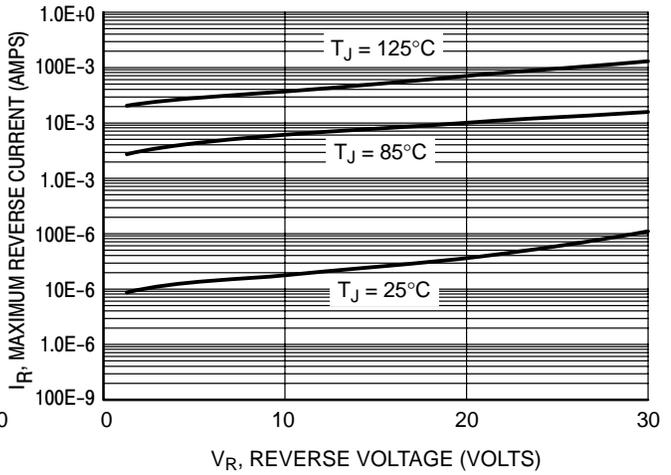


Figure 16. Maximum Reverse Current

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ORDERING INFORMATION

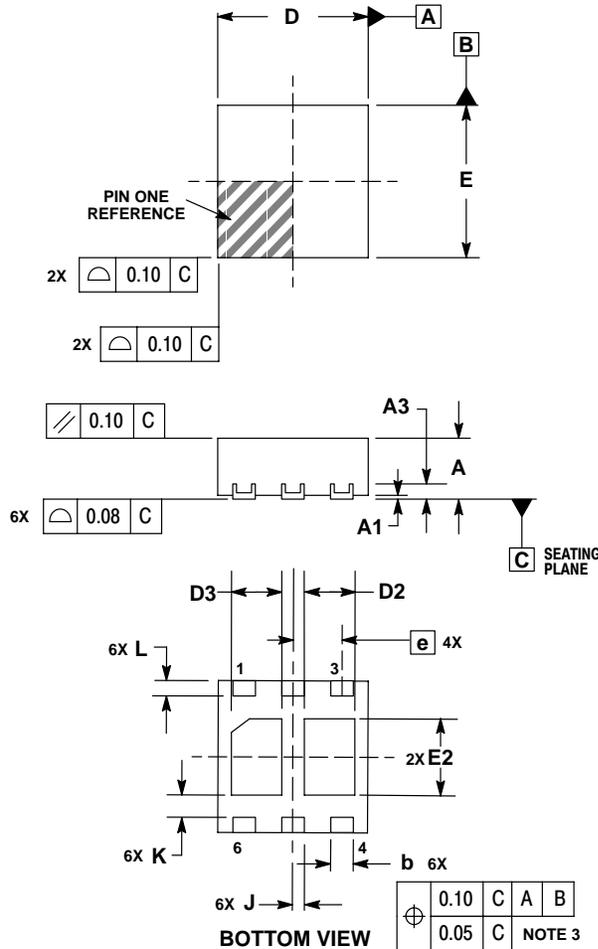
Device	Package	Shipping [†]
NTLJF4156NT1G	SC-88FL (Pb-Free)	3000 / Tape & Reel

[†]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



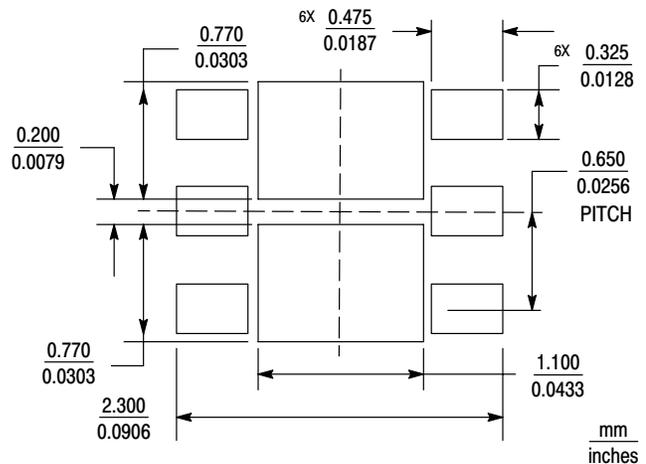
NOTES:

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:
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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