

# NTJD3158C

## Power MOSFET

20 V, +0.63/-0.82 A,  
SC-88 Complementary, ESD Protected

### Features

- Complementary N- and P-Channel MOSFET
- Small Size Dual SC-88 Package
- Reduced Gate Charge to Improve Switching Response
- Independently Connected Devices to Provide Design Flexibility
- This is a Pb-Free Device

### Applications

- DC-DC Conversion Circuits
- Load/Power Switching with Level Shift

### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		V <sub>DSS</sub>	20	V	
Gate-to-Source Voltage		V <sub>GS</sub>	±12	V	
<b>N-Channel</b> Continuous Drain Current (Note 1)	Steady State	T <sub>A</sub> = 25°C	I <sub>D</sub>	0.63	A
		T <sub>A</sub> = 85°C		0.46	
	t ≤ 5 s	T <sub>A</sub> = 25°C		0.72	
<b>P-Channel</b> Continuous Drain Current (Note 1)	Steady State	T <sub>A</sub> = 25°C	I <sub>D</sub>	-0.82	A
		T <sub>A</sub> = 85°C		-0.59	
	t ≤ 5 s	T <sub>A</sub> = 25°C		-0.93	
Power Dissipation (Note 1)	Steady State	T <sub>A</sub> = 25°C	P <sub>D</sub>	0.27	W
	t ≤ 5 s			0.35	
Pulsed Drain Current	N-Ch	tp = 10 μs	I <sub>DM</sub>	1.3	A
	P-Ch			-1.6	
Operating Junction and Storage Temperature		T <sub>J</sub> , T <sub>stg</sub>	-55 to 150	°C	
Source Current (Body Diode)		I <sub>S</sub>	0.46	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T <sub>L</sub>	260	°C	

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 1)	R <sub>θJA</sub>	460	°C/W
Junction-to-Ambient – t ≤ 5 s (Note 1)	R <sub>θJA</sub>	357	
Junction-to-Lead (Drain) – Steady State (Note 1)	R <sub>θJL</sub>	226	

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 [1 oz] including traces).

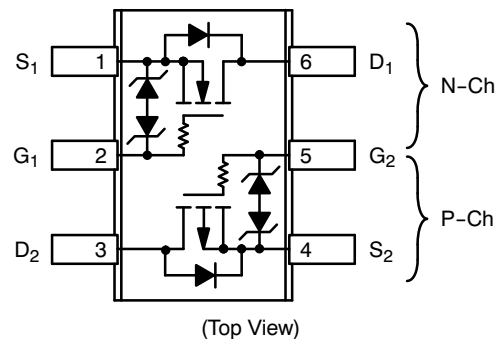


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V <sub>(BR)DSS</sub>	R <sub>DS(on)</sub> Max	I <sub>D</sub> Max
N-Ch 20 V	375 mΩ @ 4.5 V	0.63 A
	445 mΩ @ 2.5 V	
P-Ch -20 V	300 mΩ @ -4.5 V	-0.82 A
	500 mΩ @ -2.5 V	

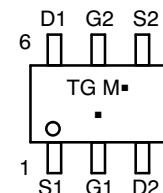
### SC-88 (SOT-363) (6-Leads)



### MARKING DIAGRAM & PIN ASSIGNMENT



SC-88 (SOT-363)  
CASE 419B  
STYLE 26



- TG = Specific Device Code
- M = Date Code
- = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

Device	Package	Shipping†
NTJD3158CT1G	SC-88 (Pb-Free)	3000/Tape & Reel
NTJD3158CT4G	SC-88 (Pb-Free)	10000/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.

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## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Parameter	Symbol	N/P	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS (Note 3)</b>							
Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	N	V <sub>GS</sub> = 0 V	I <sub>D</sub> = 250 μA	20		V
		P		I <sub>D</sub> = -250 μA	-20		
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>				22		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	N	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 16 V			1.0	μA
		P	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -16 V			1.0	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	N	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±12 V			±10	μA
		P	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±4.5 V			±1.0	
		P	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±12 V		6.0		

## ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	N	I <sub>D</sub> = 250 μA	0.6		1.5	V
		P	I <sub>D</sub> = -250 μA	-0.45			
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	N	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.63 A		290	375	mΩ
		P	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.88 A		255	300	
		N	V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 0.40 A		360	445	
		P	V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -0.71 A		345	500	
Forward Transconductance	g <sub>FS</sub>	N	V <sub>DS</sub> = 4.0 V, I <sub>D</sub> = 0.63 A		2.0		S
		P	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.88 A		3.0		

## CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C <sub>ISS</sub>	N	f = 1 MHz, V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 20 V		33	46	pF	
		P		V <sub>DS</sub> = -20 V		155			
Output Capacitance	C <sub>OSS</sub>	N		V <sub>DS</sub> = 20 V		13	22		
		P		V <sub>DS</sub> = -20 V		25			
Reverse Transfer Capacitance	C <sub>RSS</sub>	N		V <sub>DS</sub> = 20 V		2.8	5.0		
		P		V <sub>DS</sub> = -20 V		18			
Total Gate Charge	Q <sub>G(TOT)</sub>	N		V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.63 A		1.3	3.0		nC
		P		V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -0.88 A		2.2			
Gate-to-Source Charge	Q <sub>GS</sub>	N	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.63 A		0.2				
		P	V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -0.88 A		0.5				
Gate-to-Drain Charge	Q <sub>GD</sub>	N	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.63 A		0.4				
		P	V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.88 A		0.65				

## SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(ON)</sub>	N	V <sub>GS</sub> = 4.5 V, V <sub>DD</sub> = 10 V, I <sub>D</sub> = 0.5 A, R <sub>G</sub> = 20 Ω		83		ns
Rise Time	t <sub>r</sub>				227		
Turn-Off Delay Time	t <sub>d(OFF)</sub>				786		
Fall Time	t <sub>f</sub>				506		
Turn-On Delay Time	t <sub>d(ON)</sub>	P	V <sub>GS</sub> = -4.5 V, V <sub>DD</sub> = -10 V, I <sub>D</sub> = -0.5 A, R <sub>G</sub> = 20 Ω		5.8		
Rise Time	t <sub>r</sub>				6.5		
Turn-Off Delay Time	t <sub>d(OFF)</sub>				13.5		
Fall Time	t <sub>f</sub>				3.5		

## DRAIN-SOURCE DIODE CHARACTERISTICS

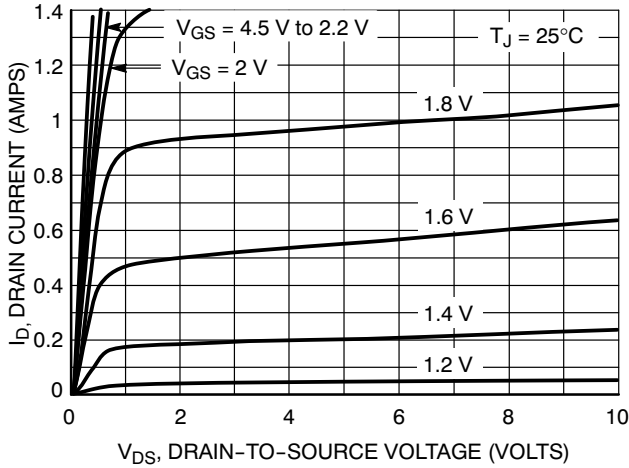
Forward Diode Voltage	V <sub>SD</sub>	N	V <sub>GS</sub> = 0 V, T <sub>J</sub> = 25°C	I <sub>S</sub> = 0.23 A	0.76	1.1	V
		P		I <sub>S</sub> = -0.48 A	-0.8	-1.2	
		N	V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C	I <sub>S</sub> = 0.23 A	0.63		
		P		I <sub>S</sub> = -0.48 A	-0.66		

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

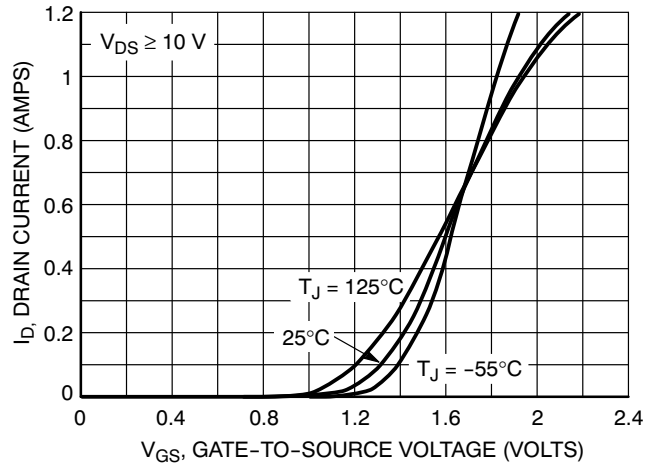
3. Switching characteristics are independent of operating junction temperatures.

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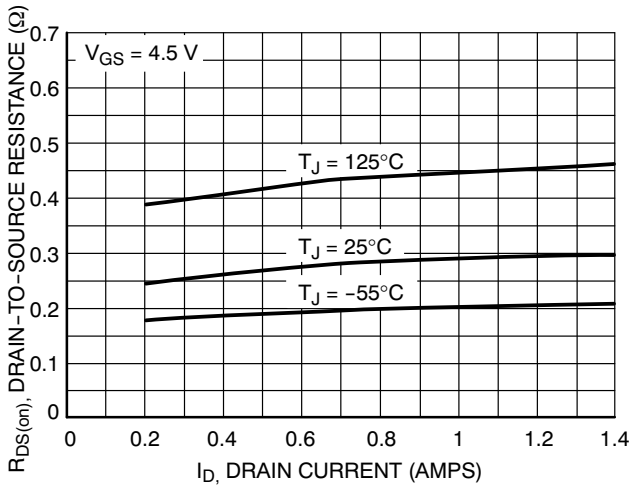
## TYPICAL PERFORMANCE CURVES (N-Ch) ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



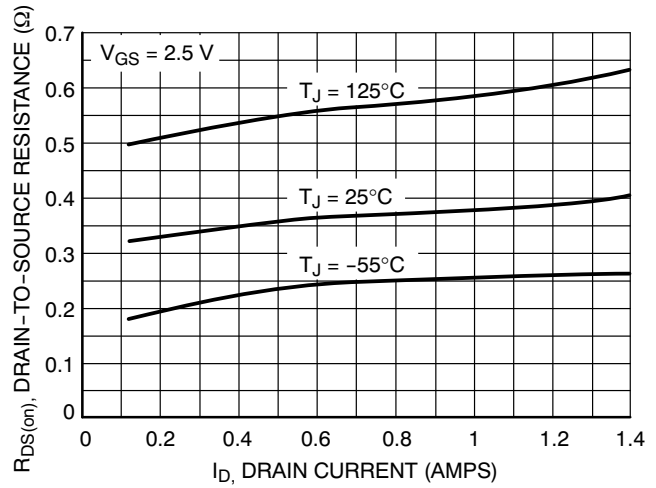
**Figure 1. On-Region Characteristics**



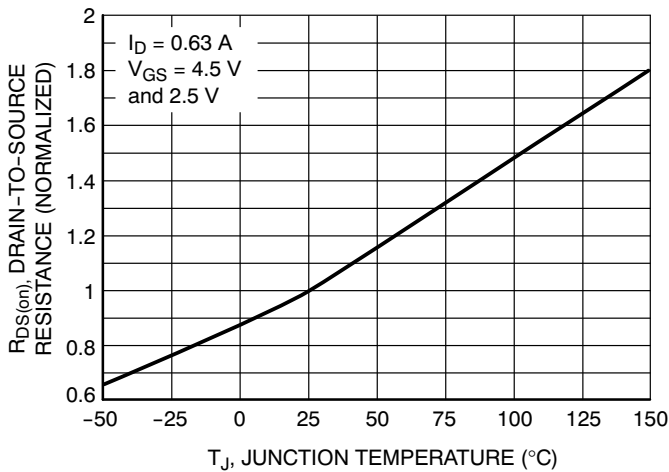
**Figure 2. Transfer Characteristics**



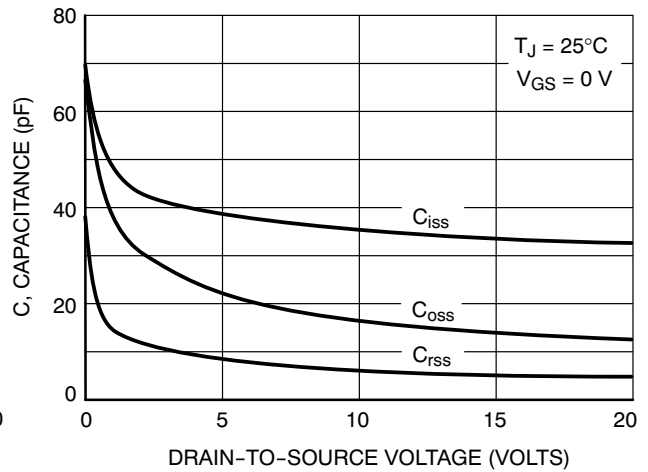
**Figure 3. On-Resistance vs. Drain Current and Temperature**



**Figure 4. On-Resistance vs. Drain Current and Temperature**



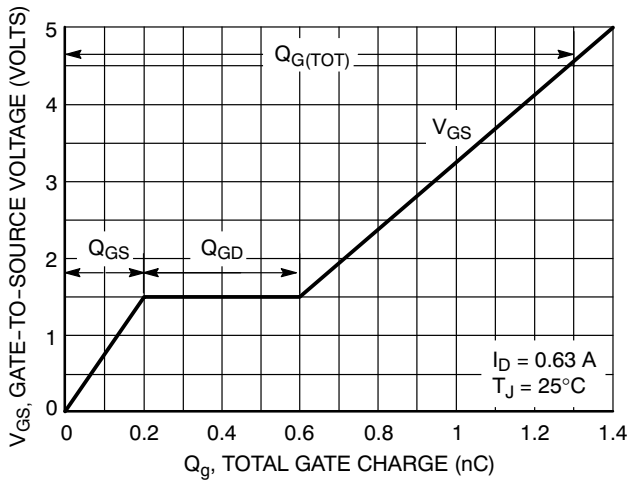
**Figure 5. On-Resistance Variation with Temperature**



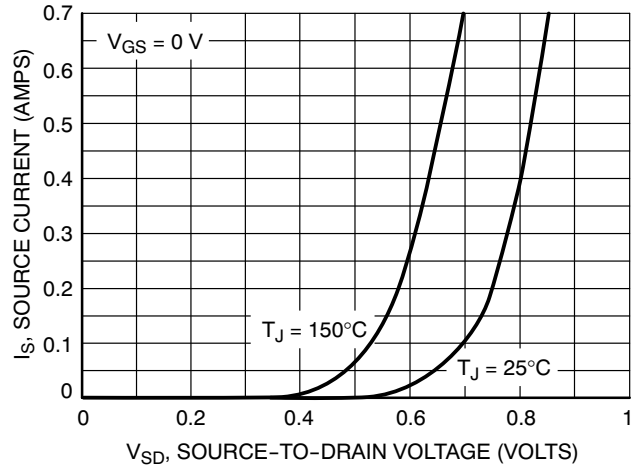
**Figure 6. Capacitance Variation**

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



**Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge**



**Figure 8. Diode Forward Voltage vs. Current**

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

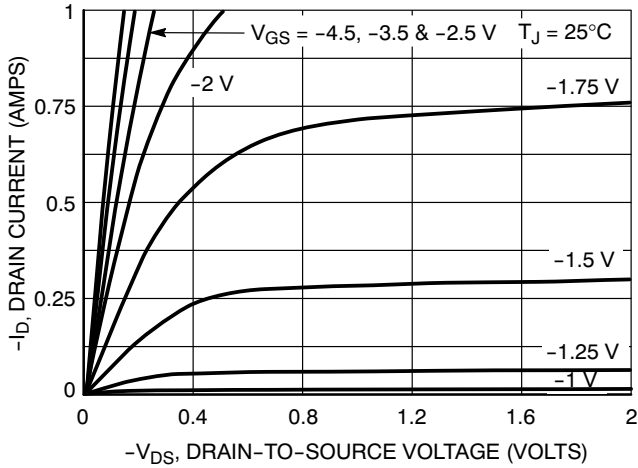


Figure 9. On-Region Characteristics

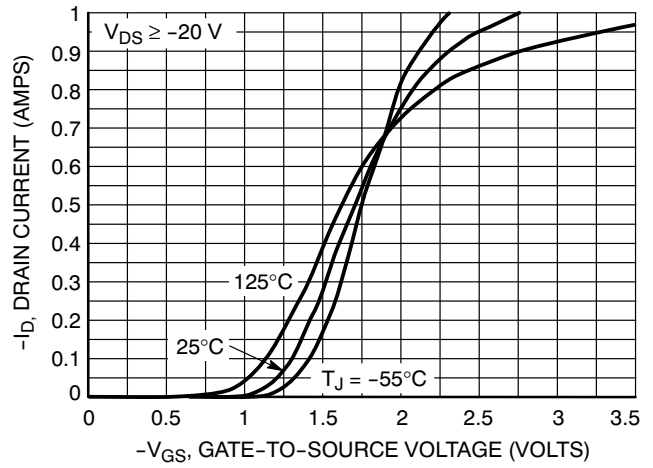


Figure 10. Transfer Characteristics

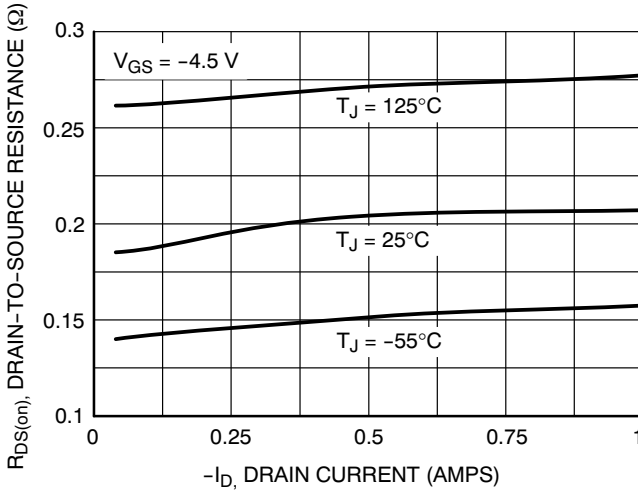


Figure 11. On-Resistance vs. Drain Current and Temperature

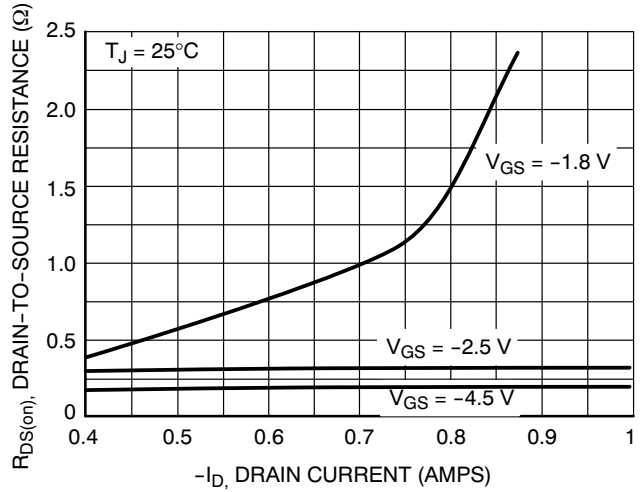


Figure 12. On-Resistance vs. Drain Current and Gate Voltage

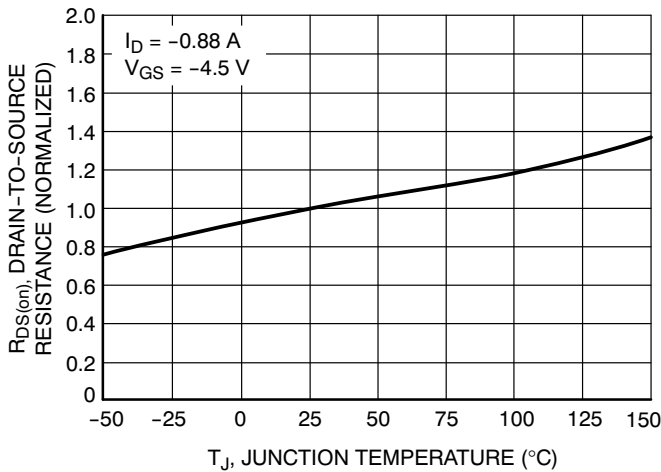


Figure 13. On-Resistance Variation with Temperature

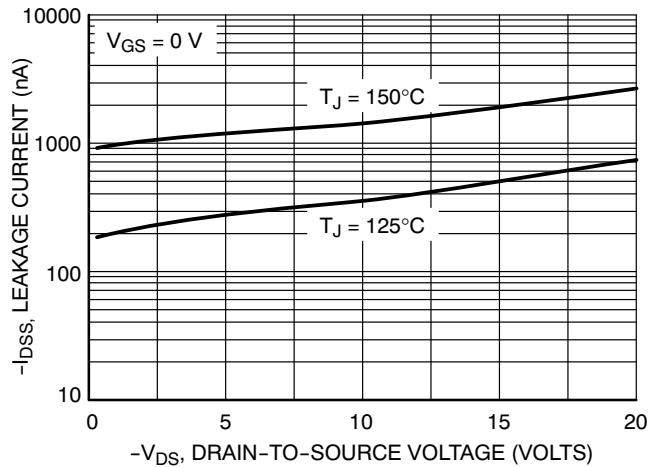


Figure 14. Drain-to-Source Leakage Current vs. Voltage

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

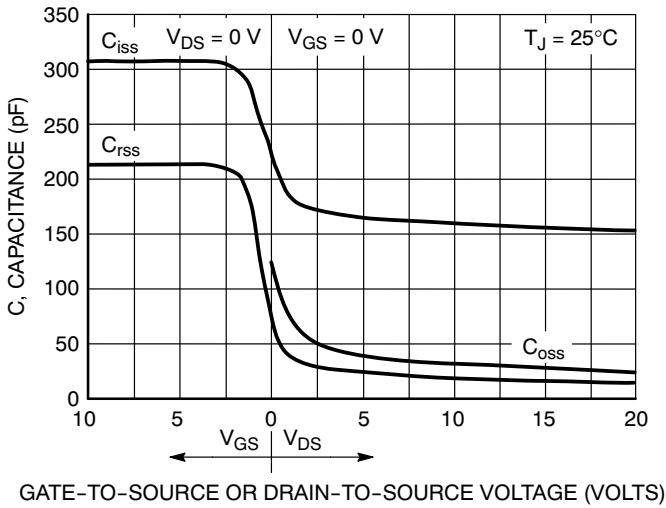


Figure 15. Capacitance Variation

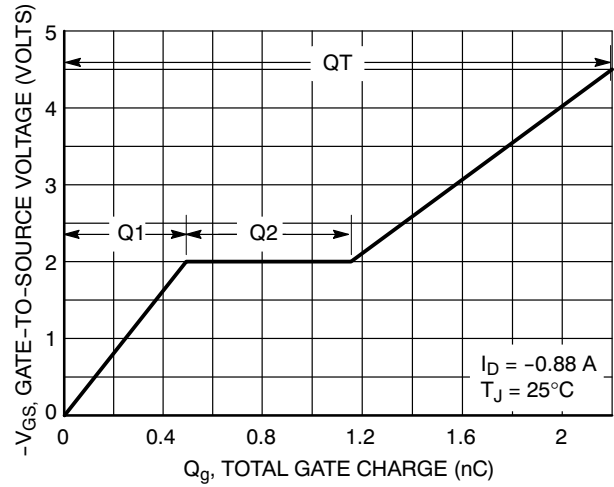


Figure 16. Gate-to-Source Voltage vs. Total Gate Charge

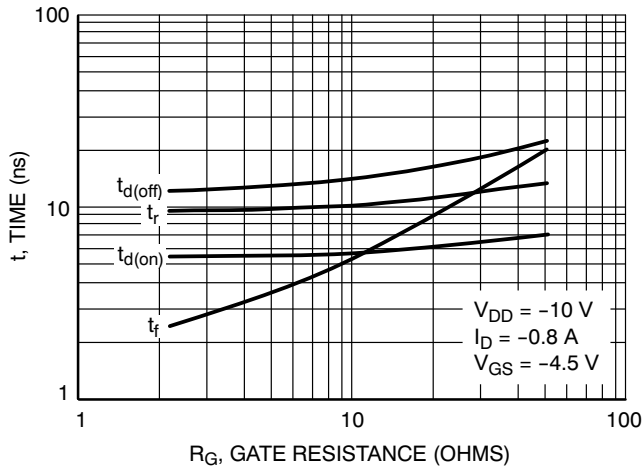


Figure 17. Resistive Switching Time Variation vs. Gate Resistance

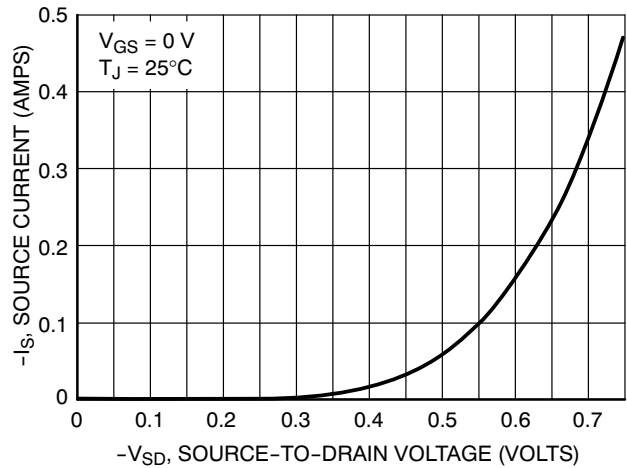
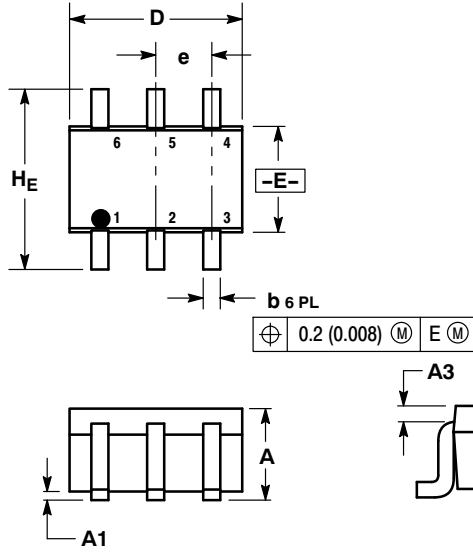


Figure 18. Diode Forward Voltage vs. Current

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## PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363  
CASE 419B-02  
ISSUE W



NOTES:

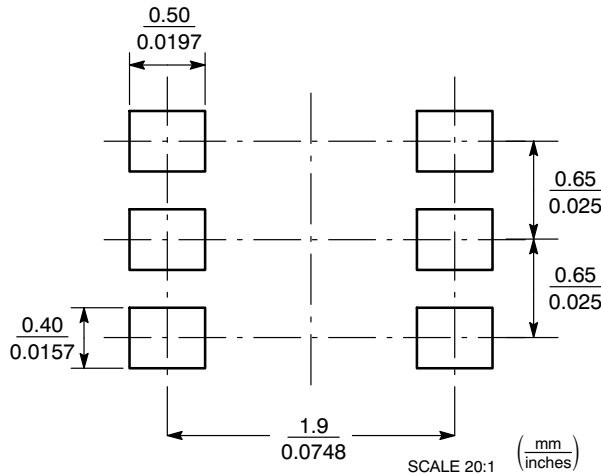
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000	0.002	0.004
A3	0.20 REF			0.008 REF		
b	0.10	0.21	0.30	0.004	0.008	0.012
C	0.10	0.14	0.25	0.004	0.005	0.010
D	1.80	2.00	2.20	0.070	0.078	0.086
E	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	2.00	2.10	2.20	0.078	0.082	0.086

STYLE 26:

- PIN 1. SOURCE 1
- GATE 1
- DRAIN 2
- SOURCE 2
- GATE 2
- DRAIN 1

### 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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