

# NTJD4158C

## Small Signal MOSFET

30 V/-20 V, +0.25/-0.88 A,  
Complementary, SC-88

### Features

- Leading 20 V Trench for Low  $R_{DS(on)}$  Performance
- ESD Protected Gate
- SC-88 Package for Small Footprint (2 x 2 mm)
- This is a Pb-Free Device

### Applications

- DC-DC Conversion
- Load/Power Management
- Load Switch
- Cell Phones, MP3s, Digital Cameras, PDAs

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage	N-Ch	$V_{DSS}$	30	V
	P-Ch		-20	
Gate-to-Source Voltage	N-Ch	$V_{GS}$	$\pm 20$	V
	P-Ch		$\pm 12$	
N-Channel Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	0.25	A
		$T_A = 85^\circ\text{C}$	0.18	
P-Channel Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	-0.88	
		$T_A = 85^\circ\text{C}$	-0.63	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	0.27 W
Pulsed Drain Cur- rent	N-Ch	$tp = 10 \mu\text{s}$	$I_{DM}$	0.5 A
	P-Ch			-3.0
Operating Junction and Storage Temperature		$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode)	N-Ch	$I_S$	0.25	A
	P-Ch		-0.48	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	460	$^\circ\text{C}/\text{W}$

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).

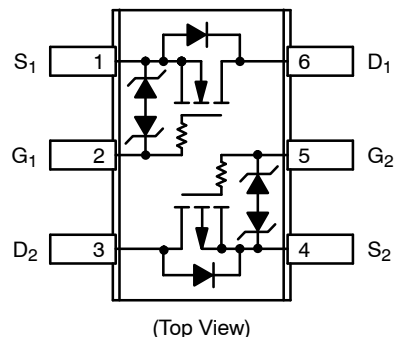


ON Semiconductor®

<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	$I_D$ Max
N-Ch 30 V	1.0 $\Omega$ @ 4.5 V	0.25 A
	1.5 $\Omega$ @ 2.5 V	
P-Ch -20 V	215 m $\Omega$ @ -4.5 V	-0.88 A
	345 m $\Omega$ @ -2.5 V	

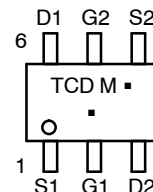
SC-88 (SOT-363)  
(6-Leads)



### MARKING DIAGRAM & PIN ASSIGNMENT



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



TCD = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

Device	Package	Shipping†
NTJD4158CT1G	SC-88 (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 Specification Brochure, BRD8011/D.

# NTJD4158C

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

Parameter	Symbol	N/P	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS (Note 3)

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	N	V <sub>GS</sub> = 0 V	I <sub>D</sub> = 250 μA	30			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>	N			33			mV/°C
		P			-9.0			
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	N	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 30 V	T <sub>J</sub> = 25°C			1.0	μA
		P	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -16 V				1.0	
		N	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 30 V	T <sub>J</sub> = 125°C		0.5		
		P	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -16 V			0.5		
Gate-to-Source Leakage Current	I <sub>GSS</sub>	N	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = 10 V				1.0	μA
		P	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = -4.5 V				1.0	

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	N	V <sub>GS</sub> = V <sub>DS</sub>	I <sub>D</sub> = 100 μA	0.8	1.2	1.5	V
		P		I <sub>D</sub> = -250 μA	-0.45			
Negative Gate Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>	N				3.2		mV/°C
		P				-2.7		
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	N	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 mA			1.0	1.5	Ω
		P	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.88 A			0.215	0.260	
		N	V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 10 mA			1.5	2.5	
		P	V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -0.71 A			0.345	0.500	
Forward Transconductance	g <sub>FS</sub>	N	V <sub>DS</sub> = 3.0 V, I <sub>D</sub> = 10 mA			0.08		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> = 5.0 V		20	33	pF	
		P		V <sub>DS</sub> = -20 V		155	225		
Output Capacitance	C <sub>OSS</sub>	N		V <sub>DS</sub> = 5.0 V		19	32		
		P		V <sub>DS</sub> = -20 V		25	40		
Reverse Transfer Capacitance	C <sub>RSS</sub>	N		V <sub>DS</sub> = 5.0 V		7.25	12		
		P		V <sub>DS</sub> = -20 V		18	30		
Total Gate Charge	Q <sub>G(TOT)</sub>	N		V <sub>GS</sub> = 5.0 V, V <sub>DS</sub> = 24 V, I <sub>D</sub> = 0.1 A		0.9	1.5		nC
		P		V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.88 A		2.2	3.5		
Threshold Gate Charge	Q <sub>G(TH)</sub>	N		V <sub>GS</sub> = 5.0 V, V <sub>DS</sub> = 24 V, I <sub>D</sub> = 0.1 A		0.2			
		P		V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.88 A		0.2			
Gate-to-Source Charge	Q <sub>GS</sub>	N	V <sub>GS</sub> = 5.0 V, V <sub>DS</sub> = 24 V, I <sub>D</sub> = 0.1 A		0.3				
		P	V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.88 A		0.5				
Gate-to-Drain Charge	Q <sub>GD</sub>	N	V <sub>GS</sub> = 5.0 V, V <sub>DS</sub> = 24 V, I <sub>D</sub> = 0.1 A		0.2				
		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> = 5.0 V, I <sub>D</sub> = 250 mA, R <sub>G</sub> = 50 Ω		15		ns	
Rise Time	t <sub>r</sub>				66			
Turn-Off Delay Time	t <sub>d(OFF)</sub>				56			
Fall Time	t <sub>f</sub>				78			
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

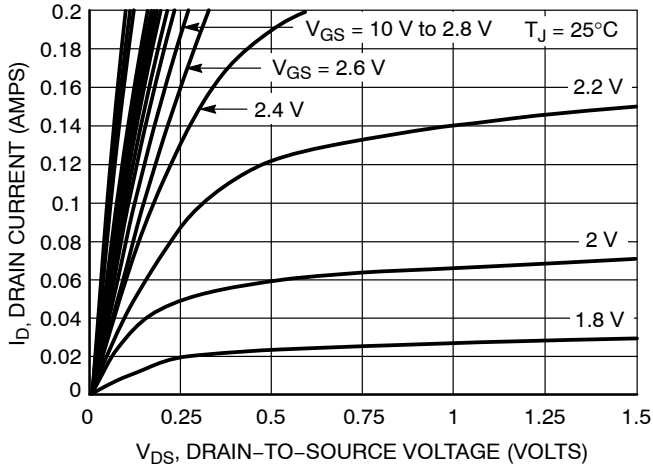
Forward Diode Voltage	V <sub>SD</sub>	N	V <sub>GS</sub> = 0 V, T <sub>J</sub> = 25°C	I <sub>S</sub> = 10 mA	0.65	0.7	V
		P		I <sub>S</sub> = -0.48 A	-0.8	-1.2	
		N	V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C	I <sub>S</sub> = 10 mA	0.45		
		P		I <sub>S</sub> = -0.48 A	-0.66		
Reverse Recovery Time	t <sub>RR</sub>	N	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 8.0 A/μs	I <sub>S</sub> = 10 mA	12.4		ns
		P	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs	I <sub>S</sub> = -0.48 mA	TBD		

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

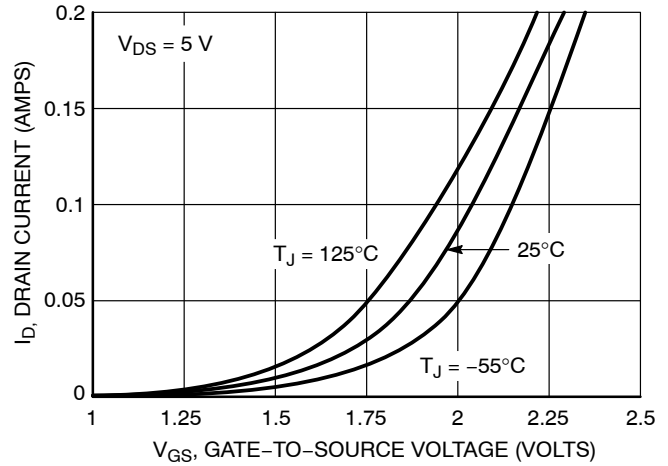
3. Switching characteristics are independent of operating junction temperatures.

# NTJD4158C

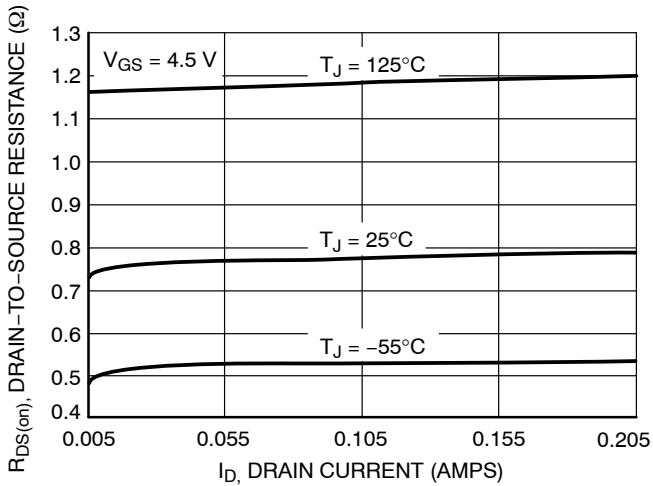
## TYPICAL N-CHANNEL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



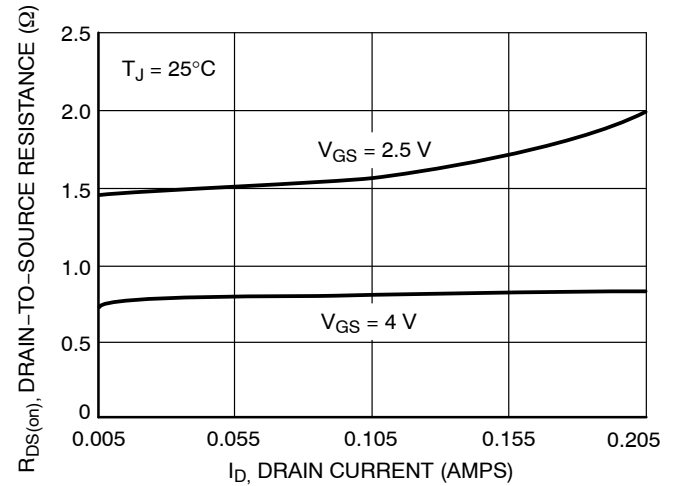
**Figure 1. On-Region Characteristics**



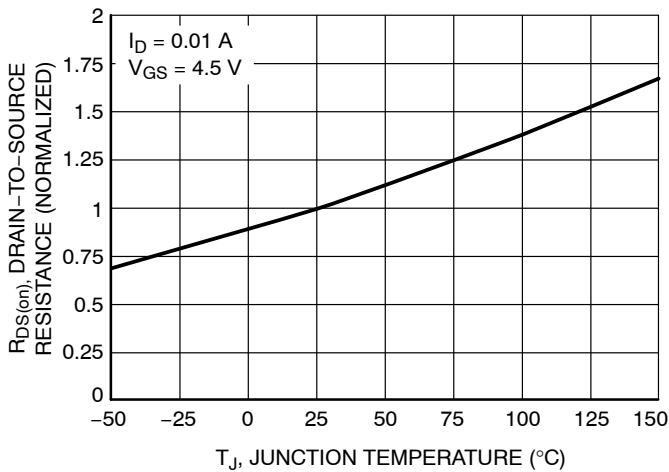
**Figure 2. Transfer Characteristics**



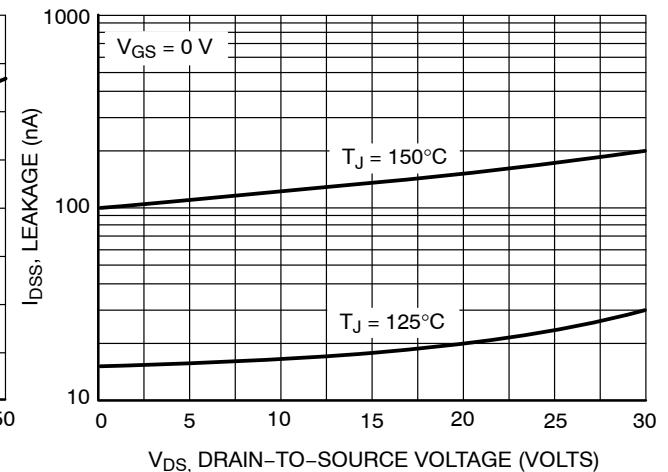
**Figure 3. On-Resistance vs. Drain Current and Temperature**



**Figure 4. On-Resistance vs. Drain Current and Gate Voltage**



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



**Figure 6. Drain-to-Source Leakage Current vs. Voltage**

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

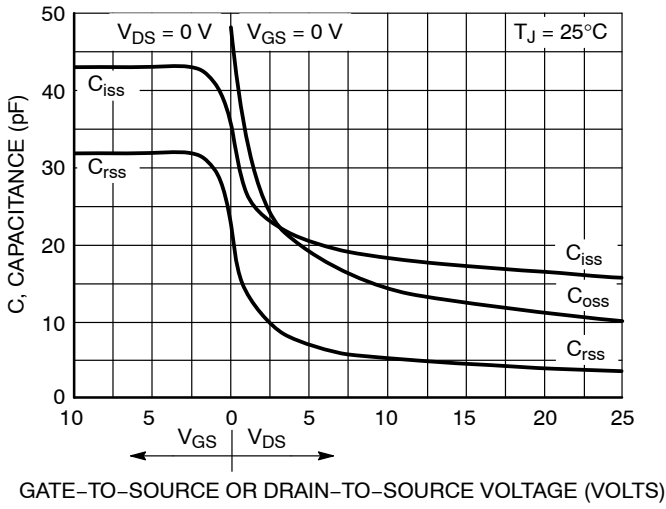


Figure 7. Capacitance Variation

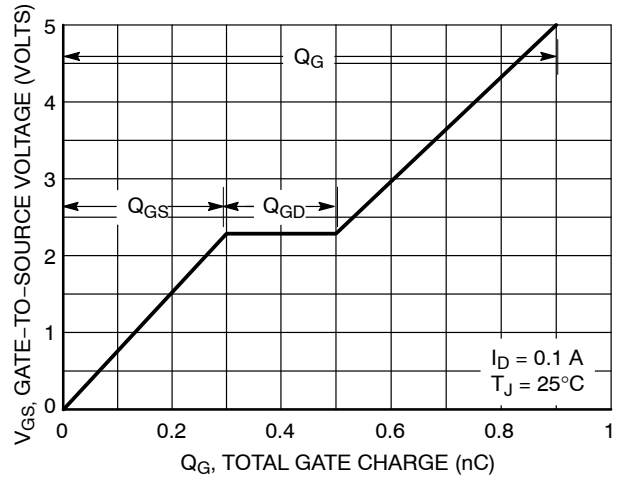


Figure 8. Gate-to-Source Voltage vs. Total Gate Charge

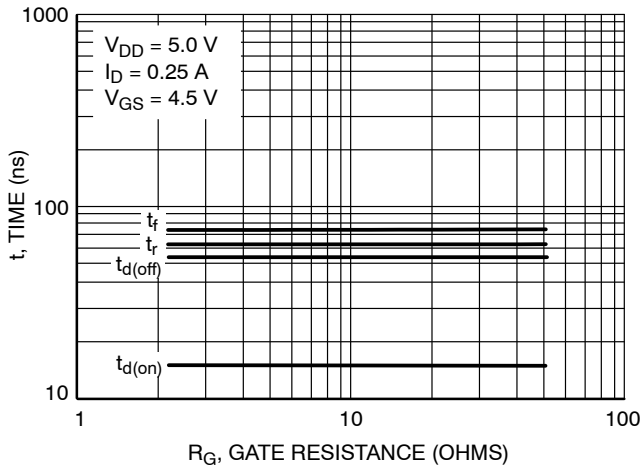


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

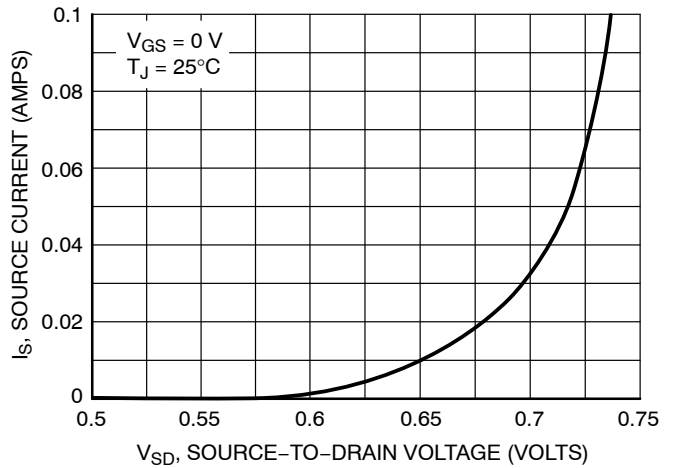


Figure 10. Diode Forward Voltage vs. Current

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

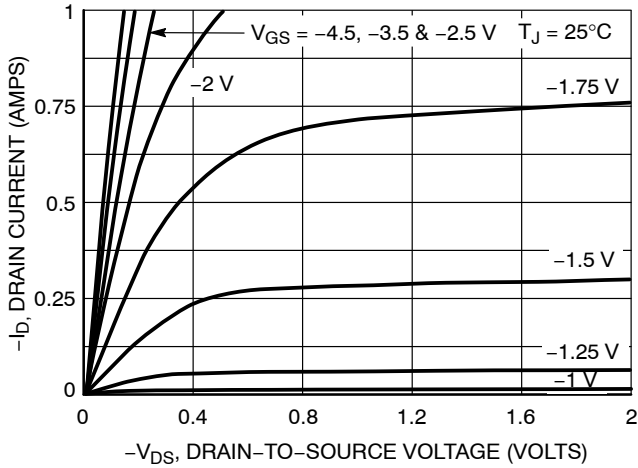


Figure 1. On-Region Characteristics

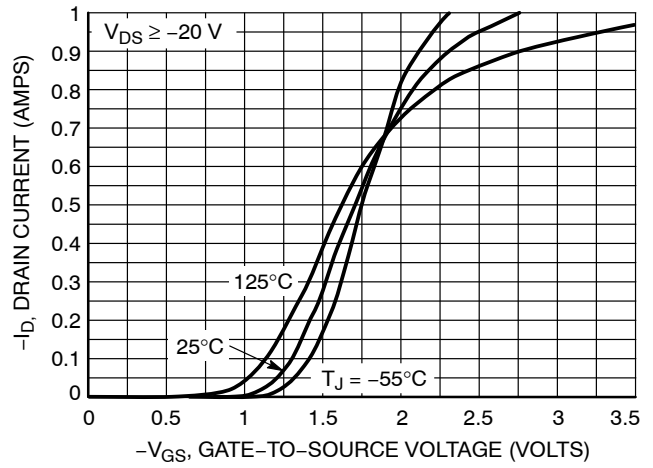


Figure 2. Transfer Characteristics

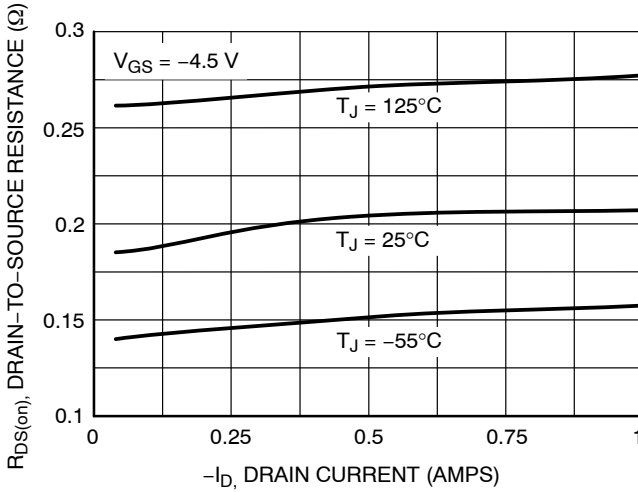


Figure 3. On-Resistance vs. Drain Current and Temperature

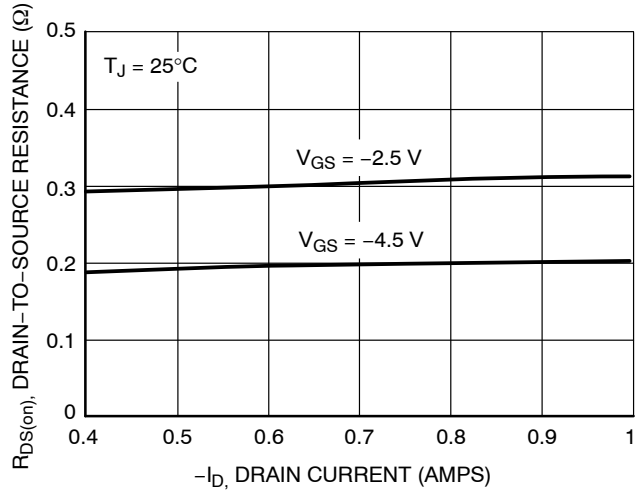


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

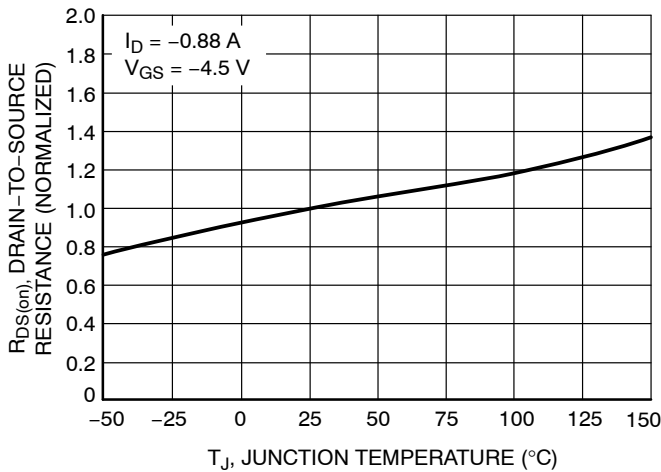


Figure 5. On-Resistance Variation with Temperature

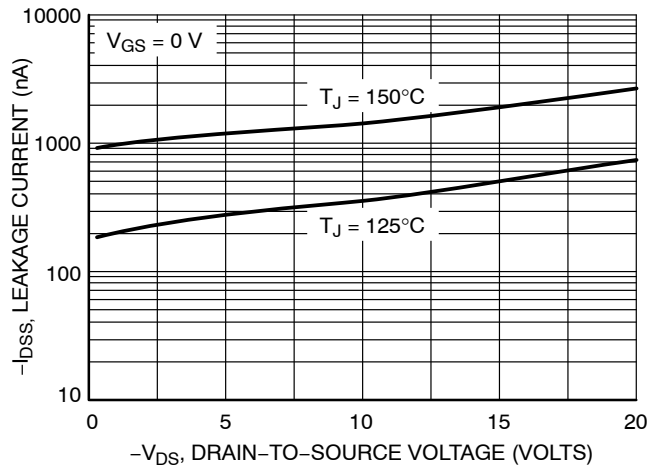


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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

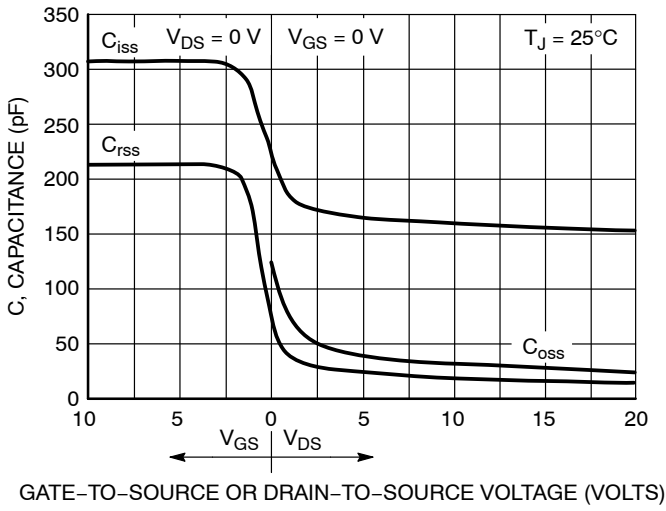


Figure 7. Capacitance Variation

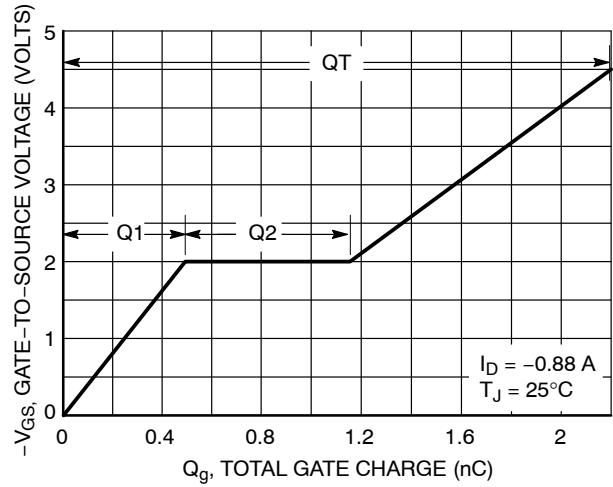


Figure 8. Gate-to-Source Voltage vs. Total Gate Charge

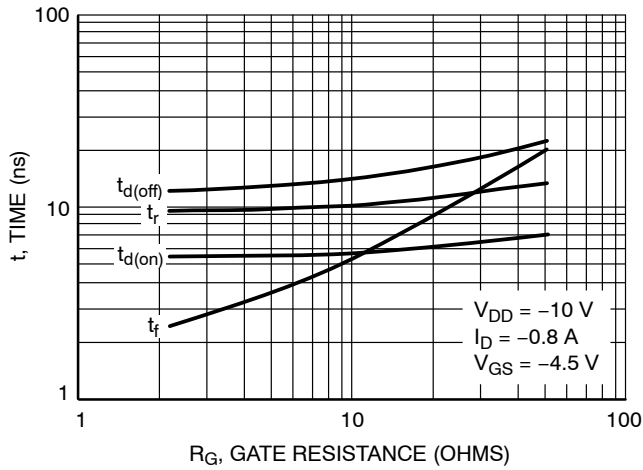


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

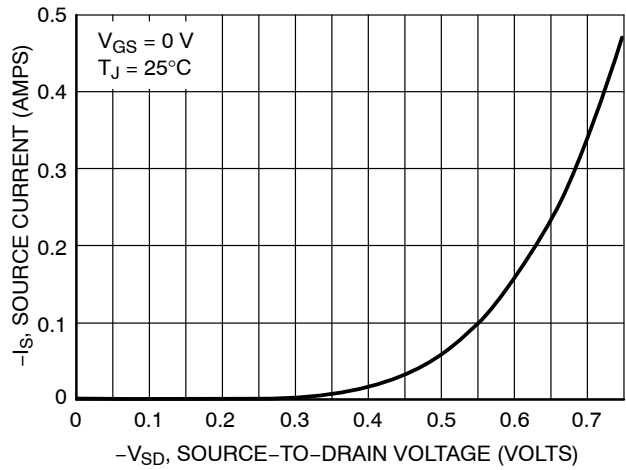
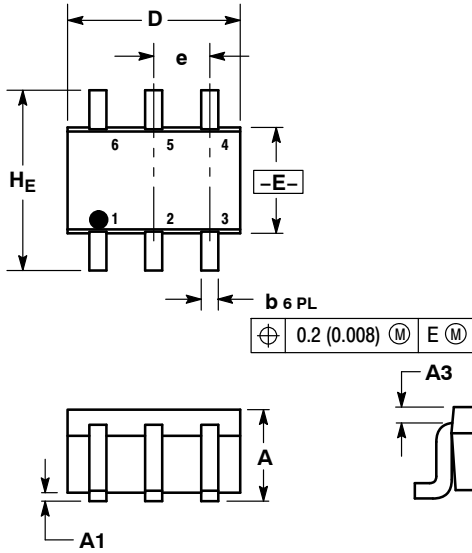


Figure 10. Diode Forward Voltage vs. Current

# NTJD4158C

## PACKAGE DIMENSIONS

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



**NOTES:**

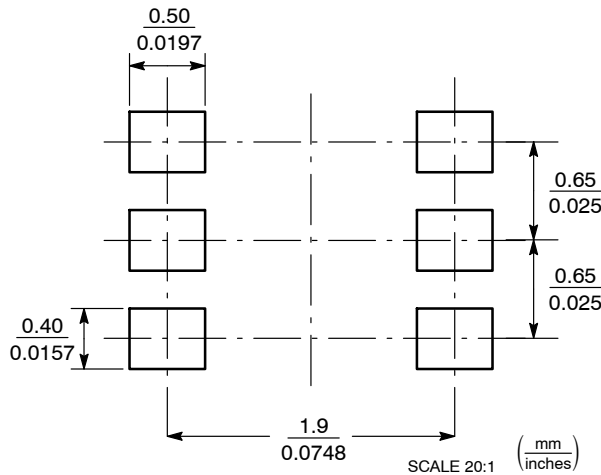
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

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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