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

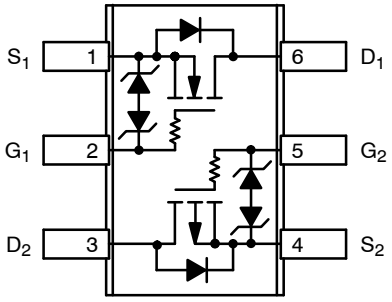
- DC−DC Conversion
- Load/Power Management
- Load Switch
- Cell Phones, MP3s, Digital Cameras, PDAs

ON Semiconductor®

http://onsemi.com

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

SC−88 (SOT−363)
(6−Leads)



(Top View)

MAXIMUM RATINGS (T_J = 25°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}	±20	V
		P−Ch		±12	
N−Channel Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	I_D	0.25	A
		T_A = 85°C		0.18	
P−Channel Continuous Drain Current (Note 1)	Steady State	T_A = 25°C		−0.88	
		T_A = 85°C		−0.63	
Power Dissipation (Note 1)	Steady State	T_A = 25°C	P_D	0.27	W
Pulsed Drain Current	N−Ch	tp = 10 μs	I_{DM}	0.5	A
	P−Ch			−3.0	
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to 150	°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	°C

THERMAL RESISTANCE RATINGS

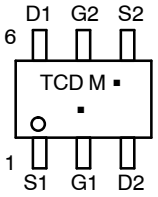
Parameter	Symbol	Max	Unit
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	460	°C/W

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).

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.

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

Parameter	Symbol	N/P	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS (Note 3)								
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	N	V_{GS} = 0 V	I_D = 250 μA	30			V
		P		I_D = −250 μA	−20			
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	N				33		mV/°C
		P				−9.0		
Zero Gate Voltage Drain Current	I_{DSS}	N	V_{GS} = 0 V, V_{DS} = 30 V	T_J = 25°C			1.0	μA
		P	V_{GS} = 0 V, V_{DS} = −16 V				1.0	
		N	V_{GS} = 0 V, V_{DS} = 30 V	T_J = 125°C		0.5		
		P	V_{GS} = 0 V, V_{DS} = −16 V			0.5		
Gate−to−Source Leakage Current	I_{GSS}	N	V_{DS} = 0 V, V_{GS} = 10 V				1.0	μA
		P	V_{DS} = 0 V, V_{GS} = −4.5 V				1.0	
ON CHARACTERISTICS (Note 2)								
Gate Threshold Voltage	$V_{GS(TH)}$	N	V_{GS} = V_{DS}	I_D = 100 μA	0.8	1.2	1.5	V
		P		I_D = −250 μA	−0.45			
Negative Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	N				3.2		mV/°C
		P				−2.7		
Drain−to−Source On Resistance	$R_{DS(on)}$	N	V_{GS} = 4.5 V, I_D = 10 mA			1.0	1.5	Ω
		P	V_{GS} = −4.5 V, I_D = −0.88 A			0.215	0.260	
		N	V_{GS} = 2.5 V, I_D = 10 mA			1.5	2.5	
		P	V_{GS} = −2.5 V, I_D = −0.71 A			0.345	0.500	
Forward Transconductance	g_{FS}	N	V_{DS} = 3.0 V, I_D = 10 mA			0.08		S
		P	V_{DS} = −10 V, I_D = −0.88 A			3.0		
CHARGES, CAPACITANCES AND GATE RESISTANCE								
Input Capacitance	C_{ISS}	N	f = 1 MHz, V_{GS} = 0 V	V_{DS} = 5.0 V		20	33	pF
		P		V_{DS} = −20 V		155	225	
Output Capacitance	C_{OSS}	N		V_{DS} = 5.0 V		19	32	
		P		V_{DS} = −20 V		25	40	
Reverse Transfer Capacitance	C_{RSS}	N		V_{DS} = 5.0 V		7.25	12	
		P		V_{DS} = −20 V		18	30	
Total Gate Charge	$Q_{G(TOT)}$	N	V_{GS} = 5.0 V, V_{DS} = 24 V, I_D = 0.1 A			0.9	1.5	nC
		P	V_{GS} = −4.5 V, V_{DS} = −10 V, I_D = −0.88 A			2.2	3.5	
Threshold Gate Charge	$Q_{G(TH)}$	N	V_{GS} = 5.0 V, V_{DS} = 24 V, I_D = 0.1 A			0.2		
		P	V_{GS} = −4.5 V, V_{DS} = −10 V, I_D = −0.88 A			0.2		
Gate−to−Source Charge	Q_{GS}	N	V_{GS} = 5.0 V, V_{DS} = 24 V, I_D = 0.1 A			0.3		
		P	V_{GS} = −4.5 V, V_{DS} = −10 V, I_D = −0.88 A			0.5		
Gate−to−Drain Charge	Q_{GD}	N	V_{GS} = 5.0 V, V_{DS} = 24 V, I_D = 0.1 A			0.2		
		P	V_{GS} = −4.5 V, V_{DS} = −10 V, I_D = −0.88 A			0.65		
SWITCHING CHARACTERISTICS (Note 3)								
Turn−On Delay Time	$t_{d(ON)}$	N	V_{GS} = 4.5 V, V_{DD} = 5.0 V, I_D = 250 mA, R_G = 50 Ω			15		ns
Rise Time	t_r					66		
Turn−Off Delay Time	$t_{d(OFF)}$					56		
Fall Time	t_f					78		
Turn−On Delay Time	$t_{d(ON)}$	P	V_{GS} = −4.5 V, V_{DD} = −10 V, I_D = −0.5 A, R_G = 20 Ω			5.8		
Rise Time	t_r					6.5		
Turn−Off Delay Time	$t_{d(OFF)}$					13.5		
Fall Time	t_f					3.5		
DRAIN−SOURCE DIODE CHARACTERISTICS								
Forward Diode Voltage	V_{SD}	N	V_{GS} = 0 V, T_J = 25°C	I_S = 10 mA		0.65	0.7	V
		P		I_S = −0.48 A		−0.8	−1.2	
		N	V_{GS} = 0 V, T_J = 125°C	I_S = 10 mA		0.45		
		P		I_S = −0.48 A		−0.66		
Reverse Recovery Time	t_{RR}	N	V_{GS} = 0 V, d_{IS}/d_t = 8.0 A/μs	I_S = 10 mA		12.4		ns
		P	V_{GS} = 0 V, d_{IS}/d_t = 100 A/μs	I_S = −0.48 mA		TBD		

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

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

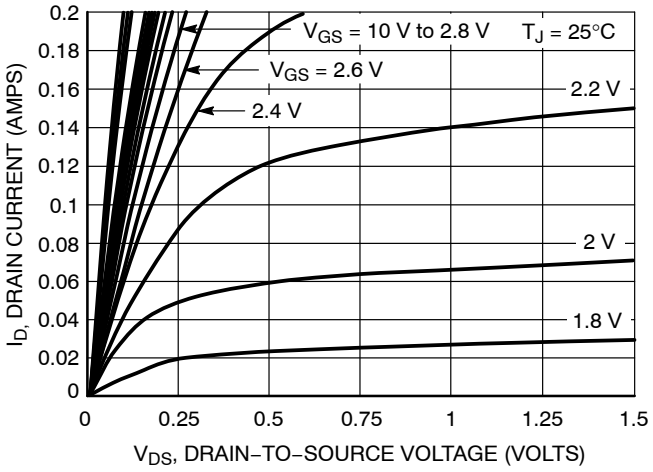


Figure 1. On−Region Characteristics

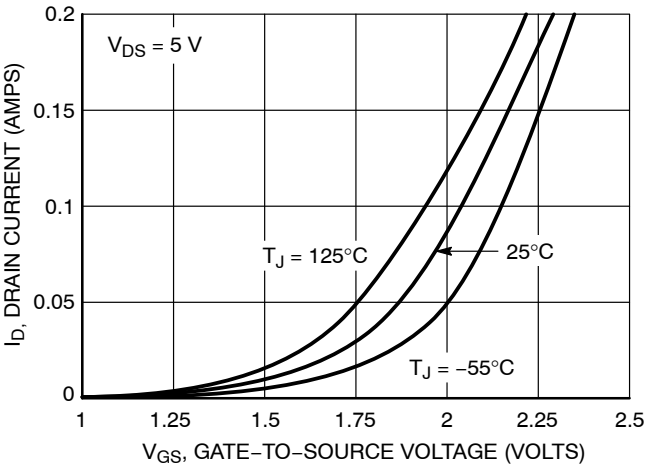


Figure 2. Transfer Characteristics

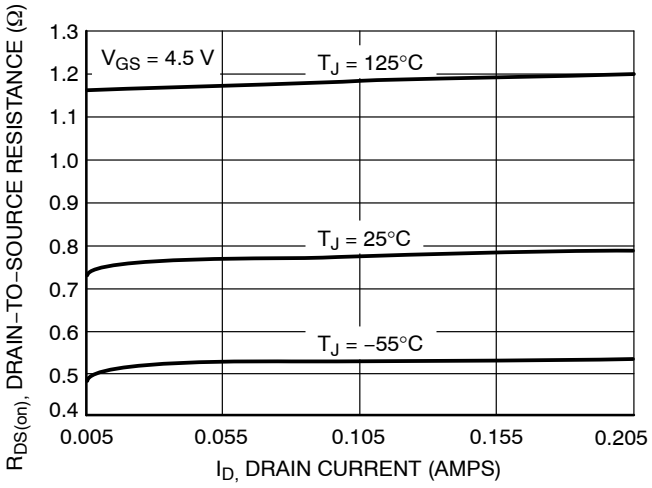


Figure 3. On−Resistance vs. Drain Current and Temperature

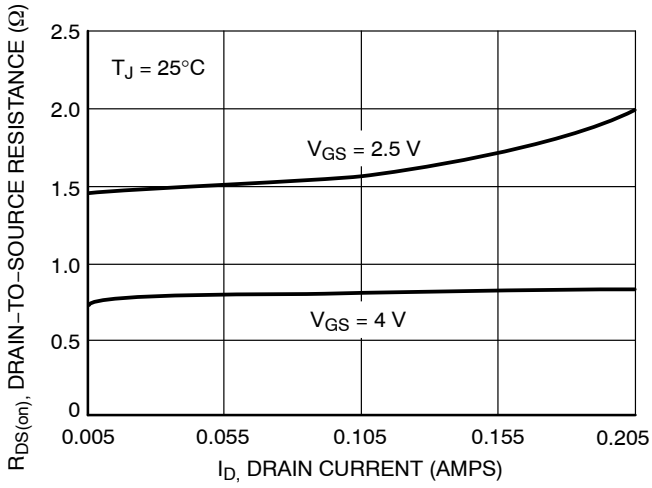


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

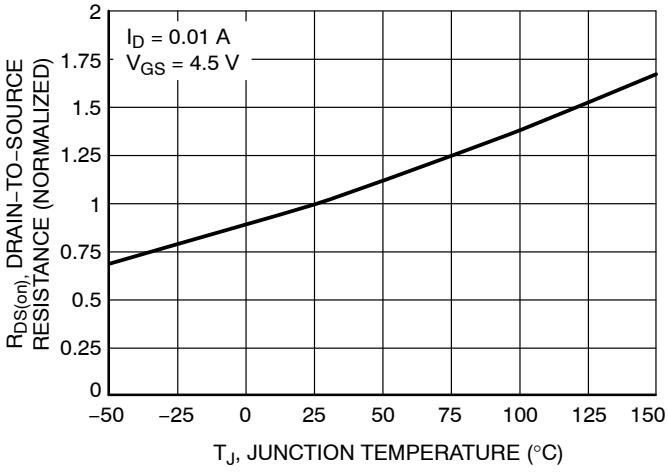


Figure 5. On−Resistance Variation with Temperature

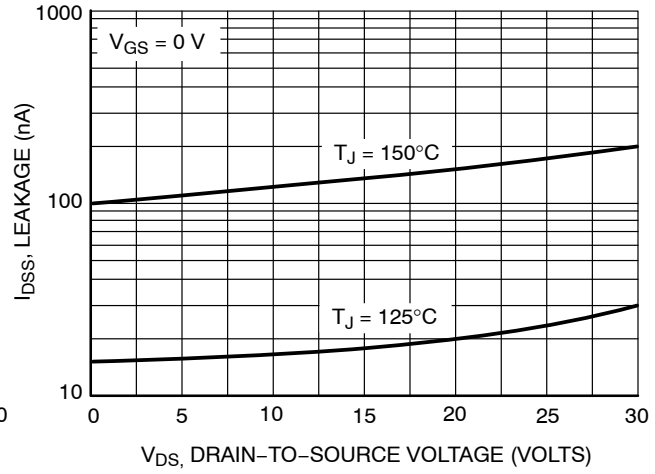


Figure 6. Drain−to−Source Leakage Current vs. Voltage

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

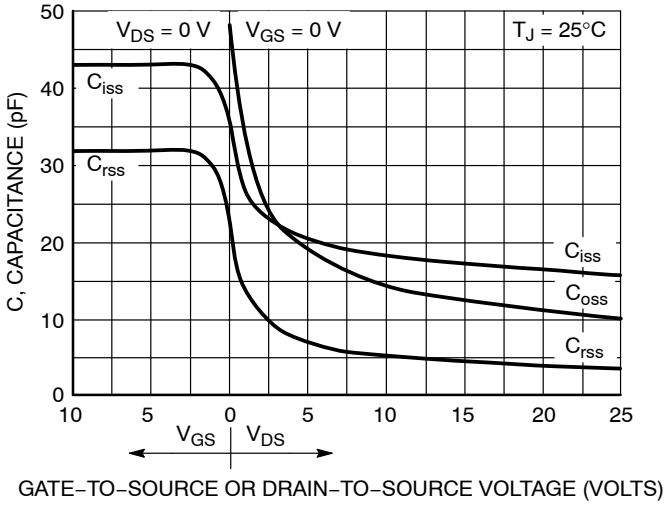


Figure 7. Capacitance Variation

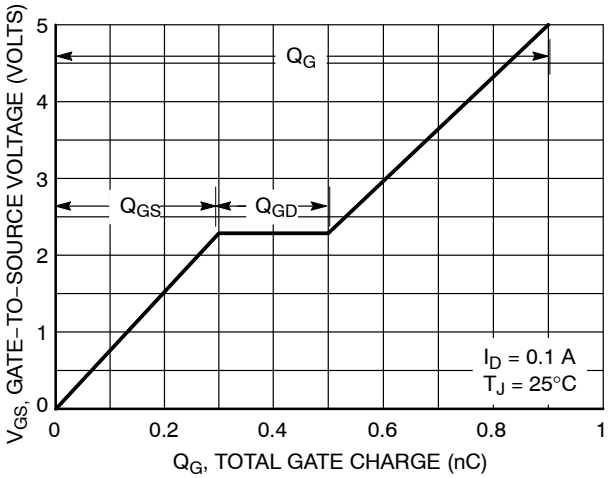


Figure 8. Gate−to−Source Voltage vs. Total Gate Charge

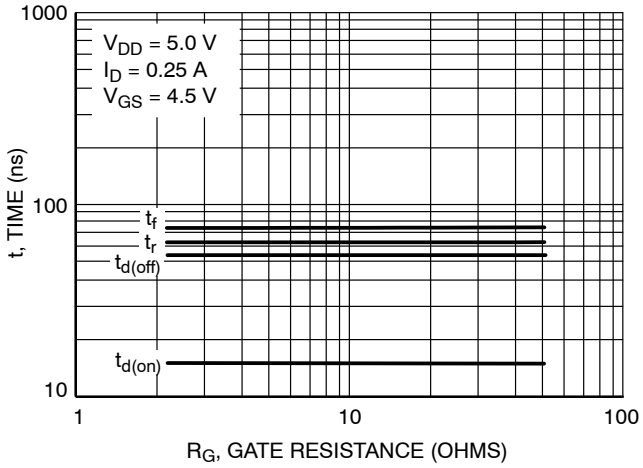


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

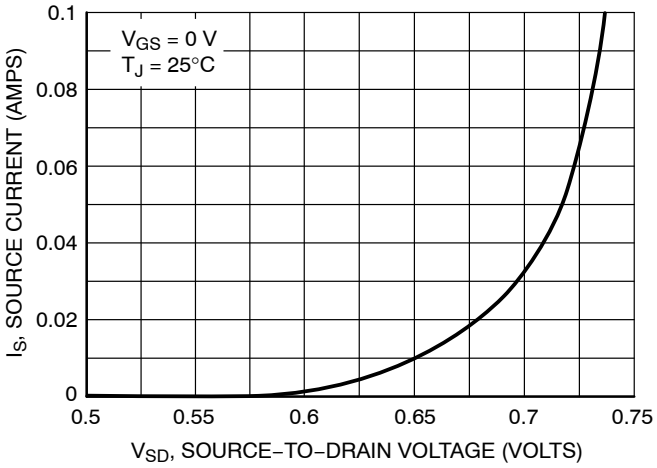


Figure 10. Diode Forward Voltage vs. Current

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

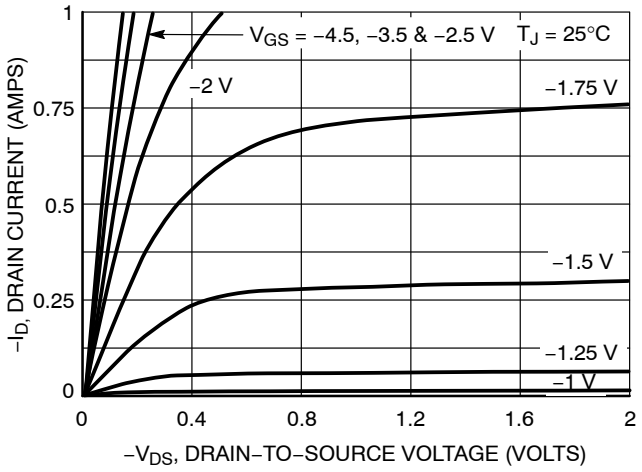


Figure 1. On−Region Characteristics

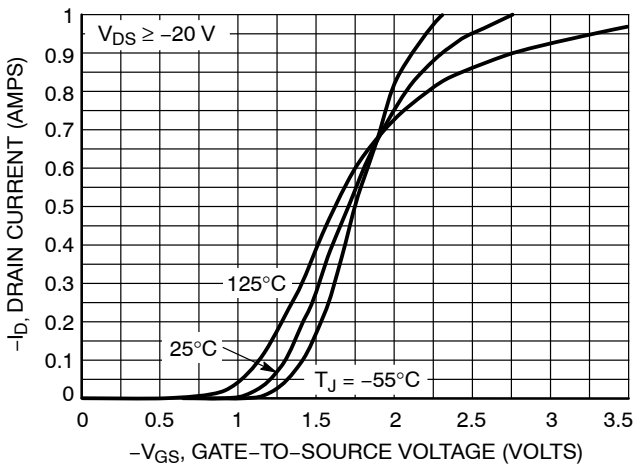


Figure 2. Transfer Characteristics

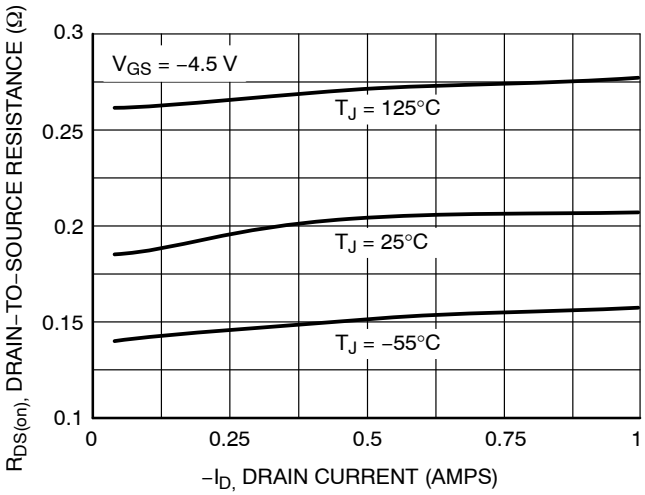


Figure 3. On−Resistance vs. Drain Current and Temperature

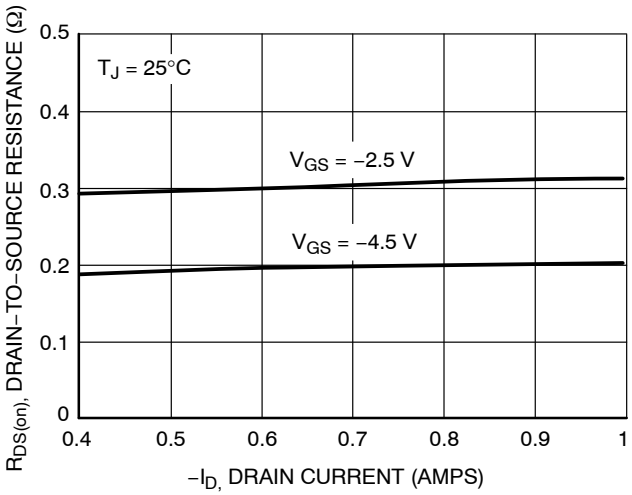


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

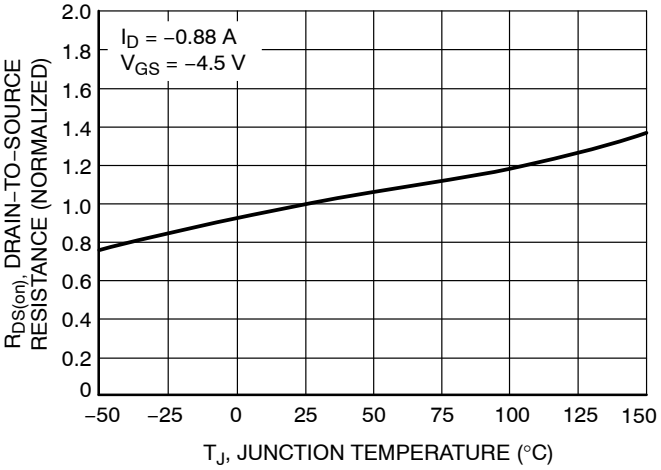


Figure 5. On−Resistance Variation with Temperature

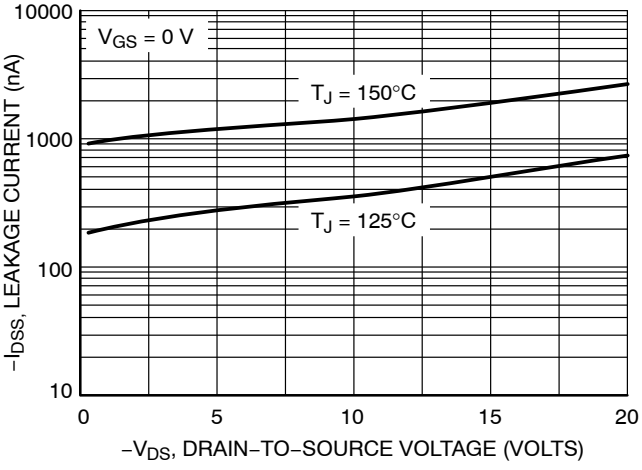


Figure 6. Drain−to−Source Leakage Current vs. Voltage

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

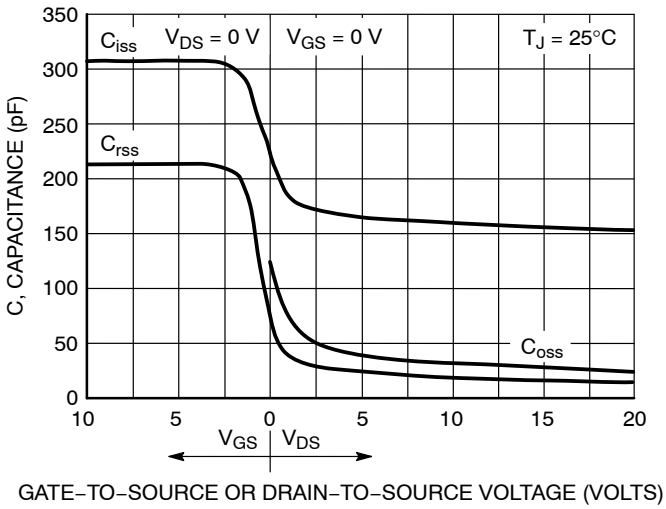


Figure 7. Capacitance Variation

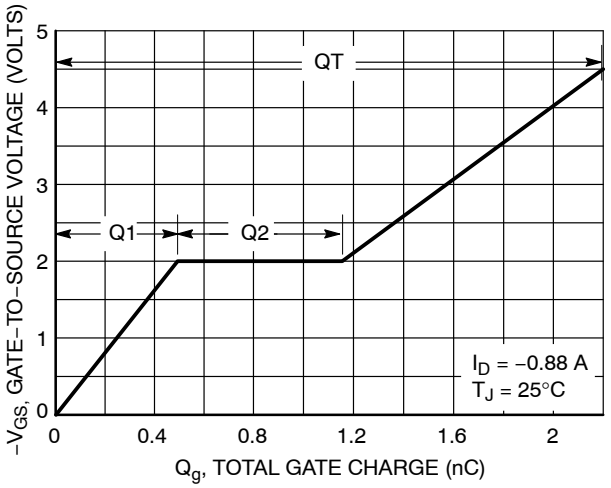


Figure 8. Gate−to−Source Voltage vs. Total Gate Charge

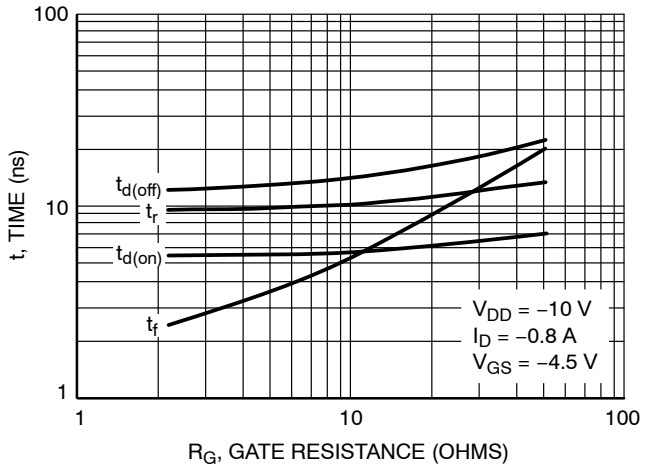


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

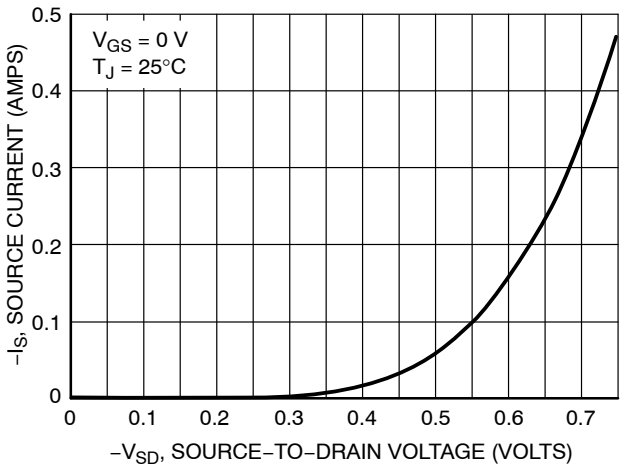
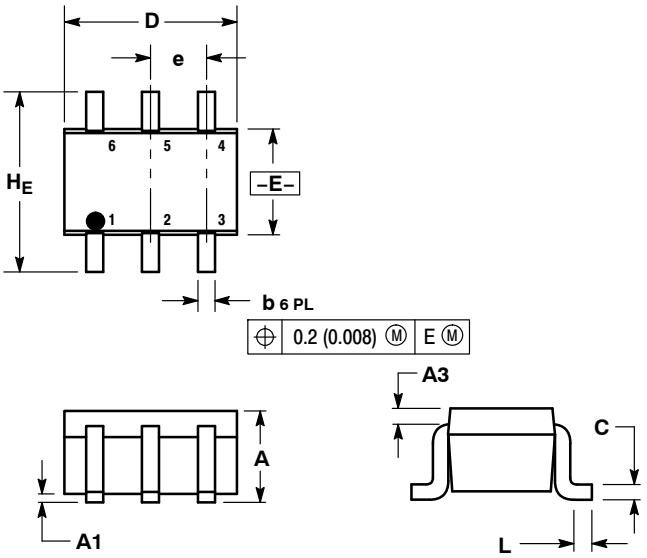


Figure 10. Diode Forward Voltage vs. Current

NTJD4158C

PACKAGE DIMENSIONS

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

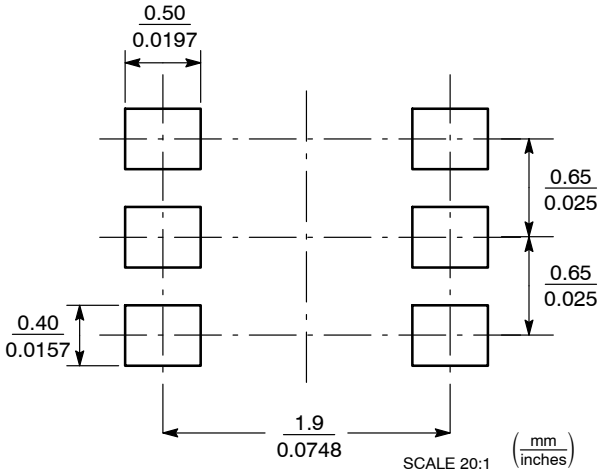


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B−01 OBSOLETE, NEW STANDARD 419B−02.

	MILLIMETERS			INCHES		
DIM	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
H_E	2.00	2.10	2.20	0.078	0.082	0.086

STYLE 26:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. 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.

PUBLICATION ORDERING INFORMATION

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