NTJD4158C, NVJD4158C

MOSFET – Small Signal, Complementary, SC-88
30 V/-20 V, +0.25/-0.88 A

ON Semiconductor®

www.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	

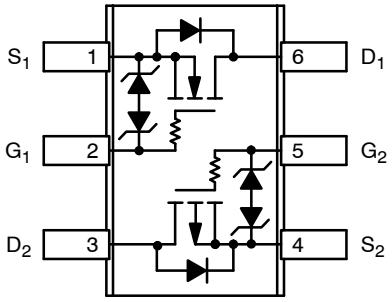
Features

- Leading 20 V Trench for Low $R_{DS(on)}$ Performance
- ESD Protected Gate
- SC–88 Package for Small Footprint (2 x 2 mm)
- NV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q101 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

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

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

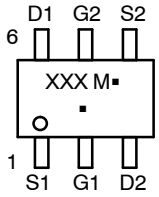
THERMAL RESISTANCE RATINGS

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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

MARKING DIAGRAM & PIN ASSIGNMENT

SC–88 (SOT–363)
CASE 419B
STYLE 26



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

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

1. Surface mounted on FR4 board using 1 in sq pad size
   (Cu area = 1.127 in sq [1 oz] including traces).

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	−0.61	−1.5	
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		10.6		

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)

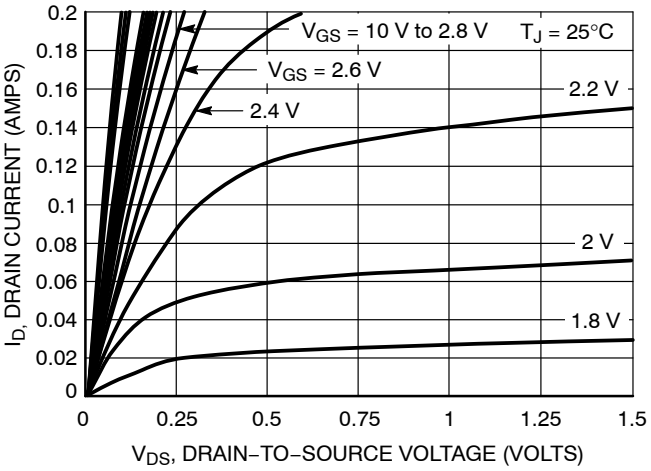


Figure 1. On−Region Characteristics

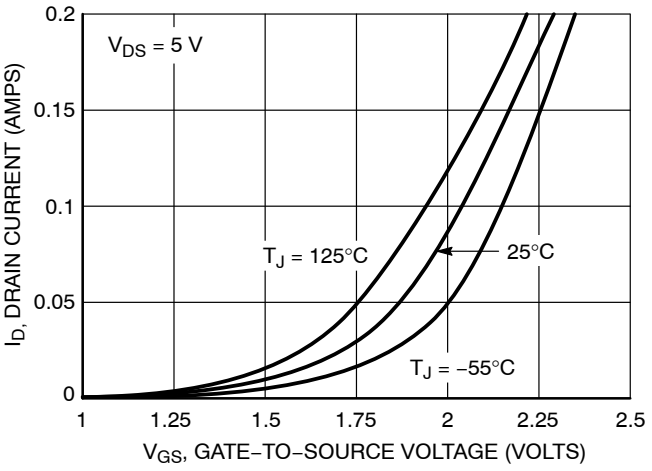


Figure 2. Transfer Characteristics

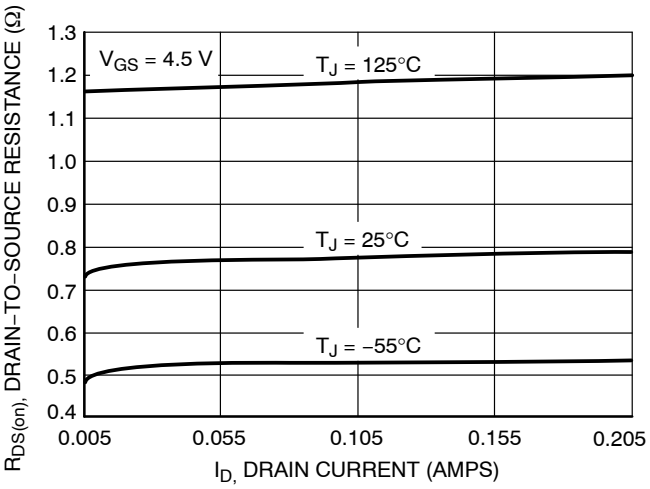


Figure 3. On−Resistance vs. Drain Current and Temperature

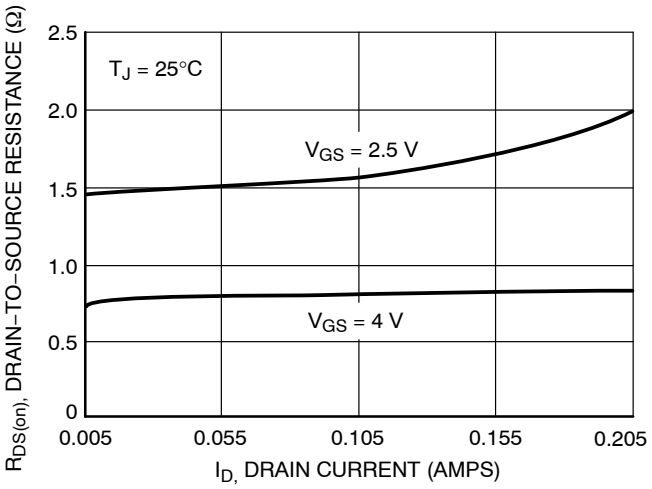


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

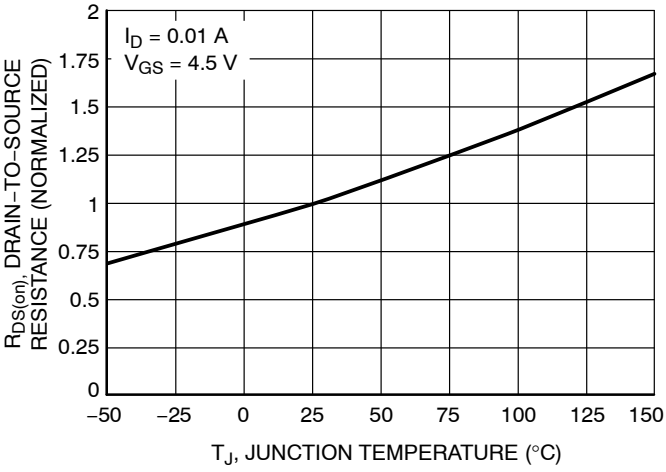


Figure 5. On−Resistance Variation with Temperature

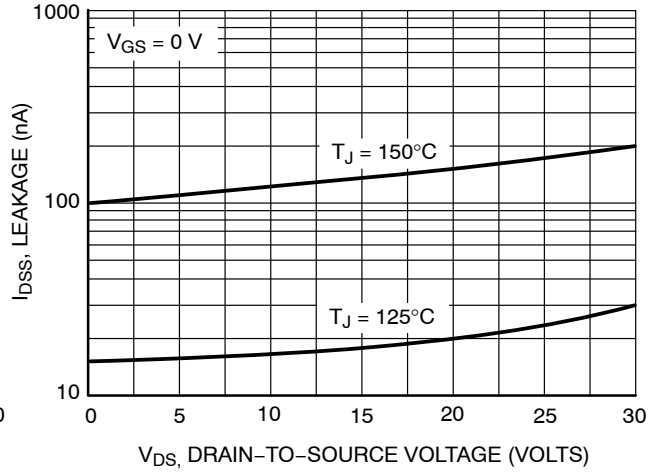


Figure 6. Drain−to−Source Leakage Current vs. Voltage

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

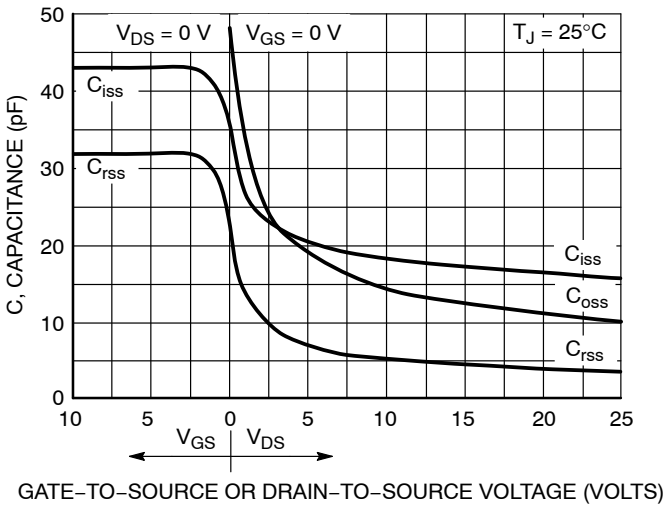


Figure 7. Capacitance Variation

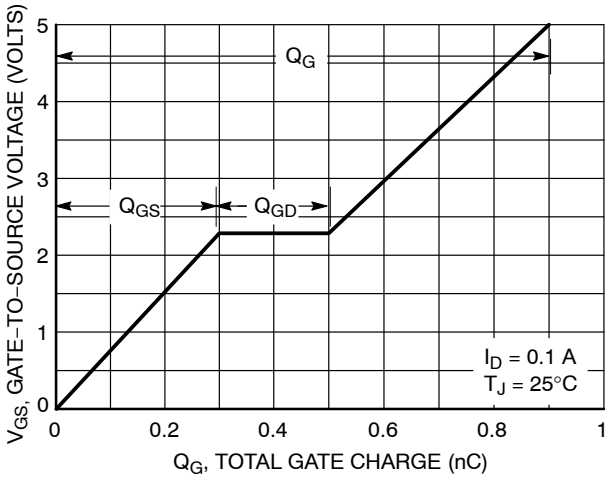


Figure 8. Gate−to−Source Voltage vs. Total Gate Charge

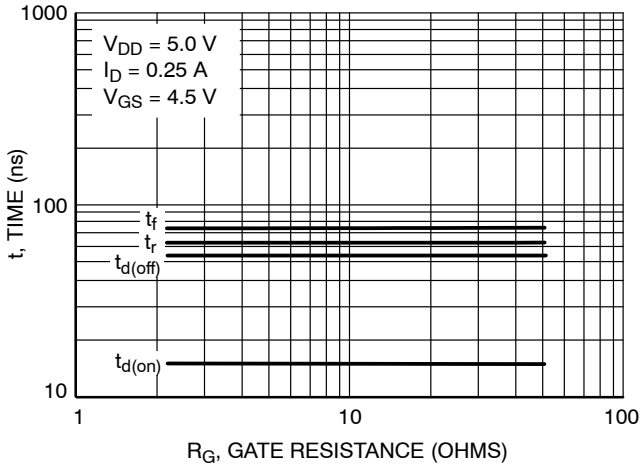


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

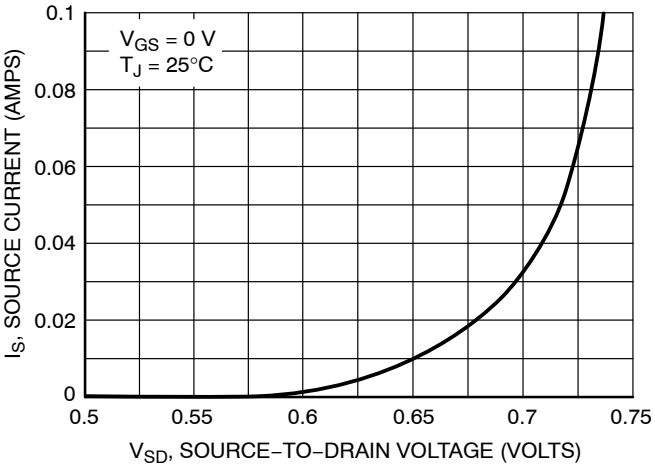


Figure 10. Diode Forward Voltage vs. Current

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

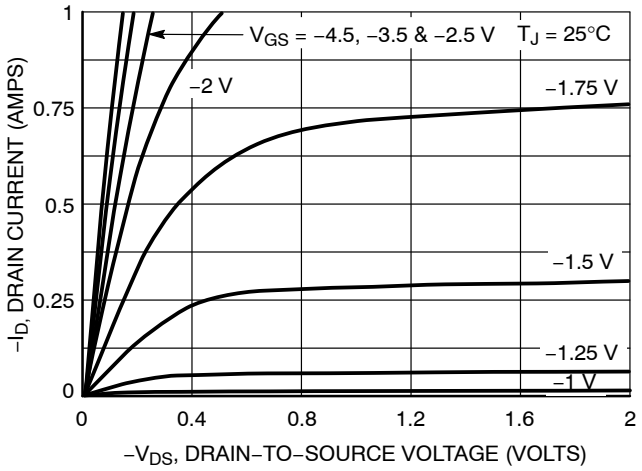


Figure 1. On−Region Characteristics

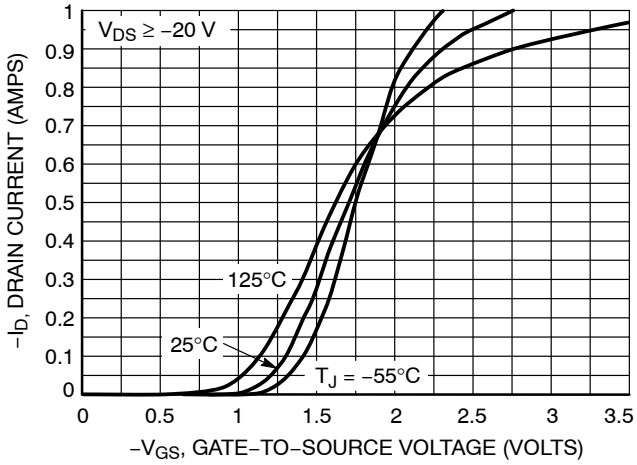


Figure 2. Transfer Characteristics

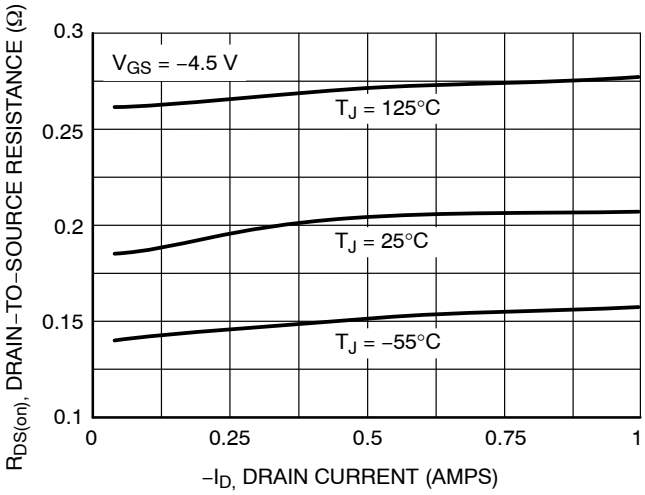


Figure 3. On−Resistance vs. Drain Current and Temperature

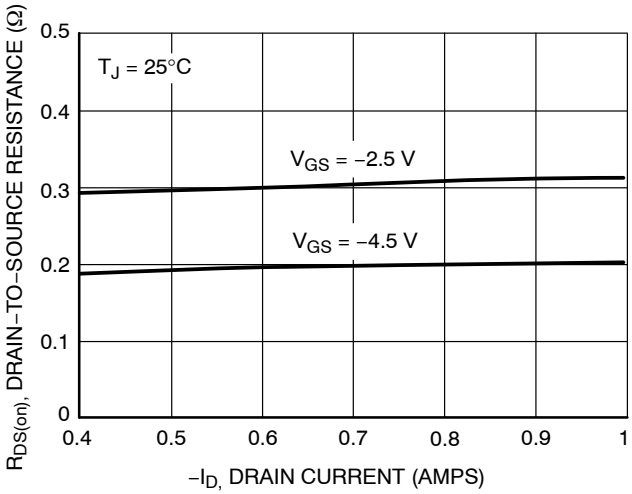


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

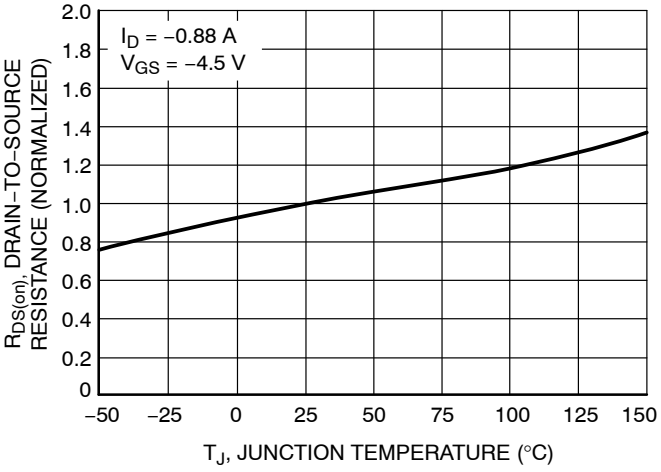


Figure 5. On−Resistance Variation with Temperature

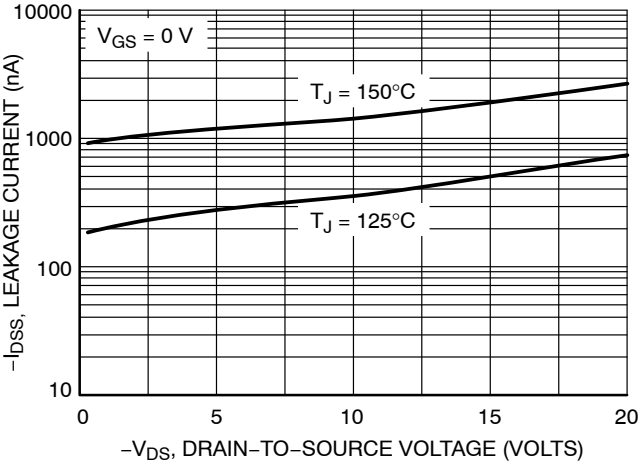


Figure 6. Drain−to−Source Leakage Current vs. Voltage

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

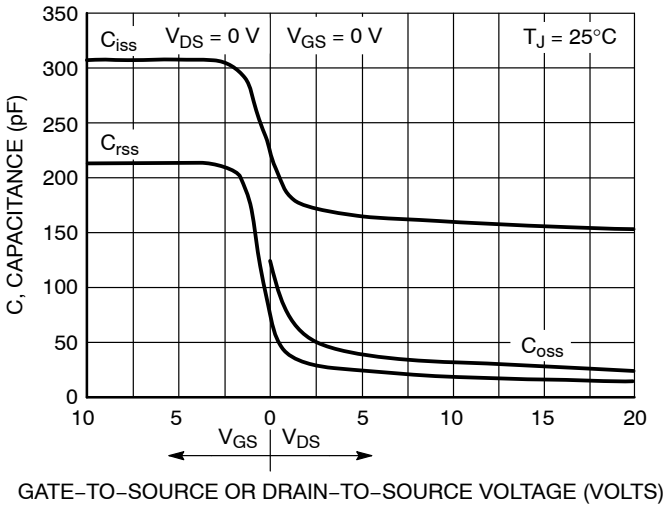


Figure 7. Capacitance Variation

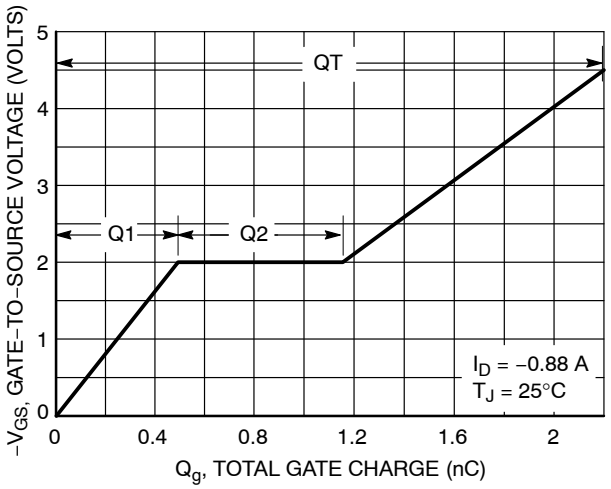


Figure 8. Gate−to−Source Voltage vs. Total Gate Charge

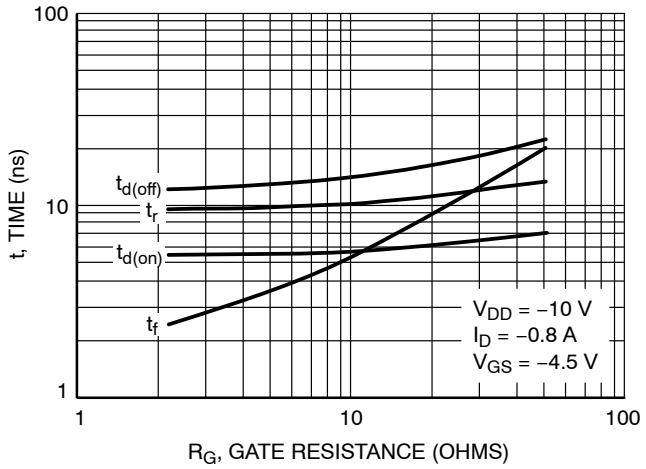


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

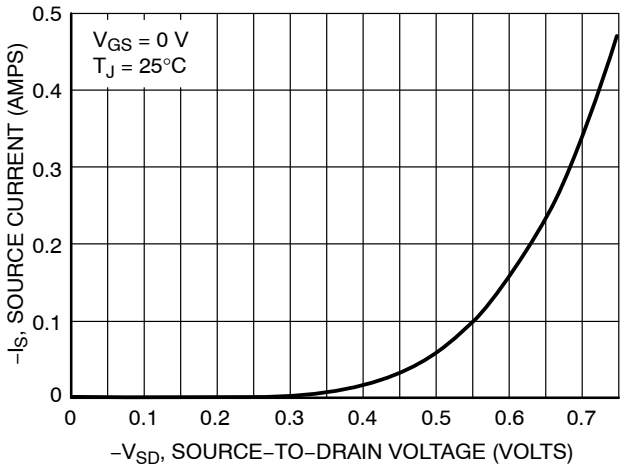


Figure 10. Diode Forward Voltage vs. Current

ORDERING INFORMATION

Device	Marking	Package	Shipping†
NTJD4158CT1G	TCD	SC−88 (Pb−Free)	3000 / Tape & Reel
NTJD4158CT2G	TCD		
NVJD4158CT1G*	VCD		

†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.

*NV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable.

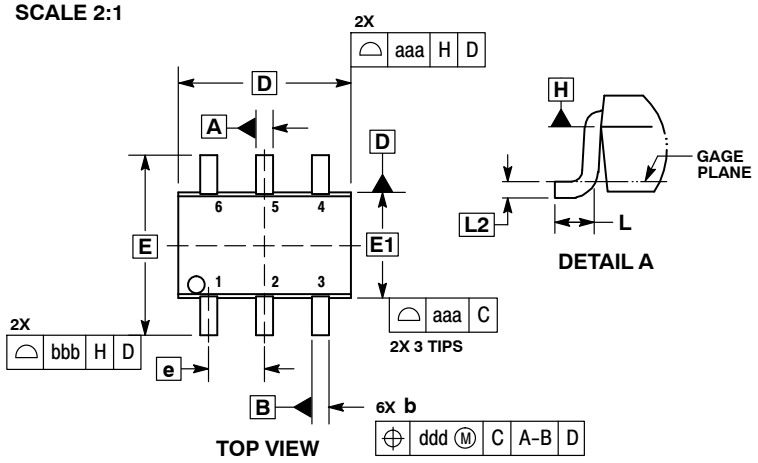
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

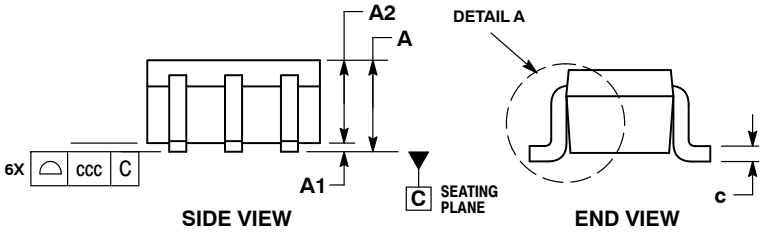
ON Semiconductor®

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

DATE 11 DEC 2012

1
SCALE 2:1

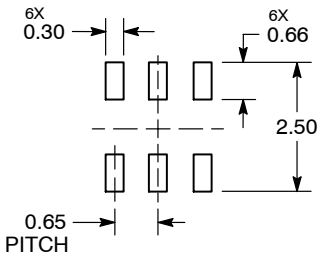




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	−−−	−−−	1.10	−−−	−−−	0.043
A1	0.00	−−−	0.10	0.000	−−−	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

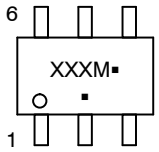
RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing location.

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

DOCUMENT NUMBER:	**98ASB42985B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.	
DESCRIPTION:	**SC−88/SC70−6/SOT−363**		**PAGE 1 OF 2**

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

DATE 11 DEC 2012

STYLE 1:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

STYLE 2:
CANCELLED

STYLE 3:
CANCELLED

STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. COLLECTOR
4. EMITTER
5. BASE
6. ANODE

STYLE 5:
PIN 1. ANODE
2. ANODE
3. COLLECTOR
4. EMITTER
5. BASE
6. CATHODE

STYLE 6:
PIN 1. ANODE 2
2. N/C
3. CATHODE 1
4. ANODE 1
5. N/C
6. CATHODE 2

STYLE 7:
PIN 1. SOURCE 2
2. DRAIN 2
3. GATE 1
4. SOURCE 1
5. DRAIN 1
6. GATE 2

STYLE 8:
CANCELLED

STYLE 9:
PIN 1. EMITTER 2
2. EMITTER 1
3. COLLECTOR 1
4. BASE 1
5. BASE 2
6. COLLECTOR 2

STYLE 10:
PIN 1. SOURCE 2
2. SOURCE 1
3. GATE 1
4. DRAIN 1
5. DRAIN 2
6. GATE 2

STYLE 11:
PIN 1. CATHODE 2
2. CATHODE 2
3. ANODE 1
4. CATHODE 1
5. CATHODE 1
6. ANODE 2

STYLE 12:
PIN 1. ANODE 2
2. ANODE 2
3. CATHODE 1
4. ANODE 1
5. ANODE 1
6. CATHODE 2

STYLE 13:
PIN 1. ANODE
2. N/C
3. COLLECTOR
4. EMITTER
5. BASE
6. CATHODE

STYLE 14:
PIN 1. VREF
2. GND
3. GND
4. IOUT
5. VEN
6. VCC

STYLE 15:
PIN 1. ANODE 1
2. ANODE 2
3. ANODE 3
4. CATHODE 3
5. CATHODE 2
6. CATHODE 1

STYLE 16:
PIN 1. BASE 1
2. EMITTER 2
3. COLLECTOR 2
4. BASE 2
5. EMITTER 1
6. COLLECTOR 1

STYLE 17:
PIN 1. BASE 1
2. EMITTER 1
3. COLLECTOR 2
4. BASE 2
5. EMITTER 2
6. COLLECTOR 1

STYLE 18:
PIN 1. VIN1
2. VCC
3. VOUT2
4. VIN2
5. GND
6. VOUT1

STYLE 19:
PIN 1. I OUT
2. GND
3. GND
4. V CC
5. V EN
6. V REF

STYLE 20:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

STYLE 21:
PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. N/C
6. CATHODE 1

STYLE 22:
PIN 1. D1 (i)
2. GND
3. D2 (i)
4. D2 (c)
5. VBUS
6. D1 (c)

STYLE 23:
PIN 1. Vn
2. CH1
3. Vp
4. N/C
5. CH2
6. N/C

STYLE 24:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 25:
PIN 1. BASE 1
2. CATHODE
3. COLLECTOR 2
4. BASE 2
5. EMITTER
6. COLLECTOR 1

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

STYLE 27:
PIN 1. BASE 2
2. BASE 1
3. COLLECTOR 1
4. EMITTER 1
5. EMITTER 2
6. COLLECTOR 2

STYLE 28:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 29:
PIN 1. ANODE
2. ANODE
3. COLLECTOR
4. EMITTER
5. BASE/ANODE
6. CATHODE

STYLE 30:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

DOCUMENT NUMBER:	**98ASB42985B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**SC−88/SC70−6/SOT−363**	**PAGE 2 OF 2**

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

◊