

# NTJD4105C

## Small Signal MOSFET

20 V / -8.0 V, Complementary,  
+0.63 A / -0.775 A, SC-88

### Features

- Complementary N and P Channel Device
- Leading -8.0 V Trench for Low  $R_{DS(on)}$  Performance
- ESD Protected Gate – ESD Rating: Class 1
- SC-88 Package for Small Footprint (2 x 2 mm)
- Pb-Free Package May be Available. The G-Suffix Denotes a Pb-Free Lead Finish

### Applications

- DC-DC Conversion
- Load/Power Switching
- Single or Dual Cell Li-Ion Battery Supplied Devices
- 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	20	V	
	P-Ch	-8.0		
Gate-to-Source Voltage	N-Ch	$\pm 12$	V	
	P-Ch	$\pm 8.0$		
Continuous Drain Current – Steady State (Based on $R_{\theta JA}$ )	N-Ch	$T_A=25^\circ\text{C}$	0.63	A
		$T_A=85^\circ\text{C}$	0.46	
	P-Ch	$T_A=25^\circ\text{C}$	-0.775	
		$T_A=85^\circ\text{C}$	-0.558	
Continuous Drain Current – Steady State (Based on $R_{\theta JL}$ )	N-Ch	$T_A=25^\circ\text{C}$	0.91	
		$T_A=85^\circ\text{C}$	0.65	
	P-Ch	$T_A=25^\circ\text{C}$	-1.1	
		$T_A=85^\circ\text{C}$	-0.8	
Pulsed Drain Current	$t_p \leq 10 \mu\text{s}$	$I_{DM}$	$\pm 1.2$	A
Power Dissipation – Steady State (Based on $R_{\theta JA}$ )	$T_A=25^\circ\text{C}$	$P_D$	0.27	W
	$T_A=85^\circ\text{C}$		0.14	
Power Dissipation – Steady State (Based on $R_{\theta JL}$ )	$T_A=25^\circ\text{C}$		0.55	
	$T_A=85^\circ\text{C}$		0.29	
Operating Junction and Storage Temperature	$T_J, T_{STG}$	-55 to 150		$^\circ\text{C}$
Source Current (Body Diode)	N-Ch	$I_S$	0.63	A
	P-Ch		-0.775	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260		$^\circ\text{C}$

### THERMAL RESISTANCE RATINGS (Note 1)

Junction-to-Ambient – Steady State	Typ	$R_{\theta JA}$	400	$^\circ\text{C/W}$
	Max		460	
Junction-to-Lead (Drain) – Steady State	Typ	$R_{\theta JL}$	194	
	Max		226	

1. Surface mounted on FR4 board using 1 oz Cu area = 0.9523 in sq.

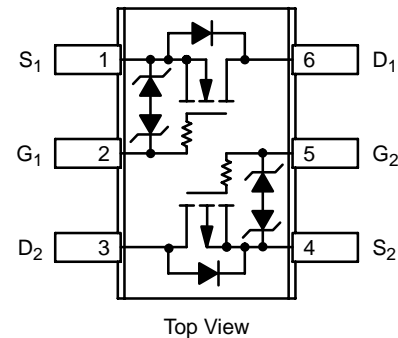


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$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
N-Ch 20 V	0.29 $\Omega$ @ 4.5 V	0.63 A
	0.36 $\Omega$ @ 2.5 V	
P-Ch -8.0 V	0.22 $\Omega$ @ -4.5 V	-0.775 A
	0.32 $\Omega$ @ -2.5 V	
	0.51 $\Omega$ @ -1.8 V	

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

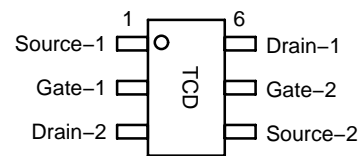


Top View



### SC-88 (SOT-363) CASE 419B Style 26

### MARKING DIAGRAM & PIN ASSIGNMENT



Top View

TC = Specific Device Code  
D = Date Code

### ORDERING INFORMATION

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

# NTJD4105C

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

Parameter	Symbol	N/P	Test Condition	Min	Typ	Max	Units
<b>OFF CHARACTERISTICS</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	27	V
		P		I <sub>D</sub> =-250 μA	-8.0	-10.5	
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> / T <sub>J</sub>	N			22		mV/°C
		P			-6.0		
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	N	V <sub>GS</sub> =0 V, V <sub>DS</sub> =16 V	T <sub>J</sub> =25 °C		1.0	μA
		P	V <sub>GS</sub> =0 V, V <sub>DS</sub> =-6.4 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>GS</sub> =±8.0		10	

## 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> =250 μA	0.6	0.92	1.5	V
		P		I <sub>D</sub> =-250 μA	-0.45	-0.83	-1.0	
Gate Threshold Temperature Coefficient	V <sub>GS(TH)</sub> / T <sub>J</sub>	N				-2.1		-mV/°C
		P				2.2		
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		0.29	0.375	Ω	
		P	V <sub>GS</sub> =-4.5 V, I <sub>D</sub> =-0.57 A		0.22	0.30		
		N	V <sub>GS</sub> =2.5 V, I <sub>D</sub> =0.40 A		0.36	0.445		
		P	V <sub>GS</sub> =-2.5 V, I <sub>D</sub> =-0.48 A		0.32	0.46		
		P	V <sub>GS</sub> =-1.8 V, I <sub>D</sub> =-0.20 A		0.51	0.90		
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> =-4.0 V, I <sub>D</sub> =-0.57 A		2.0			

## CHARGES AND CAPACITANCES

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> =-8.0V	160	225		
Output Capacitance	C <sub>OSS</sub>	N		V <sub>DS</sub> =20 V	13	22		
		P		V <sub>DS</sub> =-8.0 V	38	55		
Reverse Transfer Capacitance	C <sub>RSS</sub>	N		V <sub>DS</sub> =20 V	2.8	5.0		
		P		V <sub>DS</sub> =-8.0 V	28	40		
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> =0.7 A	1.3	3.0		nC
		P		V <sub>GS</sub> =-4.5 V, V <sub>DS</sub> =-5.0 V, I <sub>D</sub> =-0.6 A	2.2	4.0		
Threshold Gate Charge	Q <sub>G(TH)</sub>	N		V <sub>GS</sub> =4.5 V, V <sub>DS</sub> =10 V, I <sub>D</sub> =0.7 A	0.1			
		P		V <sub>GS</sub> =-4.5 V, V <sub>DS</sub> =-5.0 V, I <sub>D</sub> =-0.6 A	0.1			
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> =0.7 A	0.2				
		P	V <sub>GS</sub> =-4.5 V, V <sub>DS</sub> =-5.0 V, I <sub>D</sub> =-0.6 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> =0.7 A	0.4				
		P	V <sub>GS</sub> =-4.5 V, V <sub>DS</sub> =-5.0 V, I <sub>D</sub> =-0.6 A	0.5				

## 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	0.083		μs
Rise Time	t <sub>r</sub>			0.227		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			0.786		
Fall Time	t <sub>f</sub>			0.506		
Turn-On Delay Time	t <sub>d(ON)</sub>	P	V <sub>GS</sub> =-4.5 V, V <sub>DD</sub> =-4.0 V, I <sub>D</sub> =-0.5 A, R <sub>G</sub> =8.0 Ω	0.013		
Rise Time	t <sub>r</sub>			0.023		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			0.050		
Fall Time	t <sub>f</sub>			0.036		

## DRAIN-SOURCE DIODE CHARACTERISTICS

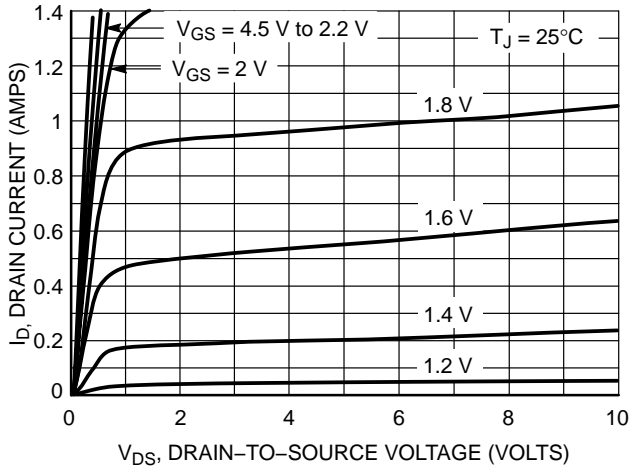
Forward Diode Voltage	V <sub>SD</sub>	N	V <sub>GS</sub> =0 V, T <sub>J</sub> =25°C	I <sub>S</sub> =0.23 A	0.76	1.1	V
		P		I <sub>S</sub> =-0.23 A	0.76	1.1	
		N	V <sub>GS</sub> =0 V, T <sub>J</sub> =125°C	I <sub>S</sub> =0.23 A	0.63		
		P		I <sub>S</sub> =-0.23 A	0.63		
Reverse Recovery Time	t <sub>RR</sub>	N	V <sub>GS</sub> =0 V, dI <sub>S</sub> /dt=90 A/μs	I <sub>S</sub> =0.23 A	0.410		μs
		P		I <sub>S</sub> =-0.23 A	0.078		

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

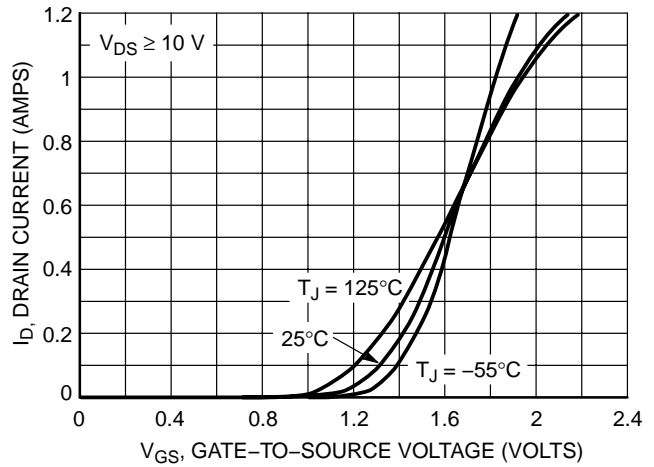
3. Switching characteristics are independent of operating junction temperatures.

# NTJD4105C

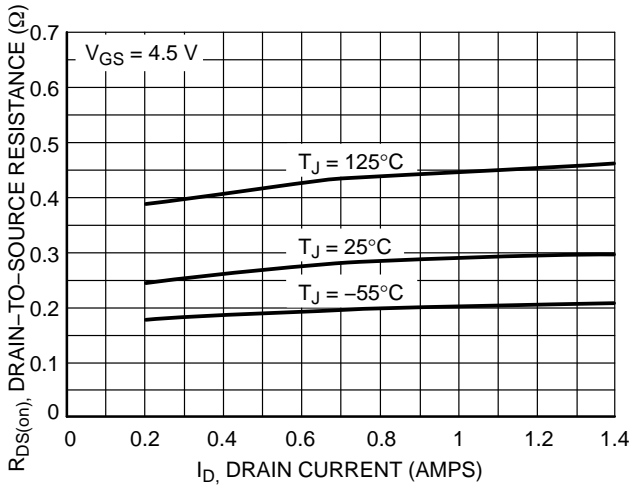
## TYPICAL N-CHANNEL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



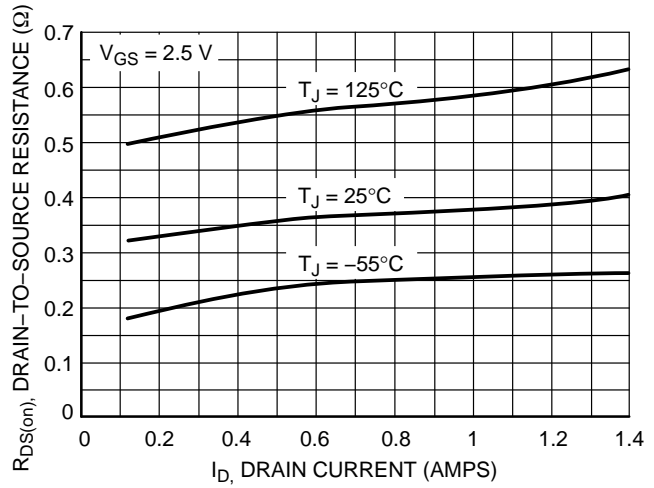
**Figure 1. On-Region Characteristics**



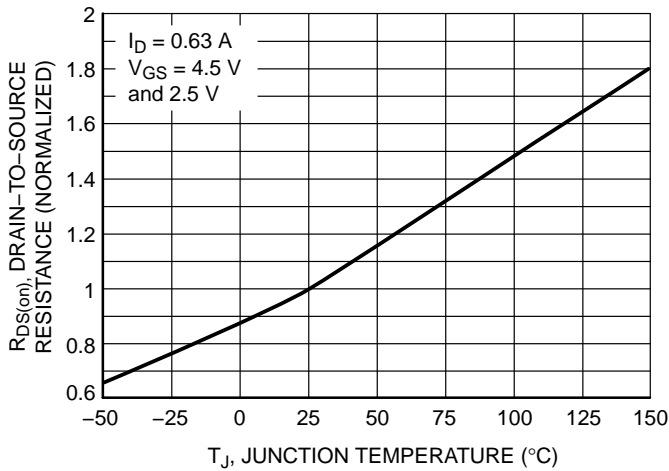
**Figure 2. Transfer Characteristics**



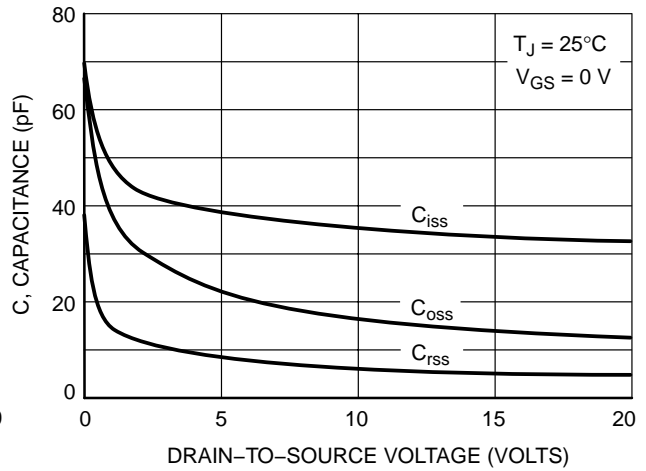
**Figure 3. On-Resistance vs. Drain Current and Temperature**



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



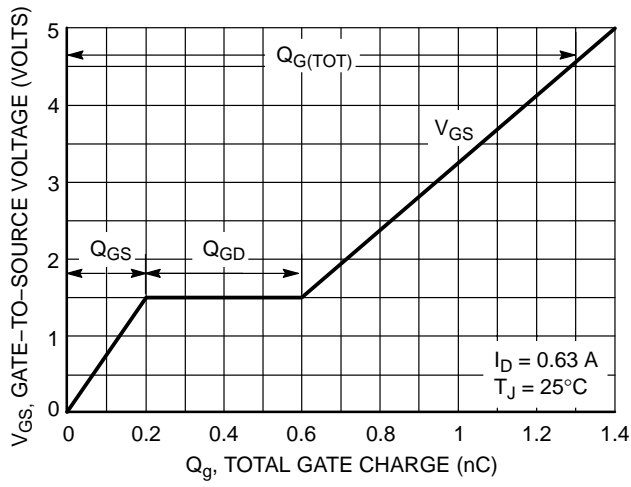
**Figure 5. On-Resistance Variation with Temperature**



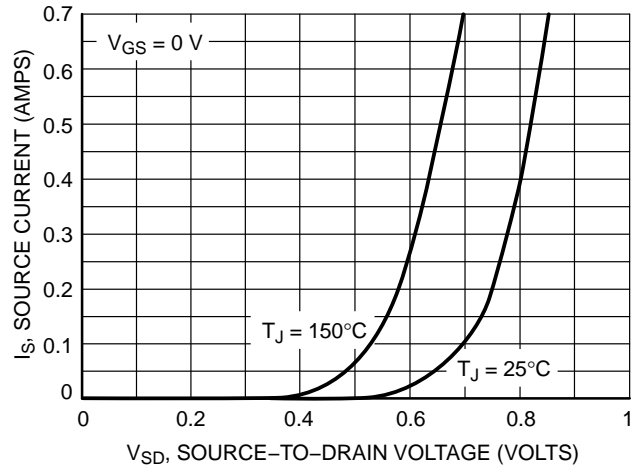
**Figure 6. Capacitance Variation**

# NTJD4105C

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



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



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

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

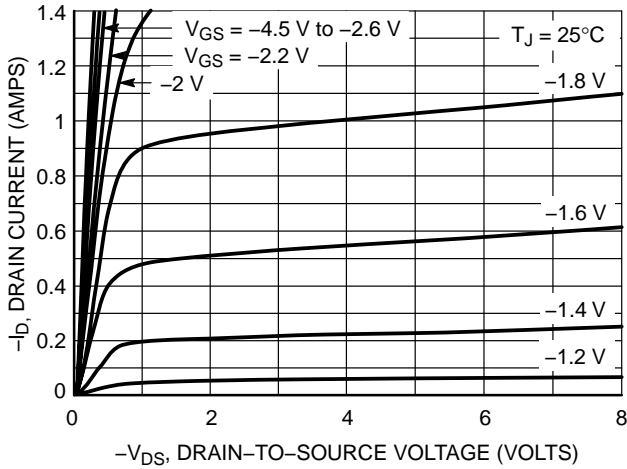


Figure 9. On-Region Characteristics

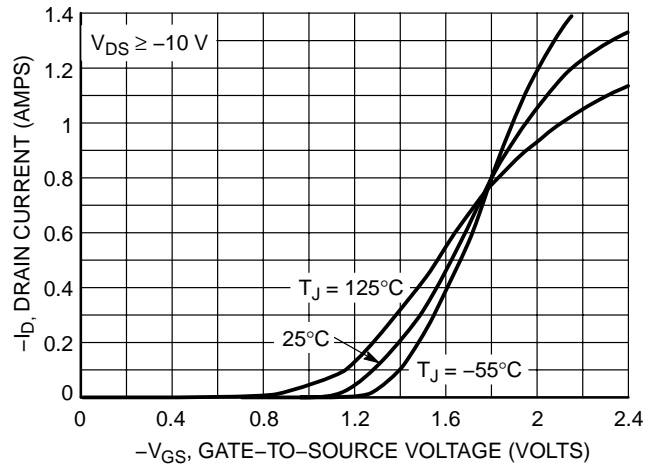


Figure 10. Transfer Characteristics

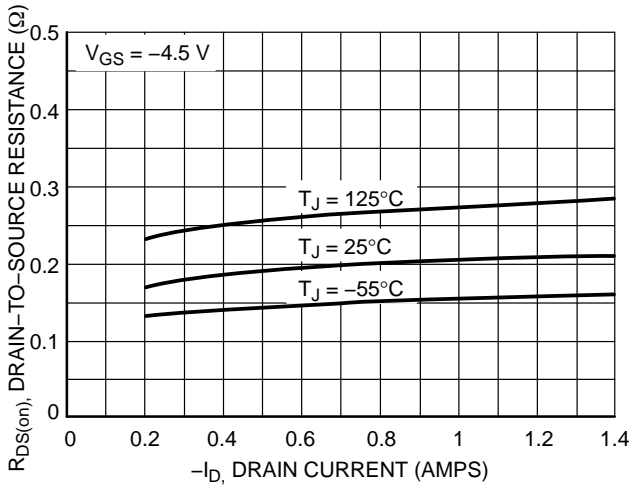


Figure 11. On-Resistance vs. Drain Current and Temperature

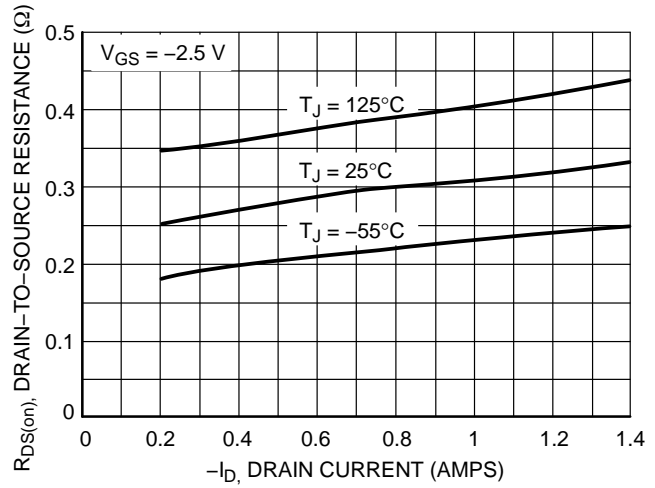


Figure 12. On-Resistance vs. Drain Current and Temperature

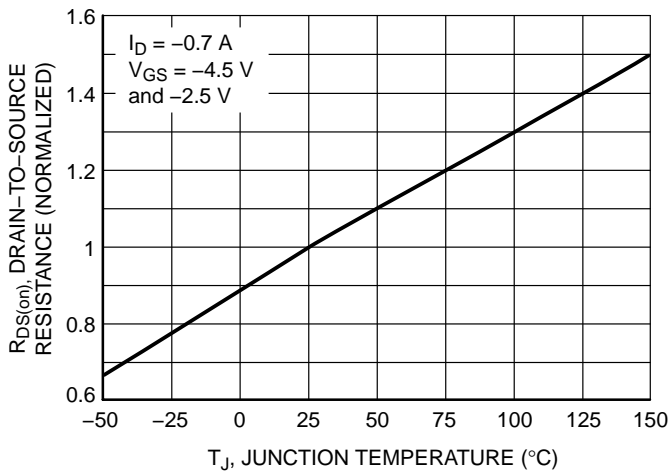


Figure 13. On-Resistance Variation with Temperature

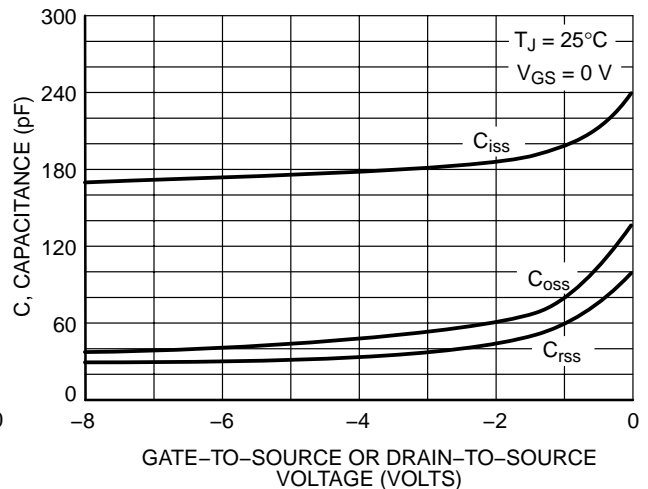


Figure 14. Capacitance Variation

# NTJD4105C

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

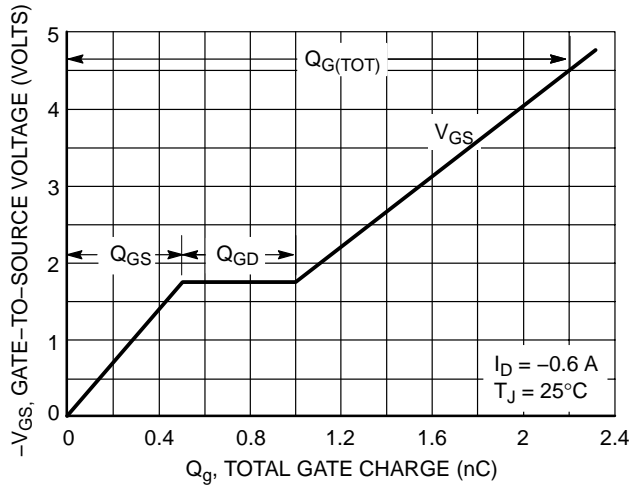


Figure 15. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

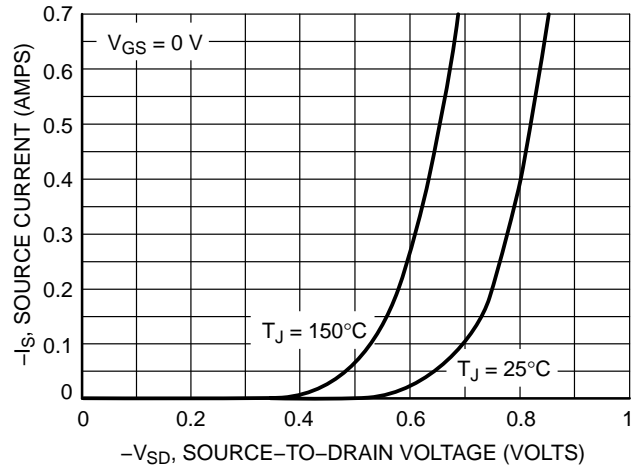


Figure 16. Diode Forward Voltage vs. Current

# NTJD4105C

## ORDERING INFORMATION1

Device	Package	Shipping†
NTJD4105CT1	SOT-363	3000 / Tape & Reel
NTJD4105CT1G	SOT-363 (Pb-Free)	3000 / Tape & Reel
NTJD4105CT2	SOT-363	3000 / Tape & Reel
NTJD4105CT2G	SOT-363 (Pb-Free)	3000 / Tape & Reel
NTJD4105CT4	SOT-363	10,000 / Tape & Reel
NTJD4105CT4G	SOT-363 (Pb-Free)	10,000 / Tape & Reel

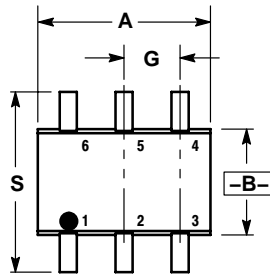
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# NTJD4105C

## PACKAGE DIMENSIONS

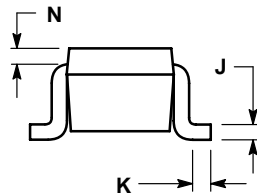
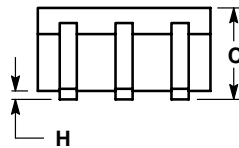
### SC-88 (SOT-363) CASE 419B-02 ISSUE T

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



D 6 PL

⊕ 0.2 (0.008) M B M

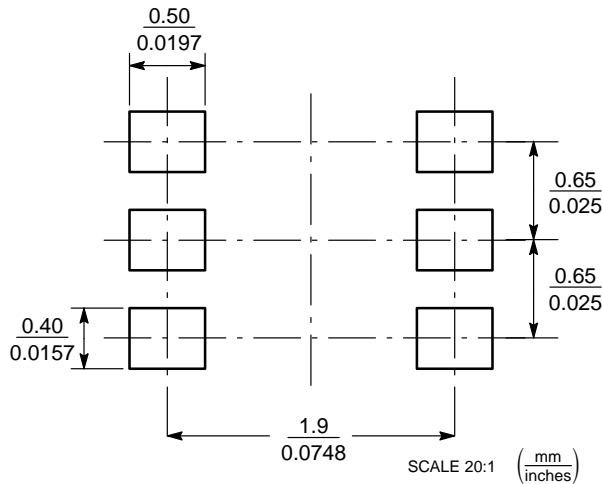


DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

STYLE 26:

- PIN 1. SOURCE 1  
2. GATE 1  
3. DRAIN 2  
4. SOURCE 2  
5. GATE 2  
6. DRAIN 1

### SOLDERING FOOTPRINT\*



### SC-88/SC70-6

\*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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