

NTGD3122C

Power MOSFET

Complementary, 20 V, +3.3/-2.5 A,
TSOP-6 Dual

Features

- Complementary N-Channel and P-Channel MOSFET
- Small Size (3 x 3 mm) Dual TSOP-6 Package
- Leading Edge Trench Technology for Low On Resistance
- 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
- LCD Display Inverter
- Portable Devices like PDA's, Cellular Phones, and Hard Drives

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V _{DSS}	20	V
Gate-to-Source Voltage (N & P-Ch)			V _{GS}	±12	V
N-Channel Continuous Drain Current (Note 1)	Steady State	T _A = 25°C	I _D	3.0	A
		T _A = 85°C		2.1	
	t ≤ 5 s	T _A = 25°C		3.3	
P-Channel Continuous Drain Current (Note 1)	Steady State	T _A = 25°C	I _D	2.3	A
		T _A = 85°C		1.6	
	t ≤ 5 s	T _A = 25°C		2.5	
Power Dissipation (Note 1)	Steady State	T _A = 25°C	P _D	1.1	W
	t ≤ 5 s			1.3	
N-Channel Continuous Drain Current (Note 2)		T _A = 25°C	I _D	2.1	A
		T _A = 85°C		1.6	
P-Channel Continuous Drain Current (Note 2)		T _A = 25°C	I _D	1.6	A
		T _A = 85°C		1.2	
Power Dissipation (Note 2)		T _A = 25°C	P _D	0.56	W
Pulsed Drain Current	N-Ch	t _p = 10 μs	I _{DM}	9.0	A
	P-Ch			7.0	
Operating Junction and Storage Temperature			T _J , T _{STG}	-55 to 150	°C
Source Current (Body Diode) (Note 2)			I _S	0.8	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T _L	260	°C

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.

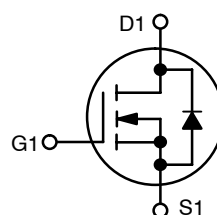
1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces). Both die on.
2. Surface Mounted on FR4 Board using the minimum recommended pad size. (Cu area = 30 mm² [2 oz]). Both die on.



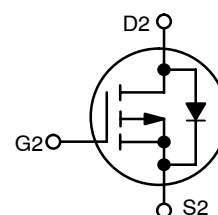
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$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX (Note 1)
N-Ch 20 V	80 m Ω @ 4.5 V	3.3 A
	110 m Ω @ 2.5 V	
P-Ch -20 V	145 m Ω @ 4.5 V	-2.5 A
	200 m Ω @ 2.5 V	



N-CHANNEL MOSFET

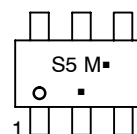


P-CHANNEL MOSFET



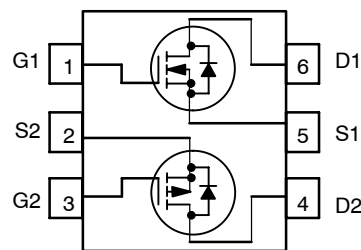
TSOP6
CASE 318G

MARKING DIAGRAM



S5 = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

PIN CONNECTION



(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

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THERMAL RESISTANCE RATINGS (NTGD3122C)

Parameter	Symbol	Max	Unit
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BOTH DIE ON

Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	115	°C/W
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	95	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	225	

ONE DIE ON

Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	175	°C/W
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	160	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	305	

3. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
 4. Surface Mounted on FR4 Board using the minimum recommended pad size (Cu area = 30 mm² [2 oz] including traces).

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	N/P	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS (Note 5)

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	N	$V_{GS} = 0$ V	$I_D = 250$ μ A	20		V
		P		$I_D = -250$ μ A	-20		
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	N			13.6		mV/°C
		P			14.4		
Zero Gate Voltage Drain Current	I_{DSS}	N	$V_{GS} = 0$ V, $V_{DS} = 16$ V	$T_J = 25^\circ\text{C}$		1.0	μ A
		P	$V_{GS} = 0$ V, $V_{DS} = -16$ V			-1.0	
		N	$V_{GS} = 0$ V, $V_{DS} = 16$ V	$T_J = 85^\circ\text{C}$		10	
		P	$V_{GS} = 0$ V, $V_{DS} = -16$ V			-10	
Gate-to-Source Leakage Current	I_{GSS}	N	$V_{DS} = 0$ V, $V_{GS} = \pm 12$ V			± 100	nA
		P	$V_{DS} = 0$ V, $V_{GS} = \pm 12$ V			± 100	

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	V _{GS(TH)}	N	V _{GS} = V _{DS}	I _D = 250 μA	0.6	0.9	1.4	V
		P		I _D = -250 μA	-0.6	-0.9	-1.4	
Drain-to-Source On Resistance	R _{DS(on)}	N	V _{GS} = 4.5 V , I _D = 2.5 A			60	80	mΩ
			V _{GS} = 2.5 V , I _D = 2.2 A			70	110	
		P	V _{GS} = -4.5 V , I _D = -1.9 A			95	145	
			V _{GS} = -2.5 V, I _D = -1.6 A			150	200	
Forward Transconductance	g _{FS}	N	V _{DS} = 5.0 V, I _D = 2.5 A			4.8		S
		P	V _{DS} = -5.0 V , I _D = -2.5 A			4.0		

CHARGES AND CAPACITANCES

Input Capacitance	C _{ISS}	N	f = 1 MHz, V _{GS} = 0 V	V _{DS} = 10 V		320		pF
Output Capacitance	C _{OSS}					72		
Reverse Transfer Capacitance	C _{RSS}					43		
Input Capacitance	C _{ISS}	P		V _{DS} = -10 V		390		
Output Capacitance	C _{OSS}					75		
Reverse Transfer Capacitance	C _{RSS}					37		

5. Pulse Test: pulse width ≤ 250 μ s, duty cycle $\leq 2\%$.

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

Parameter	Symbol	N/P	Test Conditions	Min	Typ	Max	Unit
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CHARGES AND CAPACITANCES

Total Gate Charge	Q _{G(TOT)}	N	V _{GS} = 4.5 V, V _{DS} = 10 V, I _D = 3.0 A		3.9	5.5	nC
Threshold Gate Charge	Q _{G(TH)}				0.7		
Gate-to-Source Gate Charge	Q _{GS}				1.0		
Gate-to-Drain "Miller" Charge	Q _{GD}				1.0		
Total Gate Charge	Q _{G(TOT)}	P	V _{GS} = -4.5 V, V _{DS} = -10 V, I _D = -2.2 A		3.7	5.5	
Threshold Gate Charge	Q _{G(TH)}				0.7		
Gate-to-Source Gate Charge	Q _{GS}				1.1		
Gate-to-Drain "Miller" Charge	Q _{GD}				1.2		

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	t _{d(ON)}	N	V _{GS} = 4.5 V, V _{DD} = 10 V, I _D = 1.0 A, R _G = 6.0 Ω		5.8		ns
Rise Time	t _r				5.9		
Turn-Off Delay Time	t _{d(OFF)}				11.8		
Fall Time	t _f				2.1		
Turn-On Delay Time	t _{d(ON)}	P	V _{GS} = -4.5 V, V _{DD} = -10 V, I _D = -1.0 A, R _G = 6.0 Ω		6.7		
Rise Time	t _r				12.7		
Turn-Off Delay Time	t _{d(OFF)}				13.2		
Fall Time	t _f				11		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	N	V _{GS} = 0 V, T _J = 25 °C	I _S = 0.8 A		0.8	1.2	V
		P		I _S = -0.8 A		-0.8	-1.2	
Reverse Recovery Time	t _{RR}	N	V _{GS} = 0 V, dI _S / dt = 100 A/μs, I _S = 1.0 A			10.3		ns
Charge Time	t _a					6.5		
Discharge Time	t _b					3.8		
Reverse Recovery Charge	Q _{RR}					3.0		
Reverse Recovery Time	t _{RR}	P	V _{GS} = 0 V, dI _S / dt = 100 A/μs, I _S = -1.0 A			7.4		ns
Charge Time	t _a					4.8		
Discharge Time	t _b					2.6		
Reverse Recovery Charge	Q _{RR}					2.4		

6. Switching characteristics are independent of operating junction temperatures.

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N-CHANNEL

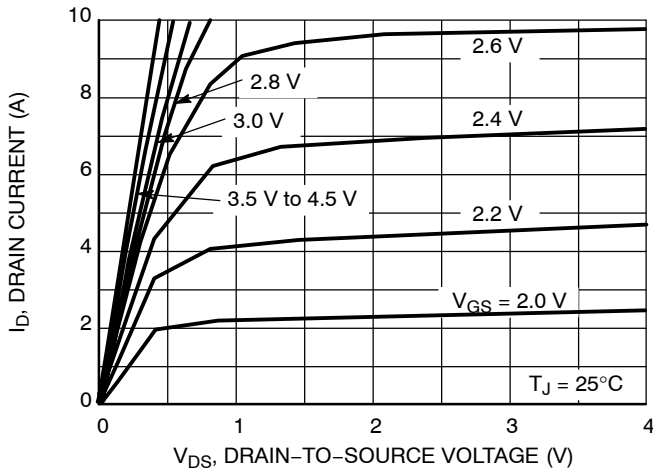


Figure 1. On-Region Characteristics

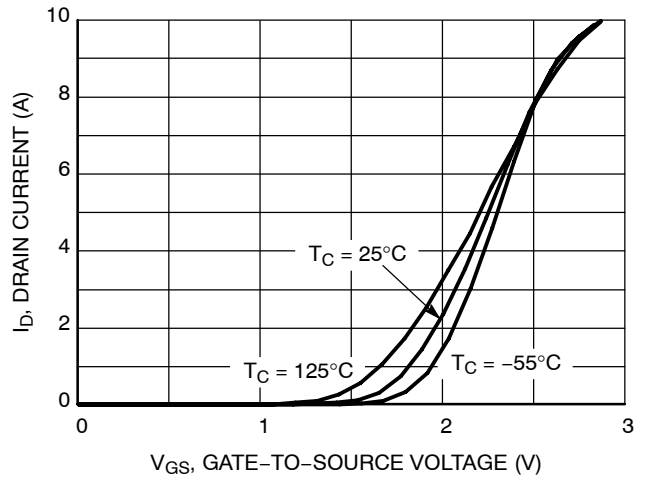


Figure 2. Transfer Characteristics

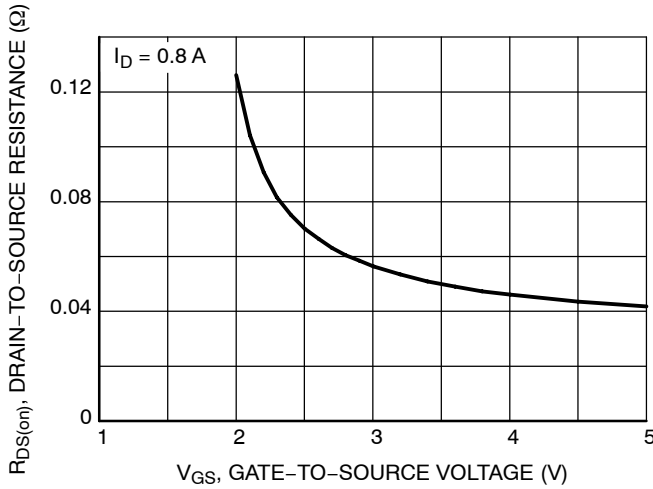


Figure 3. On-Resistance versus Gate-to-Source Voltage

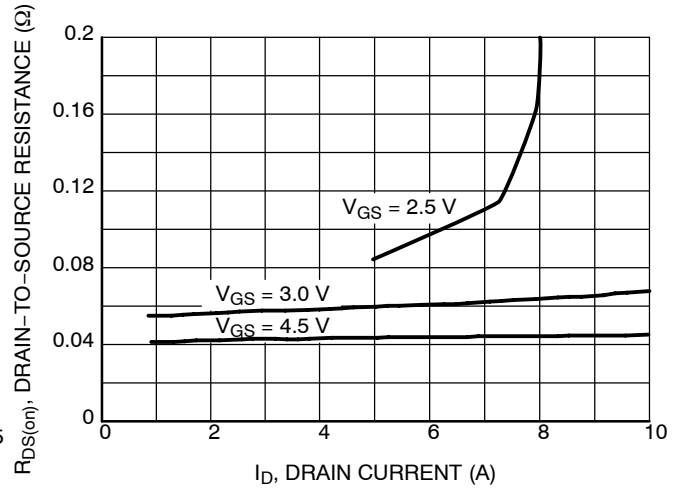


Figure 4. On-Resistance versus Drain Current and Temperature

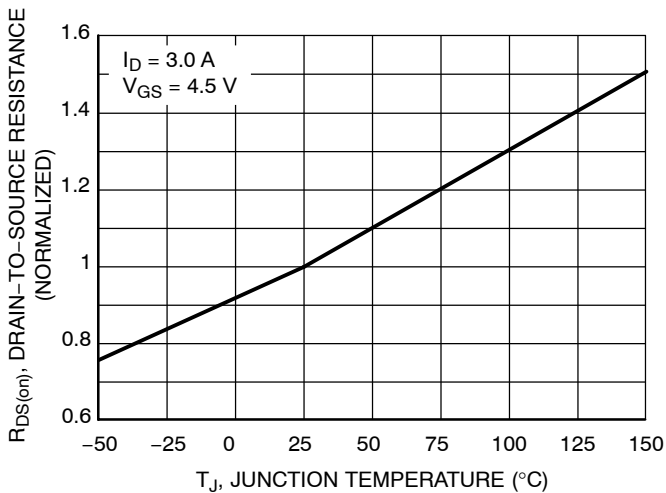


Figure 5. On-Resistance Variation with Temperature

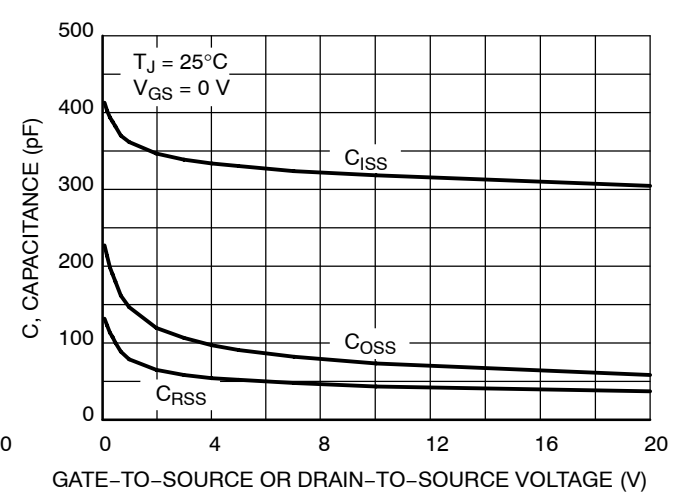


Figure 6. Capacitance Variation

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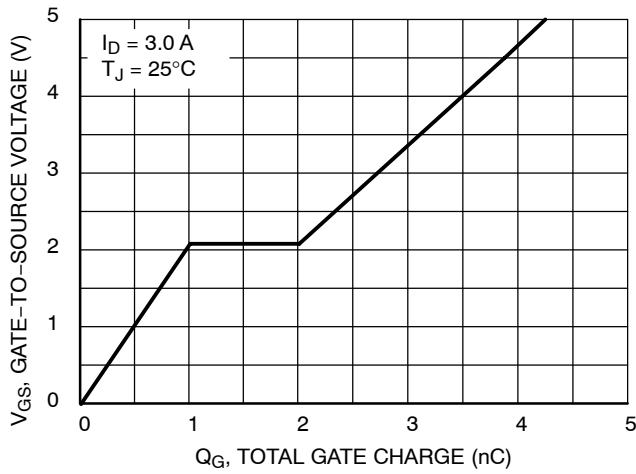


Figure 7. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

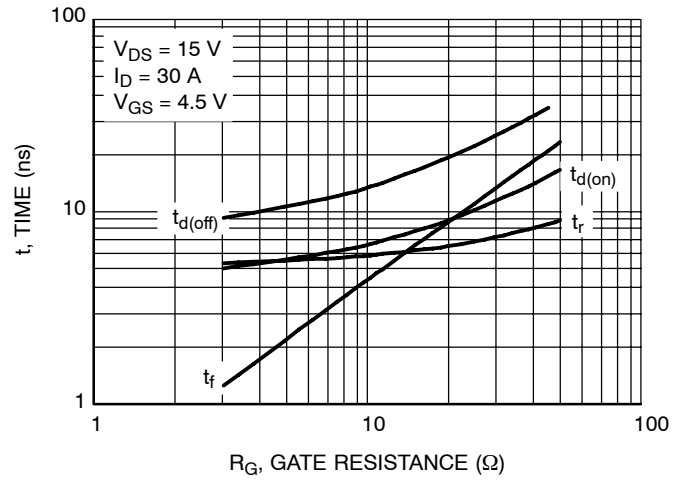


Figure 8. Resistive Switching Time Variation versus Gate Resistance

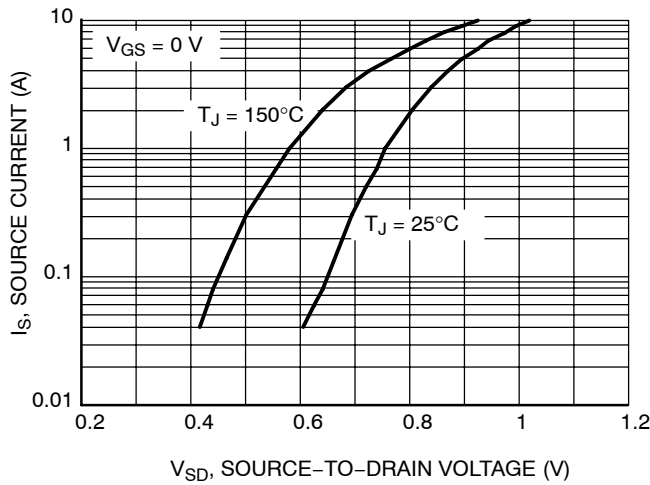


Figure 9. Diode Forward Voltage versus Current

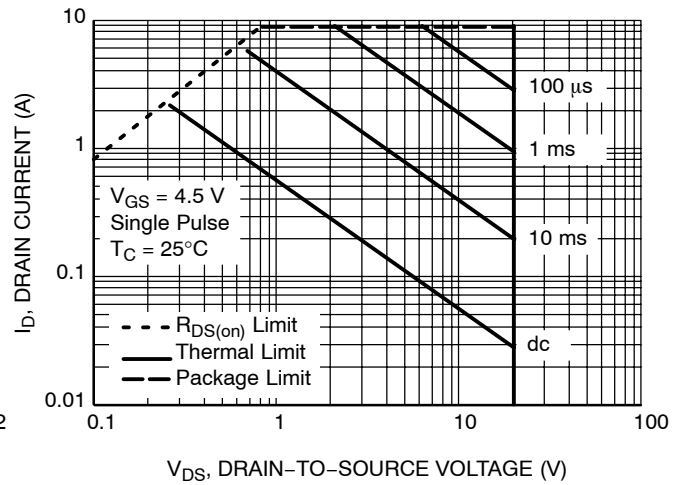


Figure 10. Maximum Rated Forward Biased Safe Operating Area

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P-CHANNEL

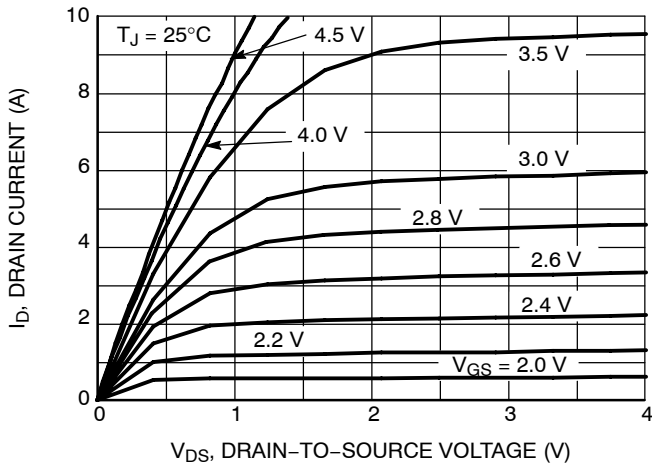


Figure 11. On-Region Characteristics

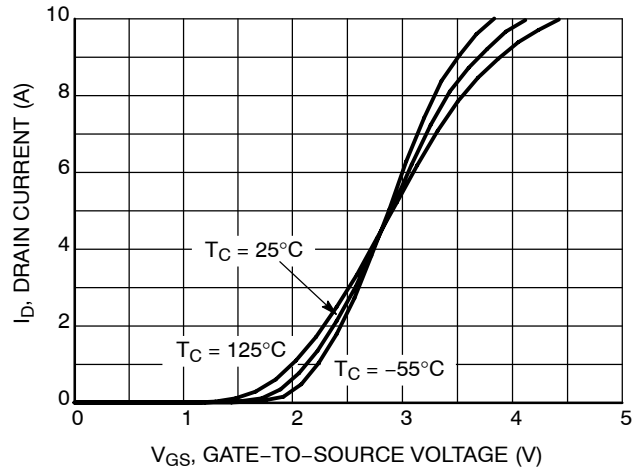


Figure 12. Transfer Characteristics

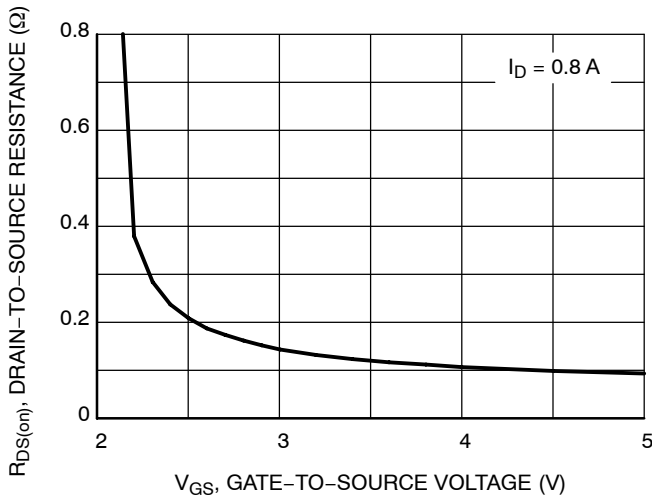


Figure 13. On-Resistance versus Gate-to-Source Voltage

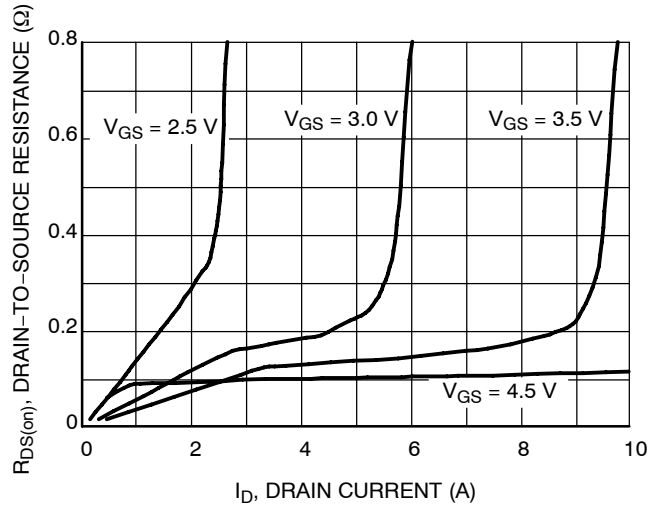


Figure 14. On-Resistance versus Drain Current and Gate Voltage

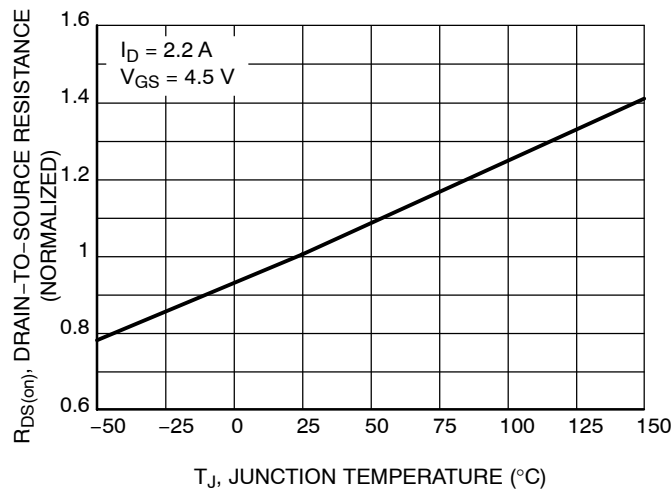


Figure 15. On-Resistance Variation with Temperature

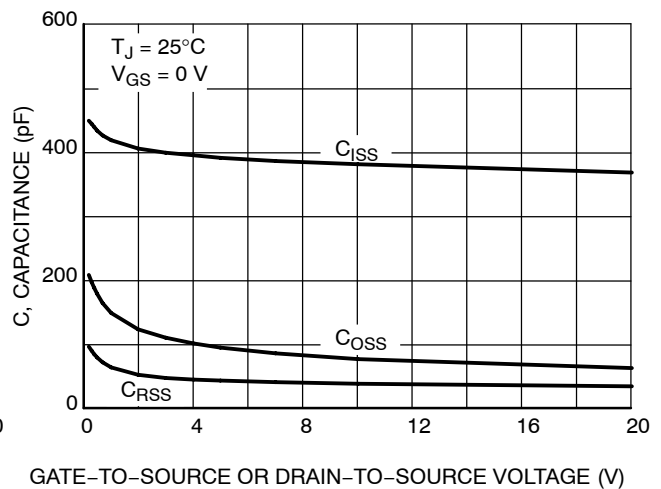


Figure 16. Capacitance Variation

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P-CHANNEL

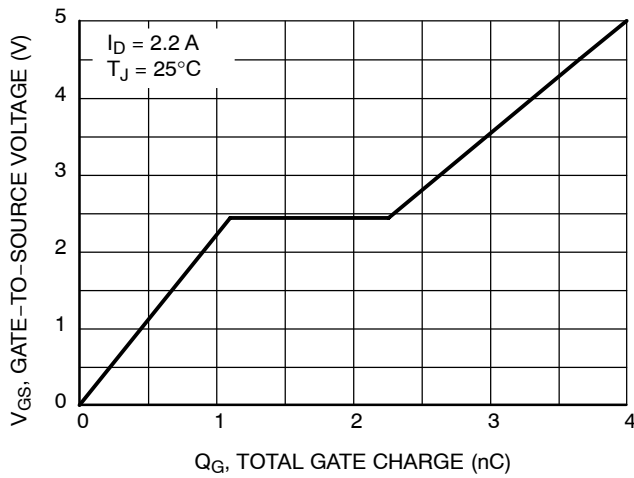


Figure 17. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

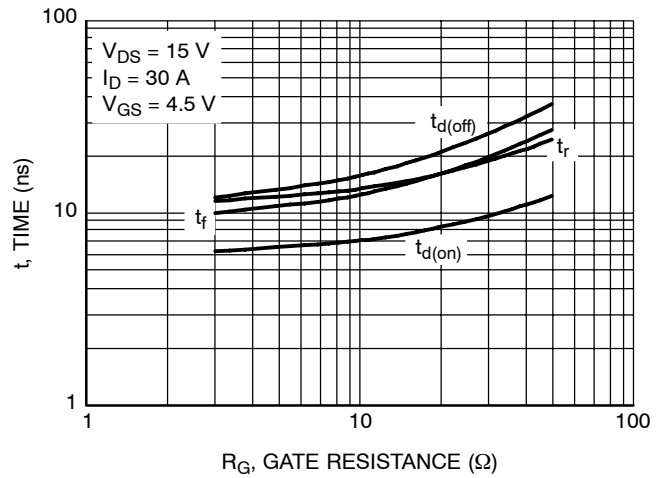


Figure 18. Resistive Switching Time Variation versus Gate Resistance

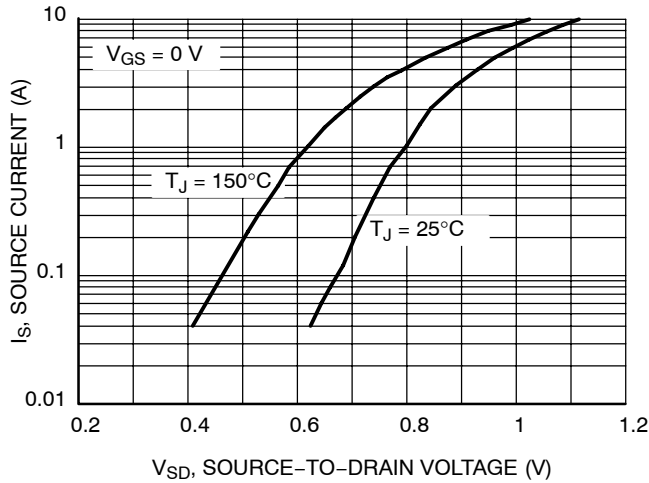


Figure 19. Diode Forward Voltage versus Current

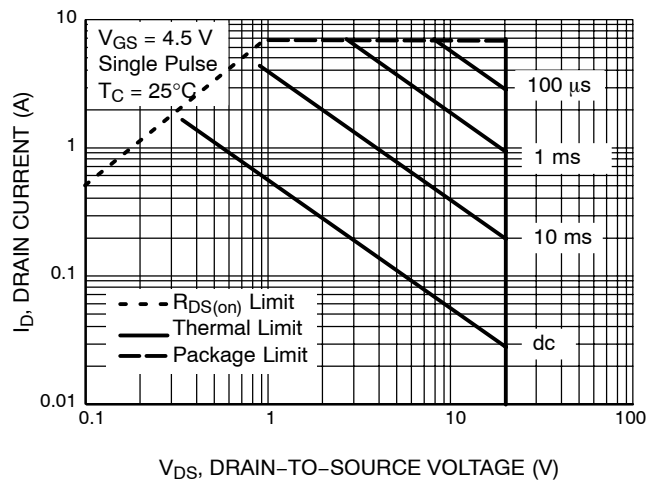


Figure 20. Maximum Rated Forward Biased Safe Operating Area

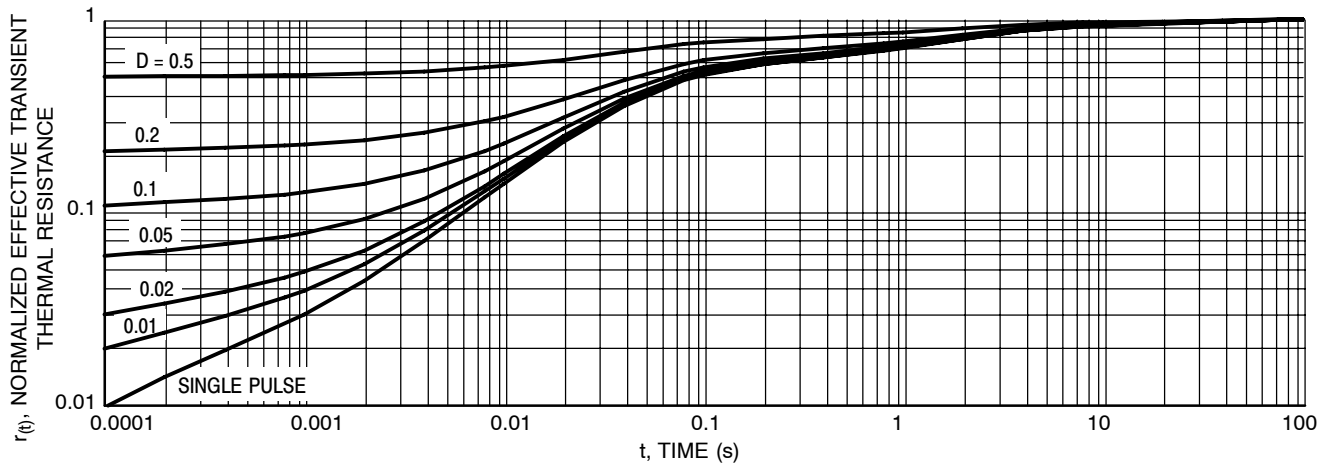


Figure 21. Thermal Response

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ORDERING INFORMATION

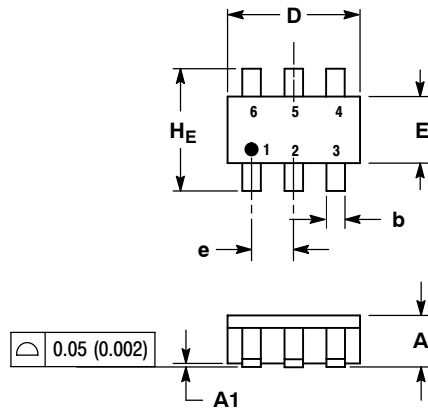
Device	Package	Shipping [†]
NTGD3122CT1G	TSOP6 (Pb-Free)	3000 / Tape & Reel

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

NTGD3122C

PACKAGE DIMENSIONS

TSOP-6 CASE 318G-02 ISSUE S

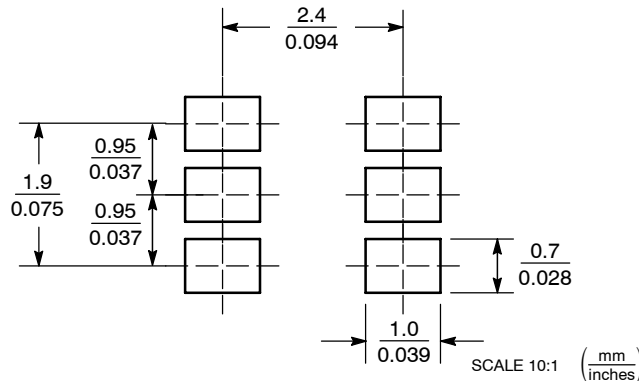


NOTES:


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.38	0.50	0.010	0.014	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
H_E	2.50	2.75	3.00	0.099	0.108	0.118
theta	0°	—	10°	0°	—	10°

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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