

NTGS3130N

Power MOSFET 20 V, 5.6 A Single N-Channel, TSOP-6

Features

- Leading Edge Trench Technology for Low On Resistance
- Low Gate Charge for Fast Switching
- Small Size (3 x 2.75 mm) TSOP-6 Package
- This is a Pb-Free Device

Applications

- DC-DC Converters
- Lithium Ion Battery Applications
- Load/Power Switching

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating			Symbol	Value	Unit
Drain-to-Source Voltage			V _{DSS}	20	V
Gate-to-Source Voltage			V _{GS}	±8	V
Continuous Drain Current (Note 1)	Steady State	T _A = 25°C	I _D	5.6	A
		T _A = 85°C		4.1	
	t ≤ 10 s	T _A = 25°C		6.2	
Power Dissipation (Note 1)	Steady State	T _A = 25°C	P _D	1.1	W
	t ≤ 10 s			1.4	
Continuous Drain Current (Note 2)	Steady State	T _A = 25°C	I _D	4.2	A
		T _A = 85°C		3.0	
Power Dissipation (Note 2)			T _A = 25°C	P _D	0.6
Pulsed Drain Current	t _p ≤ 10 s		I _{DM}	19	A
Operating and Storage Temperature Range			T _J , T _{stg}	-55 to 150	°C
Source Current (Body Diode)			I _S	1.0	A
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 _{θJA}	110	°C/W
Junction-to-Ambient - t ≤ 10 s (Note 1)		90	
Junction-to-Ambient - Steady State (Note 2)		200	

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)
2. Surface-mounted on FR4 board using the minimum recommended pad size

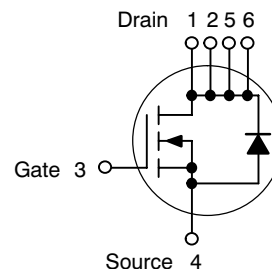


ON Semiconductor®

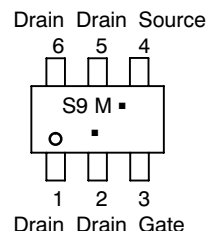
<http://onsemi.com>

V _{(BR)DSS}	R _{DS(on)} mAX	I _D Max
20 V	24 mΩ @ 4.5 V	5.6 A
	32 mΩ @ 2.5 V	4.9 A

N-Channel



MARKING DIAGRAM & PIN ASSIGNMENT



S9 = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping†
NTGS3130NT1G	TSOP-6 (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.

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

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V; I _D = 250 μA	20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J			9.8		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V; V _{DS} = 16 V, T _J = 25°C			1.0	μA
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0, V _{GS} = ±8 V			100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	0.4	0.6	1.4	V
Negative Temperature Coefficient	V _{GS(TH)} /T _J			3.4		mV/°C
Drain-to-Source On-Resistance	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 5.6 A		19	24	mΩ
		V _{GS} = 2.5 V, I _D = 4.9 A		25	32	
Forward Transconductance	g _{FS}	V _{DS} = 10 V, I _D = 5.6 A		8.2		S

CHARGES, CAPACITANCE, & GATE RESISTANCE

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 16 V		935		pF
Output Capacitance	C _{OSS}			169		
Reverse Transfer Capacitance	C _{RSS}			104		
Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 10 V		965		pF
Output Capacitance	C _{OSS}			198		
Reverse Transfer Capacitance	C _{RSS}			110		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V V _{DS} = 16 V I _D = 5.6 A		13.2	20.3	nC
Threshold Gate Charge	Q _{G(TH)}			0.60		
Gate-to-Source Charge	Q _{GS}			1.5		
Gate-to-Drain Charge	Q _{GD}			4.2		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V V _{DS} = 5.0 V I _D = 6.2 A		11.8	18.0	
Threshold Gate Charge	Q _{G(TH)}			0.6		
Gate-to-Source Charge	Q _{GS}			1.4		
Gate-to-Drain Charge	Q _{GD}			2.7		

SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 4.5 V, V _{DD} = 16 V, I _D = 1 A, R _G = 3 Ω		6.3	12.6	ns
Rise Time	t _r			7.3	13.5	
Turn-Off Delay Time	t _{d(OFF)}			21.7	35.1	
Fall Time	t _f			9.7	17.6	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 1.0 A	T _J = 25°C		0.7	1.2	V
Reverse Recovery Time	t _{RR}	V _{GS} = 0 Vdc, dI _{SD} /dt = 100 A/μs, I _S = 1.0 A			20.4		ns
Charge Time	t _a				8.1		
Discharge Time	t _b				11.6		
Reverse Recovery Charge	Q _{RR}				8.8		nC

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperature.

TYPICAL CHARACTERISTICS

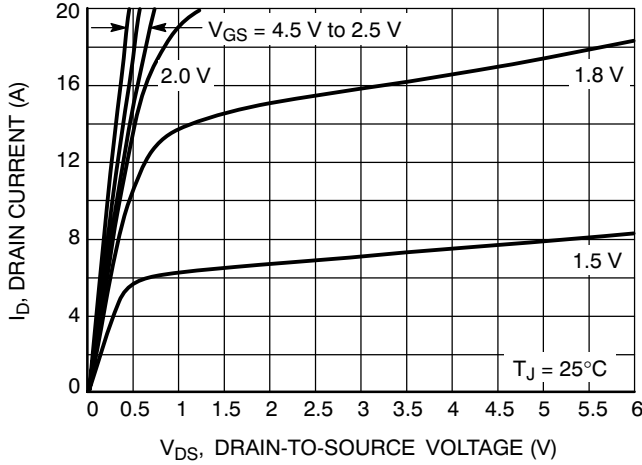


Figure 1. On-Region Characteristics

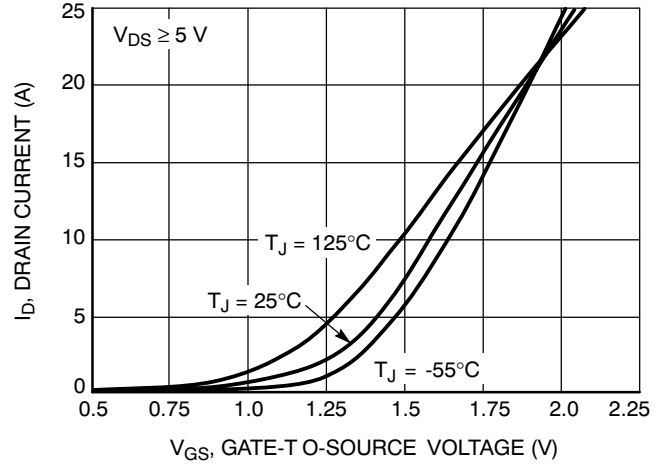


Figure 2. Transfer Characteristics

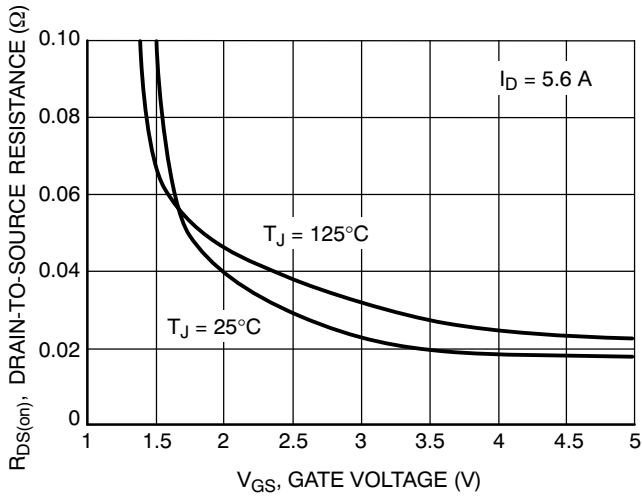


Figure 3. On-Resistance vs. Gate-to-Source Voltage

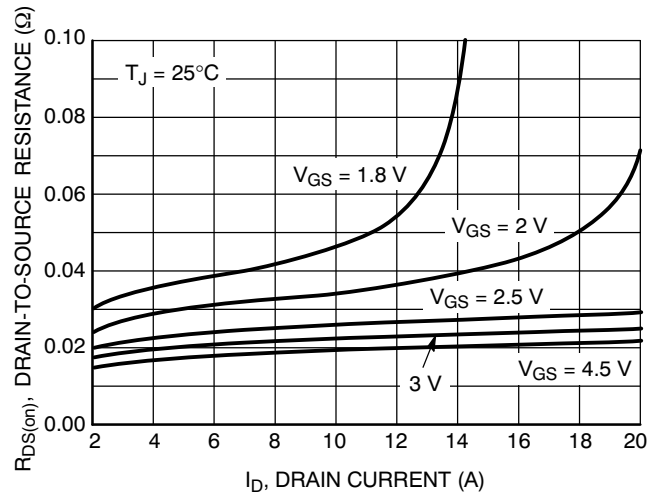


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

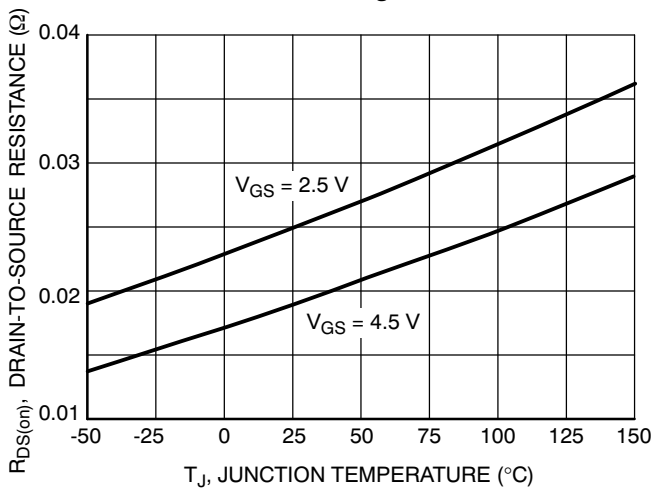


Figure 5. On-Resistance Variation with Temperature

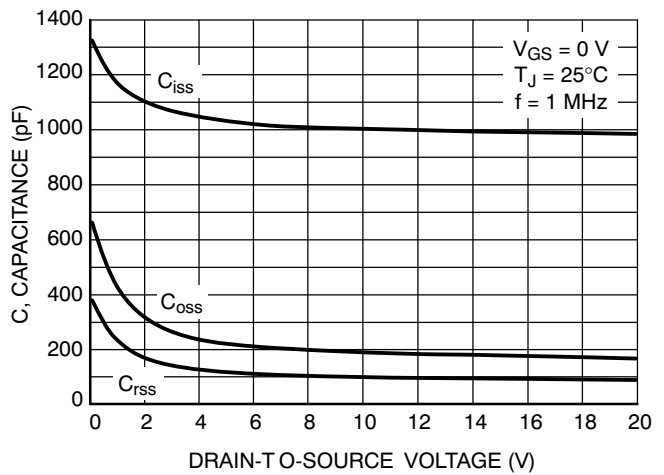


Figure 6. Capacitance Variation

TYPICAL CHARACTERISTICS

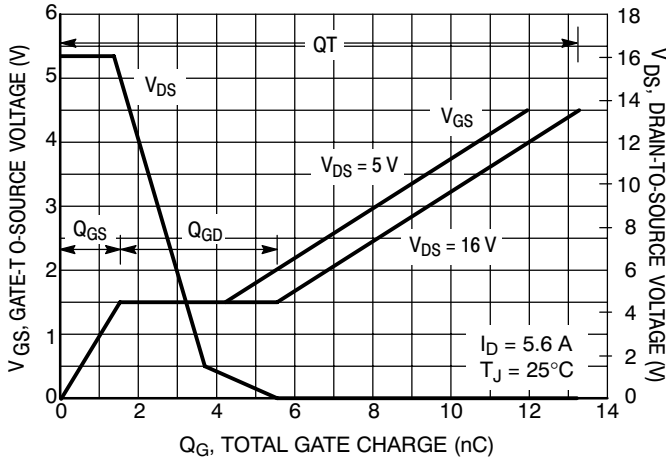


Figure 7. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

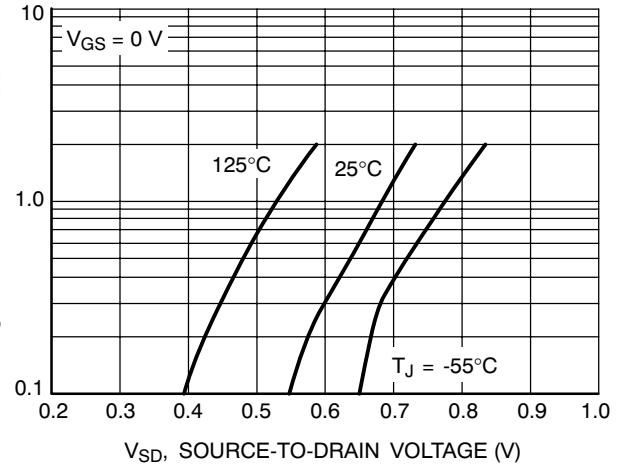


Figure 8. Diode Forward Voltage vs. Current

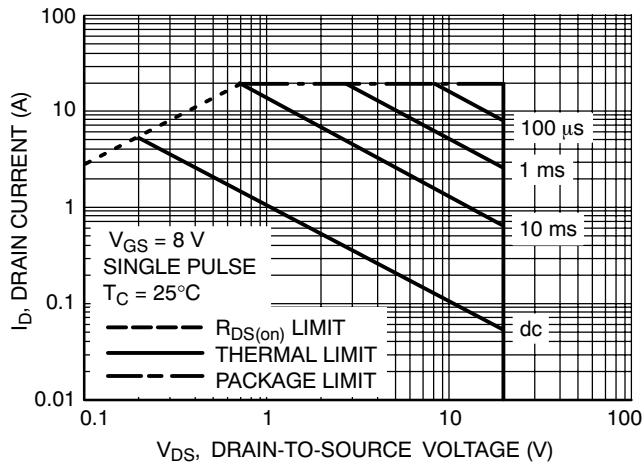


Figure 9. Maximum Rated Forward Biased Safe Operating Area

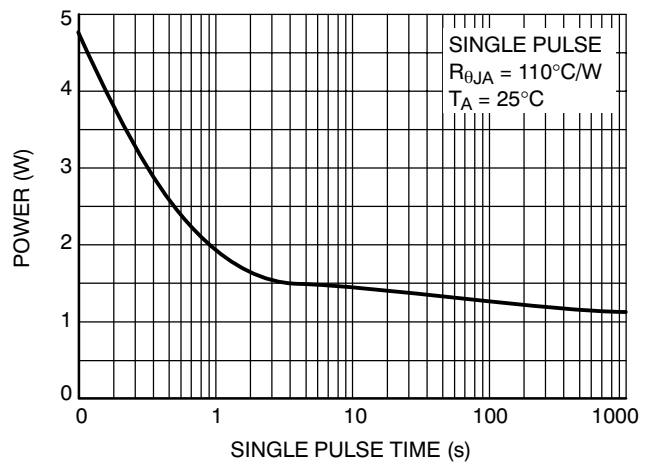


Figure 10. Single Pulse Maximum Power Dissipation

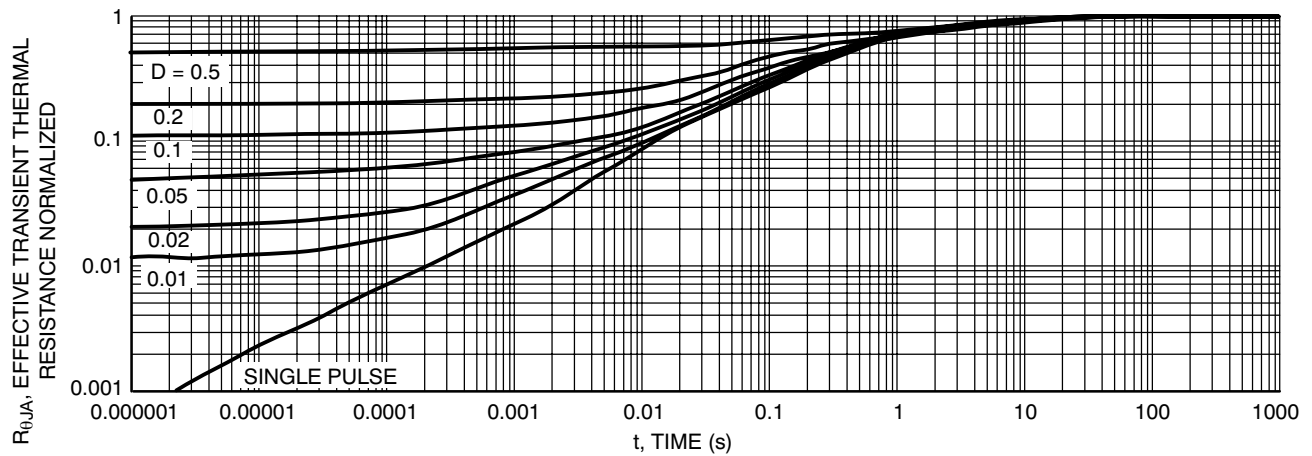
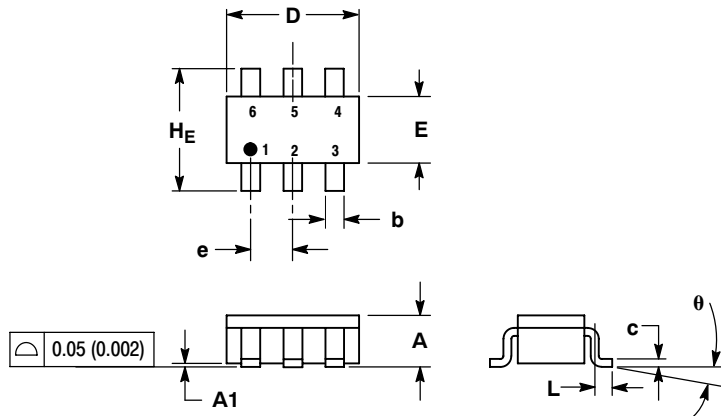


Figure 11. Thermal Response

NTGS3130N

PACKAGE DIMENSIONS

TSOP-6 CASE 318G-02 ISSUE S



NOTES:

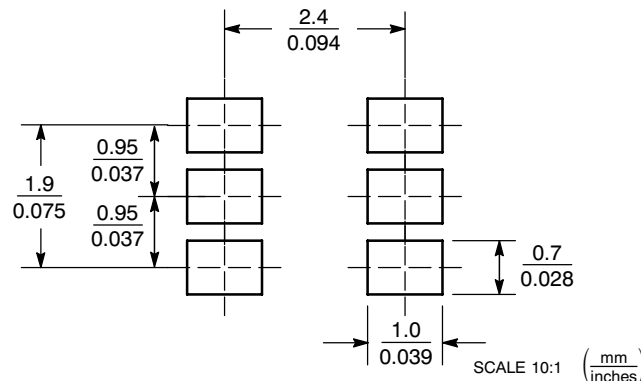
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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
HE	2.50	2.75	3.00	0.099	0.108	0.118
θ	0°	-	10°	0°	-	10°

STYLE 1:

- PIN 1. DRAIN
- DRAIN
- GATE
- SOURCE
- DRAIN
- DRAIN

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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