

# Power MOSFET

-20 V, -2.5 A, P-Channel, TSOP-6 Dual

# NTGD3133P

### Features

- Reduced Gate Charge for Fast Switching
- -2.5 V Gate Rating
- Leading Edge Trench Technology for Low On Resistance
- Independent Devices to Provide Design Flexibility
- This is a Pb-Free Device

### Applications

- Li-Ion Battery Charging
- Load Switch / Power Switching
- DC to DC Conversion
- Portable Devices like PDA's, Cellular Phones, and Hard Drives

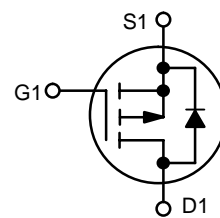
### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		V <sub>DSS</sub>	-20	V	
Gate-to-Source Voltage		V <sub>GS</sub>	±12	V	
Continuous Drain Current (Note 1)	Steady State	I <sub>D</sub>	T <sub>A</sub> = 25°C	-2.3	A
			T <sub>A</sub> = 85°C	-1.6	
	t ≤ 5 s	T <sub>A</sub> = 25°C	-2.5		
Power Dissipation (Note 1)	Steady State	P <sub>D</sub>	T <sub>A</sub> = 25°C	1.1	W
			t ≤ 5 s	1.3	
Continuous Drain Current (Note 2)	Steady State	I <sub>D</sub>	T <sub>A</sub> = 25°C	-1.6	A
			T <sub>A</sub> = 85°C	-1.2	
Power Dissipation (Note 2)		P <sub>D</sub>	T <sub>A</sub> = 25°C	0.56	W
Pulsed Drain Current		t <sub>p</sub> = 10 μs	I <sub>DM</sub>	±7.0	A
Operating Junction and Storage Temperature		T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C	
Source Current (Body Diode)		I <sub>S</sub>	-0.8	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T <sub>L</sub>	260	°C	

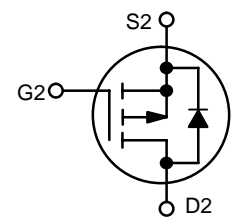
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

V <sub>(BR)DSS</sub>	R <sub>DS(on)</sub> MAX	I <sub>D</sub> MAX
-20 V	145 mΩ @ -4.5 V	-2.5 A
	200 mΩ @ -2.5 V	



P-CHANNEL MOSFET

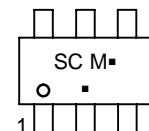


P-CHANNEL MOSFET



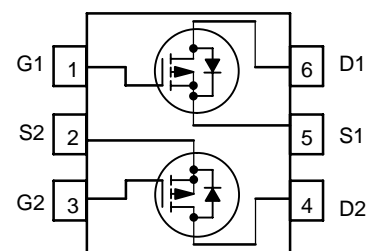
TSOP6  
CASE 318G

### MARKING DIAGRAM



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

### PIN CONNECTION



(Top View)

### ORDERING INFORMATION

Device	Package	Shipping†
NTGD3133PT1G	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 Specification Brochure, BRD8011/D.



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## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
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 Min Pad (Note 4)	$R_{\theta JA}$	225	

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

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

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

### ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$	$I_D = -250$ $\mu$ A	-0.6	-0.9	-1.4	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5$ V, $I_D = -1.9$ A		-	95	145	m $\Omega$
		$V_{GS} = -2.5$ V, $I_D = -1.6$ A		-	150	200	
Forward Transconductance	$g_{FS}$	$V_{DS} = -5.0$ V, $I_D = -2.5$ A		-	4.0	-	S

### CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{GS} = 0$ V, $V_{DS} = -10$ V, $f = 1.0$ MHz	-	390	-	pF
Output Capacitance	$C_{OSS}$		-	75	-	
Reverse Transfer Capacitance	$C_{RSS}$		-	37	-	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5$ V, $V_{DS} = -10$ V, $I_D = -2.2$ A	-	3.7	5.5	nC
Threshold Gate Charge	$Q_{G(TH)}$		-	0.7	-	
Gate-to-Source Charge	$Q_{GS}$		-	1.1	-	
Gate-to-Drain Charge	$Q_{GD}$		-	1.2	-	

### SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -4.5$ V, $V_{DD} = -10$ V, $I_D = -1.0$ A, $R_G = 6.0$ $\Omega$	-	6.7	-	ns
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	$V_{SD}$	$V_{GS} = 0$ V, $T_J = 25^\circ\text{C}$	$I_S = -0.8$ A	-	-0.8	-1.2	V
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0$ V, $di_{SD} / dt = 100$ A/ $\mu$ s, $I_S = -1.0$ A		-	7.4	-	ns
Charge Time	$t_a$			-	4.8	-	
Discharge Time	$t_b$			-	2.6	-	
Reverse Recovery Charge	$Q_{RR}$			-	2.4	-	nC

- Pulse Test: pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperatures.