

Power MOSFET

-30 V, -2.3 A, Dual P-Channel, TSOP-6

NTGD4161P

Features

- Fast Switching Speed
- Low Gate Charge
- Low $R_{DS(on)}$
- Independently Connected Devices to Provide Design Flexibility
- This is a Pb-Free Device

Applications

- Load Switch
- Battery Protection
- Portable Devices Like PDAs, 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}	-30	V	
Gate-to-Source Voltage	V_{GS}	± 20	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	-2.1	A
		$T_A = 85^\circ\text{C}$	-1.5	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	-2.3	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	1.1	W
		$t \leq 5$ s	1.3	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	-1.5	A
		$T_A = 85^\circ\text{C}$	-1.1	
Power Dissipation (Note 2)		$T_A = 25^\circ\text{C}$	0.6	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	-10	A
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	-0.8	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$	

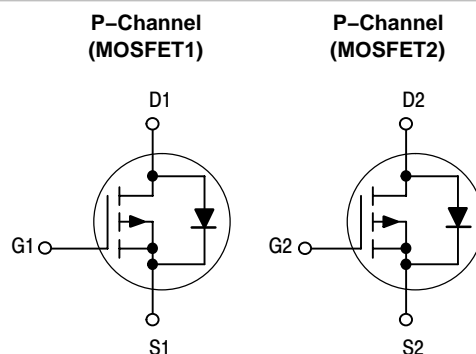
THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	115	$^\circ\text{C/W}$
Junction-to-Ambient - Steady State (Note 2)		225	
Junction-to-Ambient - $t \leq 5$ s (Note 1)		95	
Junction-to-Case - Steady State (Note 1)	$R_{\theta JC}$	40	

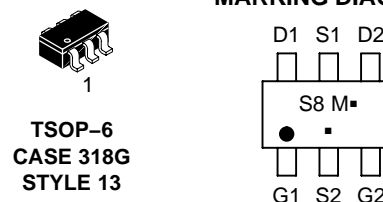
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. When surface mounted to an FR4 board using 1 in. pad size (Cu. area = 1.2 in² [1 oz] including traces)
2. When surface mounted to an FR4 board using minimum recommended pad size (Cu. area = 0.047 in²)

$V_{(BR)DSS}$	$R_{DS(on)}$ Max
-30 V	160 m Ω @ -10 V
	280 m Ω @ -4.5 V



MARKING DIAGRAM



TSOP-6
CASE 318G
STYLE 13

- S8 = 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†
NTGD4161PT1G	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 Specifications Brochure, BRD8011/D.



NTGD4161P

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			22		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = -24\text{ V}$	$T_J = 25^\circ\text{C}$		-1.0	μA
			$T_J = 125^\circ\text{C}$		-10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-1.0	-1.9	-3.0	V
Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			-4.7		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -2.1\text{ A}$		105	160	m Ω
		$V_{GS} = -4.5\text{ V}, I_D = -1.6\text{ A}$		190	280	
Forward Transconductance	g_{FS}	$V_{DS} = -5.0\text{ V}, I_D = -2.1\text{ A}$		2.7		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{DS} = -15\text{ V}, f = 1.0\text{ MHz}, V_{GS} = 0\text{ V}$		281		pF
Output Capacitance	C_{OSS}			50		
Reverse Transfer Capacitance	C_{RSS}			28		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -10\text{ V}, V_{DS} = -5.0\text{ V}, I_D = -2.1\text{ A}$		5.6	7.1	nC
Threshold Gate Charge	$Q_{G(TH)}$			0.65		
Gate-to-Source Charge	Q_{GS}			1.2		
Gate-to-Drain Charge	Q_{GD}			0.90		

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = -4.5\text{ V}, V_{DD} = -15\text{ V}, I_D = -1.0\text{ A}, R_G = 6.0\ \Omega$		7.6	14	ns
Rise Time	t_r			9.2	23	
Turn-Off Delay Time	$t_{d(off)}$			12.5	20	
Fall Time	t_f			4.5	12	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = -0.8\text{ A}$	$T_J = 25^\circ\text{C}$		-0.79	-1.2	V
			$T_J = 125^\circ\text{C}$		-0.65		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = -0.8\text{ A}$		8.0		ns	
Charge Time	t_a			5.7			
Discharge Time	t_b			2.3			
Reverse Recovery Charge	Q_{RR}			3			nC

3. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.