

# Power MOSFET and Schottky Diode

# NTGD4169F

## 30 V, 2.9 A, N-Channel with Schottky Barrier Diode, TSOP-6

### Features

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

### Applications

- DC-DC Converters
- 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		$V_{DSS}$	30	V
Gate-to-Source Voltage		$V_{GS}$	$\pm 12$	V
N-Channel Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$ $T_A = 85^\circ\text{C}$	2.6	A
	$t \leq 5$ s		1.9	
		$T_A = 25^\circ\text{C}$	2.9	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	0.9	W
	$t \leq 5$ s		1.1	
Pulsed Drain Current		$t_p = 10 \mu\text{s}$	8.6	A
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-25 to 150	$^\circ\text{C}$
Source Current (Body Diode)		$I_S$	0.9	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$

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

Parameter	Symbol	Value	Unit
Peak Repetitive Reverse Voltage	$V_{RRM}$	30	V
DC Blocking Voltage	$V_R$	30	V
Average Rectified Forward Current	$I_F$	1	A

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	140	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - $t \leq 5$ s (Note 1)	$R_{\theta JA}$	110	$^\circ\text{C}/\text{W}$

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.

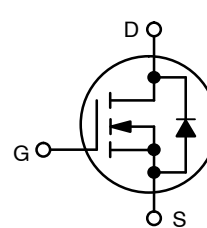
1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

### N-CHANNEL MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ Max	$I_D$ Max
30 V	90 m $\Omega$ @ 4.5 V	2.6 A
	125 m $\Omega$ @ 2.5 V	2.2 A

### SCHOTTKY DIODE

$V_R$ Max	$V_F$ Max	$I_F$ Max
30 V	0.53 V	1.0 A



N-Channel MOSFET

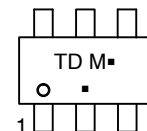


Schottky Diode



TSOP-6  
CASE 318G  
STYLE 15

### MARKING DIAGRAM



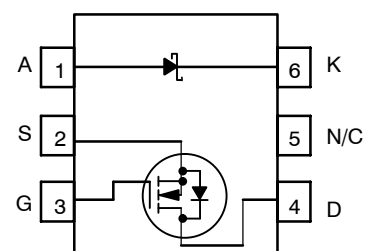
TD = Specific Device Code

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 3 of this data sheet.

# NTGD4169F

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

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			21.4		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 24 V			1.0	μA
					10	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±12 V			100	nA

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	0.5	0.9	1.5	V
Gate Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			-3.4		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 2.6 A		52	90	mΩ
		V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 2.2 A		67	125	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 2.6 A		2.6		S

### CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 15 V		295		pF
Output Capacitance	C <sub>OSS</sub>			48		
Reverse Transfer Capacitance	C <sub>RSS</sub>			27		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 15 V, I <sub>D</sub> = 2.0 A		3.7	5.5	nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.6		
Gate-to-Source Charge	Q <sub>GS</sub>			0.9		
Gate-to-Drain Charge	Q <sub>GD</sub>			0.8		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 15 V, I <sub>D</sub> = 1.0 A, R <sub>G</sub> = 6.0 Ω		7.0		ns
Rise Time	t <sub>r</sub>			4.0		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			14		
Fall Time	t <sub>f</sub>			2.0		

### DRAIN-TO-SOURCE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 0.9 A	T <sub>J</sub> = 25°C		0.7	1.2	V
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, d <sub>IS</sub> /d <sub>t</sub> = 100 A/μs, I <sub>S</sub> = 0.9 A			8.0		ns
Charge Time	T <sub>a</sub>				5.0		
Discharge Time	T <sub>b</sub>				3.0		
Reverse Recovery Time	Q <sub>RR</sub>					3.0	

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

3. Switching characteristics are independent of operating junction temperatures.



# NTGD4169F

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	$V_F$	$I_F = 0.5\text{ A}$		0.41	0.45	V
		$I_F = 1.0\text{ A}$		0.46	0.53	
Maximum Instantaneous Reverse Current	$I_R$	$V_R = 30\text{ V}$		7.3	20	$\mu\text{A}$
		$V_R = 20\text{ V}$		2.5	8.0	

## SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS ( $T_J = 85^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	$V_F$	$I_F = 0.5\text{ A}$		0.35		V
		$I_F = 1.0\text{ A}$		0.41		
Maximum Instantaneous Reverse Current	$I_R$	$V_R = 30\text{ V}$		0.4		mA
		$V_R = 20\text{ V}$		0.17		

## SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS ( $T_J = 125^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	$V_F$	$I_F = 0.5\text{ A}$		0.31		V
		$I_F = 1.0\text{ A}$		0.39		
Maximum Instantaneous Reverse Current	$I_R$	$V_R = 30\text{ V}$		4.4		mA
		$V_R = 20\text{ V}$		1.6		

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Capacitance	C	$V_R = 10\text{ V}, f = 1.0\text{ MHz}$		28		pF

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTGD4169FT1G	TSOP-6 (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>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.