

NTGS5120P

Power MOSFET

–60 V, –2.9 A, Single P–Channel, TSOP–6

Features

- 60 V BV_{DS}, Low R_{DS(on)} in TSOP–6 Package
- 4.5 V Gate Rating
- This is a Pb–Free Device

Applications

- High Side Load Switch
- Power Switch for Printers, Communication Equipment

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

Parameter			Symbol	Value	Unit
Drain–to–Source Voltage			V _{DSS}	–60	V
Gate–to–Source Voltage			V _{GS}	± 20	V
Continuous Drain Current (Note 1)	Steady State	T _A = 25°C	I _D	–2.5	A
		T _A = 85°C		–2.0	
	t ≤ 5 s	T _A = 25°C		–2.9	
Power Dissipation (Note 1)	Steady State	T _A = 25°C	P _D	1.1	W
	t ≤ 5 s			1.4	
Continuous Drain Current (Note 2)	Steady State	T _A = 25°C	I _D	–1.8	A
		T _A = 85°C		–1.3	
Power Dissipation (Note 2)	Steady State	T _A = 25°C	P _D	0.6	W
Pulsed Drain Current	t _p = 10 μs		I _{DM}	–8	A
Operating Junction and Storage Temperature			T _J , T _{STG}	–55 to 150	°C
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.

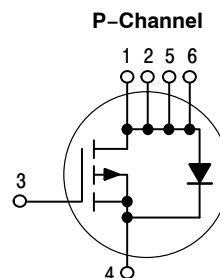
1. Surface–mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)
2. Surface–mounted on FR4 board using the minimum recommended pad size.



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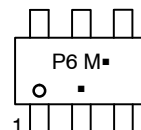
V _{(BR)DSS}	R _{DS(ON)} MAX	I _D MAX
–60 V	111 mΩ @ –10 V	–2.9 A
	142 mΩ @ –4.5 V	



MARKING DIAGRAM

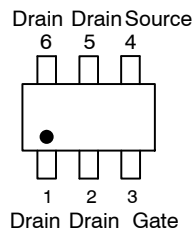


TSOP–6
CASE 318G
STYLE 1



P6 = Device Code
M = Date Code
■ = Pb–Free Package
(Note: Microdot may be in either location)

PIN ASSIGNMENT



ORDERING INFORMATION

Device	Package	Shipping†
NTGS5120PT1G	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.

NTGS5120P

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	102	°C/W
Junction-to-Ambient – $t = 5$ s (Note 3)	$R_{\theta JA}$	77.6	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	200	

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.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = -250$ μ A	-60			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0$ V, $V_{DS} = -48$ V	$T_J = 25^\circ\text{C}$		-1.0	μ A
			$T_J = 125^\circ\text{C}$		-5.0	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 12$ V			± 100	nA
		$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			± 200	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = -250$ μ A	-1.0		-3.0	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -10$ V, $I_D = -2.9$ A		72	111	m Ω
		$V_{GS} = -4.5$ V, $I_D = -2.5$ A		88	142	
Forward Transconductance	g_{FS}	$V_{DS} = -5.0$ V, $I_D = -6.0$ A		10.1		S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0$ V, $f = 1$ MHz, $V_{DS} = -30$ V		942		pF
Output Capacitance	C_{OSS}			72		
Reverse Transfer Capacitance	C_{RSS}			48		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -10$ V, $V_{DS} = -30$ V; $I_D = -2.9$ A		18.1		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.2		
Gate-to-Source Charge	Q_{GS}			2.7		
Gate-to-Drain Charge	Q_{GD}			3.6		

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -10$ V, $V_{DS} = -30$ V, $I_D = -1.0$ A, $R_G = 6.0$ Ω		8.7		ns
Rise Time	t_r			4.9		
Turn-Off Delay Time	$t_{d(OFF)}$			38		
Fall Time	t_f			12.8		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0$ V, $I_S = -0.9$ A	$T_J = 25^\circ\text{C}$		-0.75	-1.0	V
Reverse Recovery Time	t_{RR}	$V_{GS} = 0$ V, $dI_S/dt = 100$ A/ μ s, $I_S = -0.9$ A		18.3			ns
Charge Time	t_a			15.5			ns
Reverse Recovery Charge	Q_{RR}			15.1			nC

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

TYPICAL CHARACTERISTICS

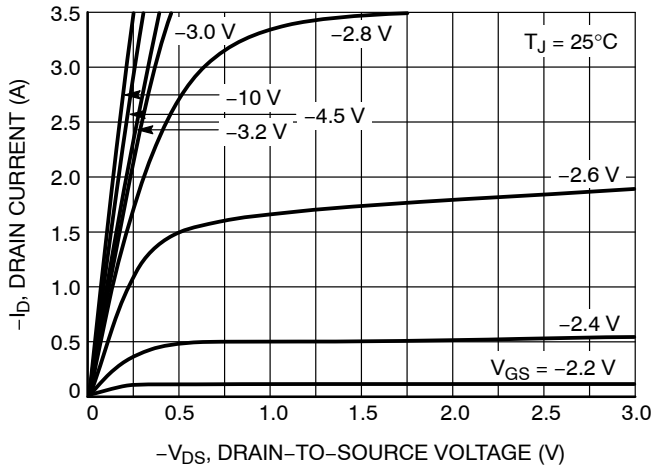


Figure 1. On-Region Characteristics

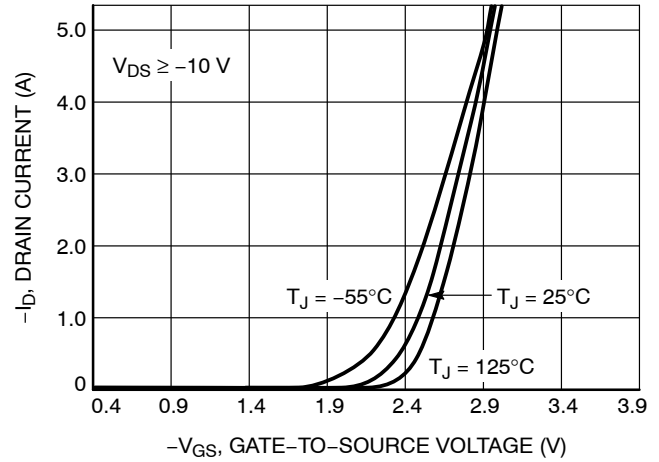


Figure 2. Transfer Characteristics

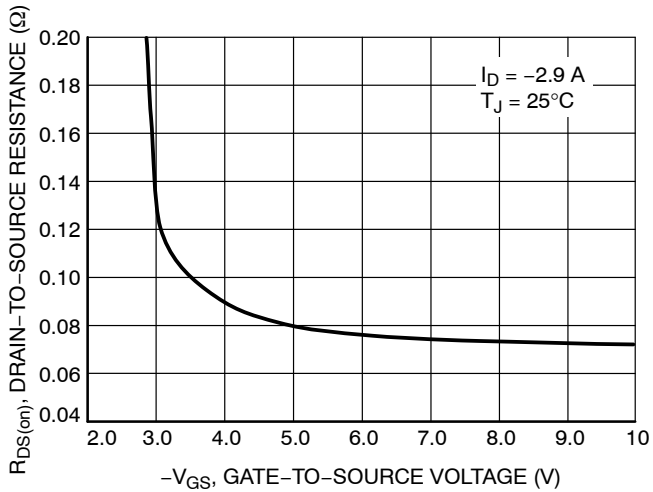


Figure 3. On-Resistance vs. Gate Voltage

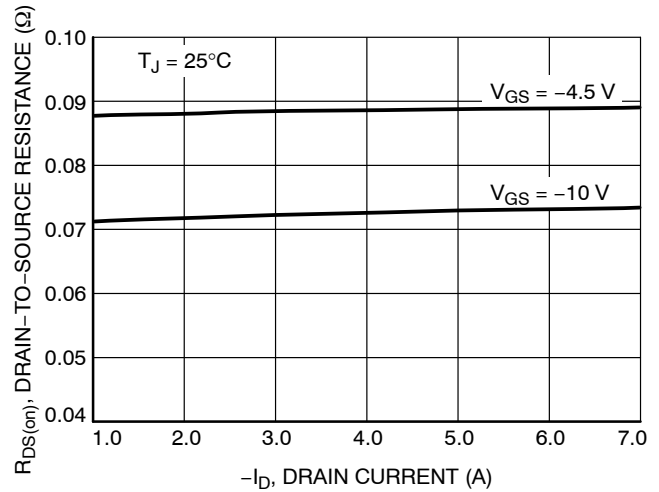


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

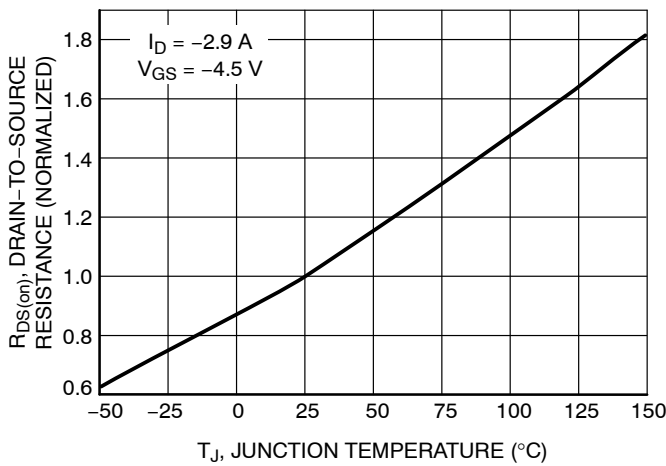


Figure 5. On-Resistance Variation with Temperature

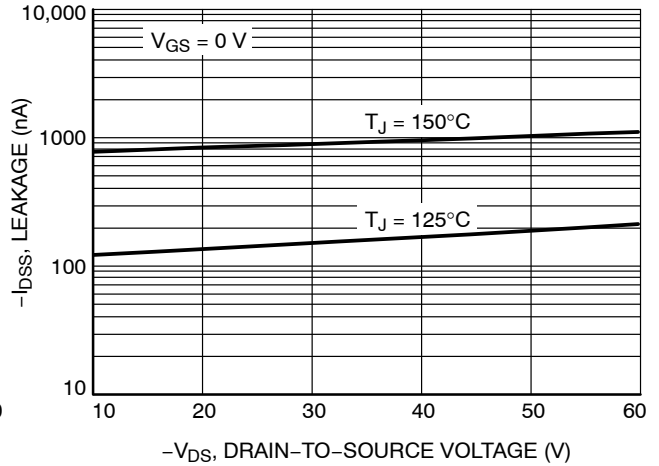


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

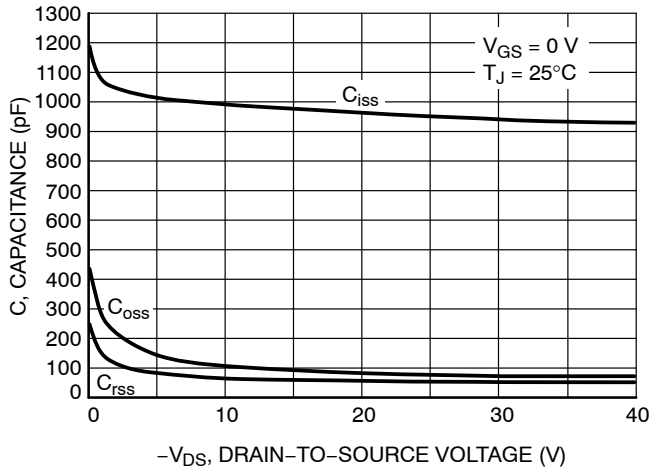


Figure 7. Capacitance Variation

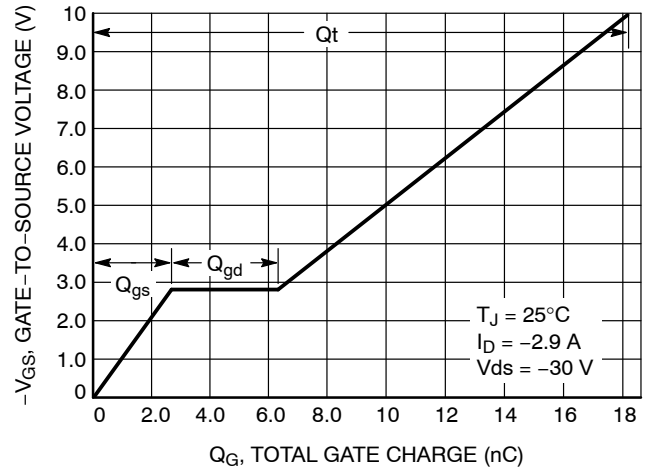


Figure 8. Gate-to-Source Voltage vs. Total Charge

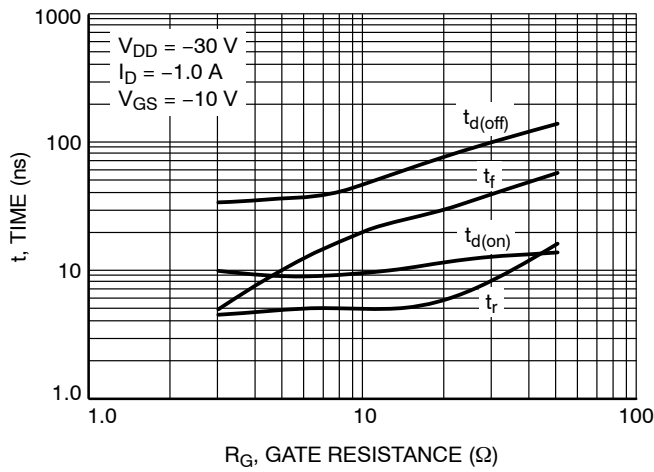


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

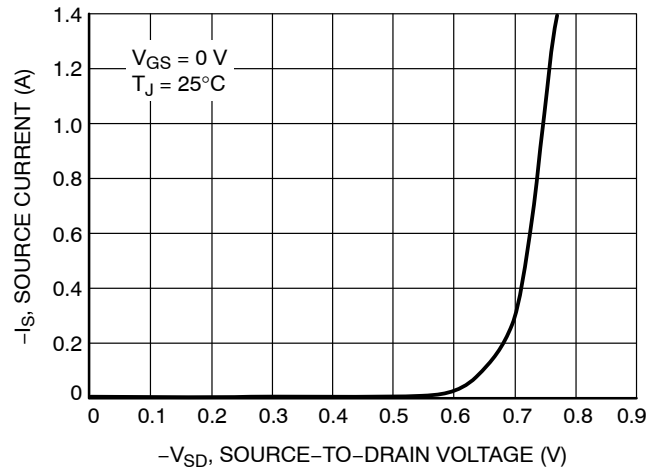
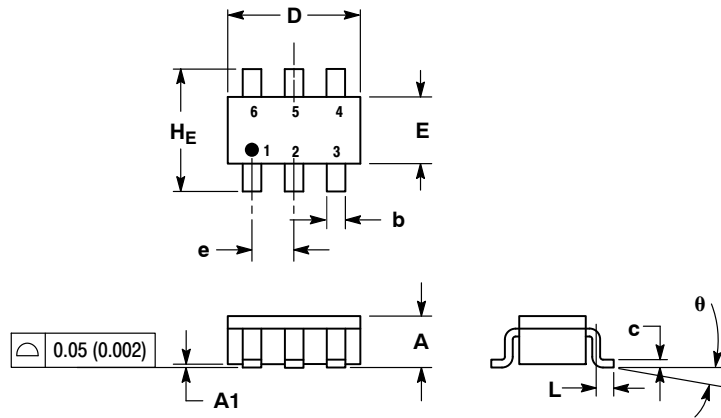


Figure 10. Diode Forward Voltage vs. Current

NTGS5120P

PACKAGE DIMENSIONS

TSOP-6 CASE 318G-02 ISSUE S

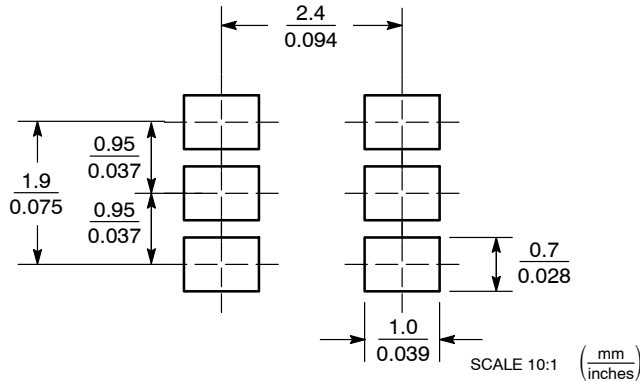


NOTES:

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°

SOLDERING FOOTPRINT*



STYLE 1:

- PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

*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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