

NTHD5904T1

Power MOSFET Dual N-Channel

3.1 Amps, 20 Volts

Features

- Low $R_{DS(on)}$ for Higher Efficiency
- Logic Level Gate Drive
- Miniature ChipFET™ Surface Mount Package Saves Board Space

Applications

- Power Management in Portable and Battery-Powered Products; i.e., Cellular and Cordless Telephones and PCMCIA Cards

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	5 secs	Steady State	Unit
Drain-Source Voltage	V_{DS}	20		V
Gate-Source Voltage	V_{GS}	± 12		V
Continuous Drain Current ($T_J = 150^\circ\text{C}$) (Note 1) $T_A = 25^\circ\text{C}$ $T_A = 85^\circ\text{C}$	I_D	± 4.2	± 3.1	A
		± 3.0	± 2.2	
Pulsed Drain Current	I_{DM}	± 10		A
Continuous Source Current (Diode Conduction) (Note 1)	I_S	1.8	0.9	A
Maximum Power Dissipation (Note 1) $T_A = 25^\circ\text{C}$ $T_A = 85^\circ\text{C}$	P_D	2.1	1.1	W
		1.1	0.6	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to $+150$		$^\circ\text{C}$

1. Surface Mounted on 1" x 1" FR4 Board.

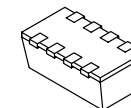
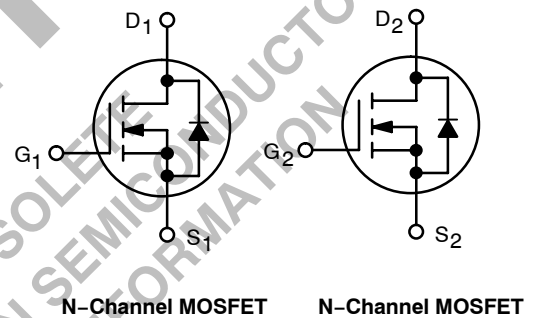


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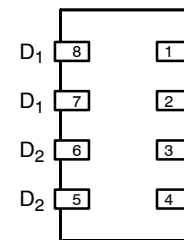
DUAL N-CHANNEL 3.1 AMPS, 20 VOLTS

$R_{DS(on)} = 75 \text{ m}\Omega$

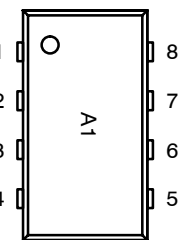


ChipFET
CASE 1206A
STYLE 2

PIN CONNECTIONS



MARKING DIAGRAM



A1 = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping
NTHD5904T1	ChipFET	3000/Tape & Reel

NTHD5904T1

THERMAL CHARACTERISTICS

Characteristic	Symbol	Typ	Max	Unit
Maximum Junction-to-Ambient (Note 2) $t \leq 5$ sec Steady State	R_{thJA}	50 90	60 110	$^{\circ}\text{C}/\text{W}$
Maximum Junction-to-Foot (Drain) Steady State	R_{thJF}	30	40	$^{\circ}\text{C}/\text{W}$

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

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
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Static

Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	0.6	-	-	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 12 \text{ V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 16 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1.0	μA
		$V_{DS} = 16 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 85^{\circ}\text{C}$	-	-	5.0	
On-State Drain Current (Note 3)	$I_{D(on)}$	$V_{DS} \geq 5.0 \text{ V}, V_{GS} = 4.5 \text{ V}$	10	-	-	A
Drain-Source On-State Resistance (Note 3)	$r_{DS(on)}$	$V_{GS} = 4.5 \text{ V}, I_D = 3.1 \text{ A}$	-	0.065	0.075	Ω
		$V_{GS} = 2.5 \text{ V}, I_D = 2.3 \text{ A}$	-	0.115	0.143	
Forward Transconductance (Note 3)	g_{fs}	$V_{DS} = 10 \text{ V}, I_D = 3.1 \text{ A}$	-	8.0	-	S
Diode Forward Voltage (Note 3)	V_{SD}	$I_S = 0.9 \text{ A}, V_{GS} = 0 \text{ V}$	-	0.8	1.2	V

Dynamic (Note 4)

Total Gate Charge	Q_g	$V_{DS} = 10 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 3.1 \text{ A}$	-	4.0	6.0	nC
Gate-Source Charge	Q_{gs}		-	0.6	-	
Gate-Drain Charge	Q_{gd}		-	1.3	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10 \text{ V}, R_L = 10 \Omega, I_D \approx 1.0 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_G = 6 \Omega$	-	12	18	ns
Rise Time	t_r		-	35	55	
Turn-Off Delay Time	$t_{d(off)}$		-	19	30	
Fall Time	t_f		-	9.0	15	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = 0.9 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$	-	40	80	

2. Surface Mounted on 1" x 1" FR4 Board.
3. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production testing.

TYPICAL ELECTRICAL CHARACTERISTICS

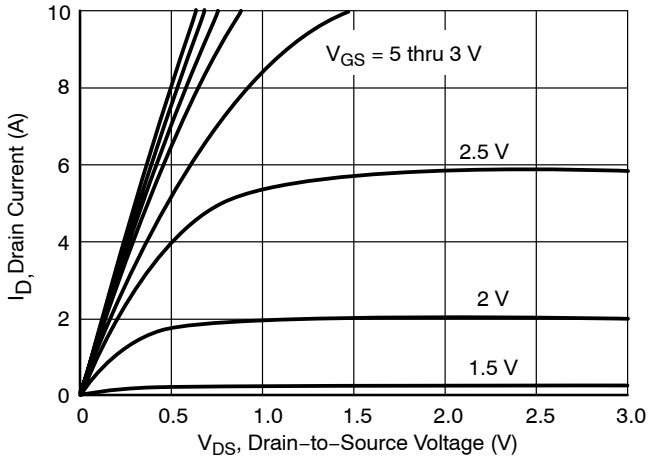


Figure 1. Output Characteristics

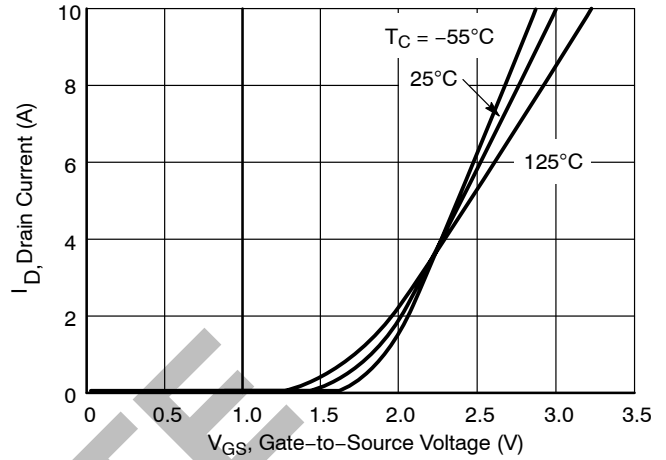


Figure 2. Transfer Characteristics

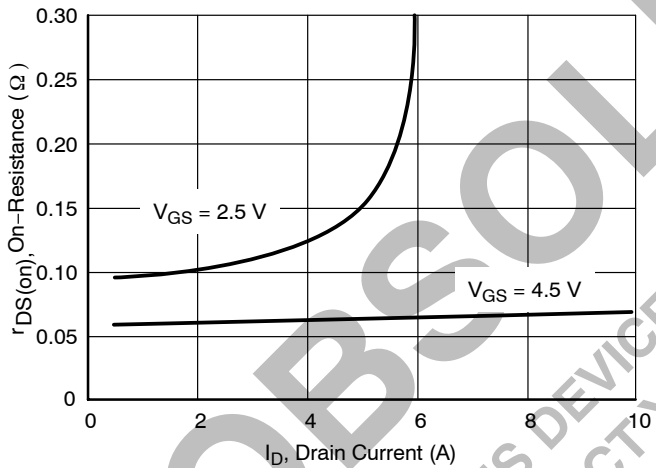


Figure 3. On-Resistance vs. Drain Current

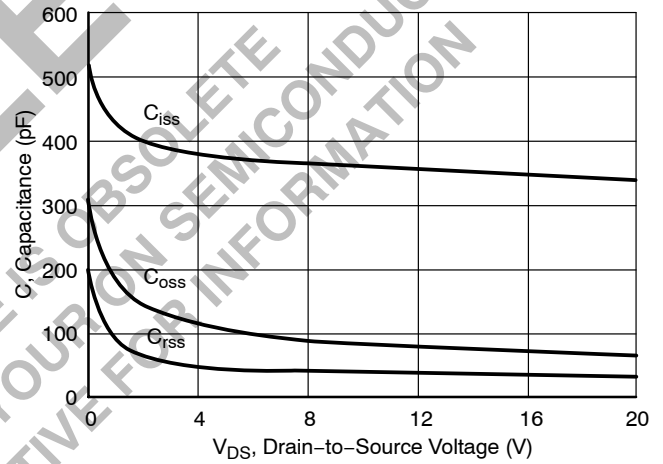


Figure 4. Capacitance

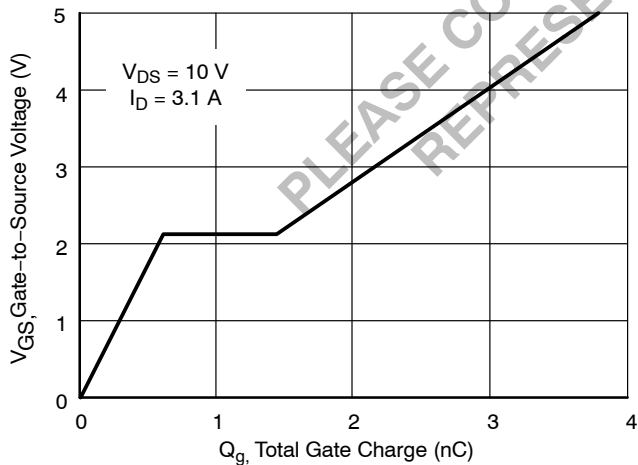


Figure 5. Gate Charge

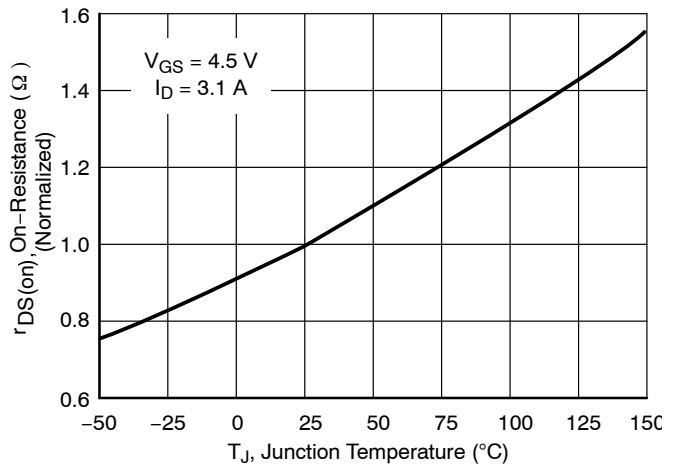


Figure 6. On-Resistance vs. Junction Temperature

TYPICAL ELECTRICAL CHARACTERISTICS

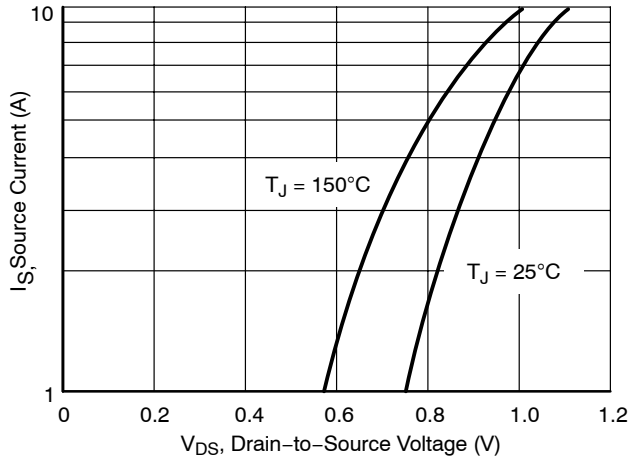


Figure 7. Source-Drain Diode Forward Voltage

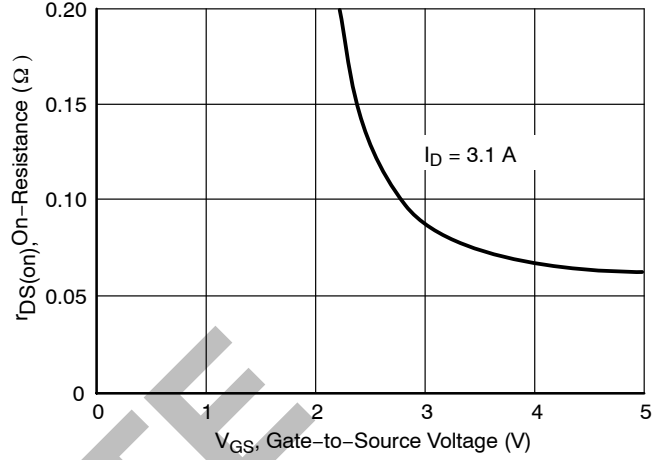


Figure 8. On-Resistance vs. Gate-to-Source Voltage

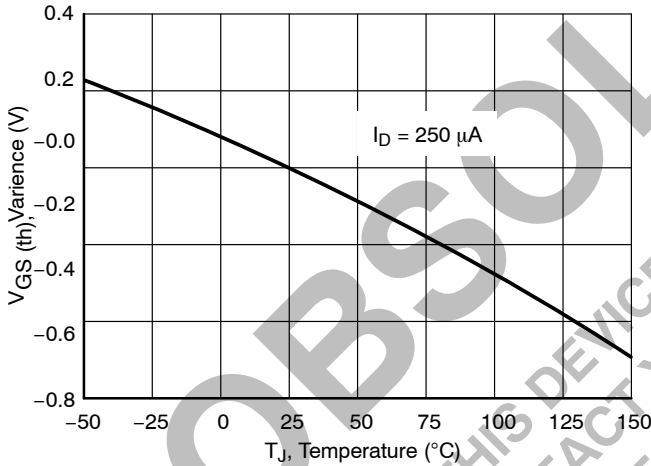


Figure 9. Threshold Voltage

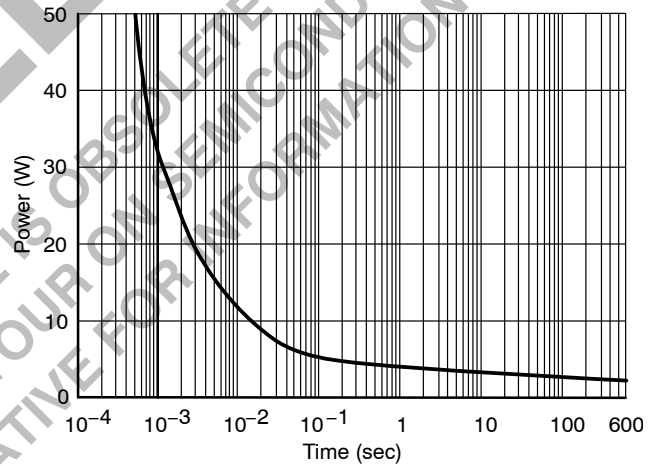


Figure 10. Single Pulse Power

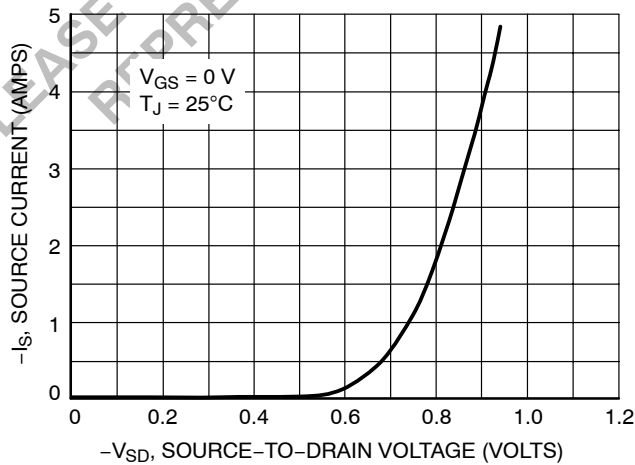


Figure 11. Diode Forward Voltage vs. Current

TYPICAL ELECTRICAL CHARACTERISTICS

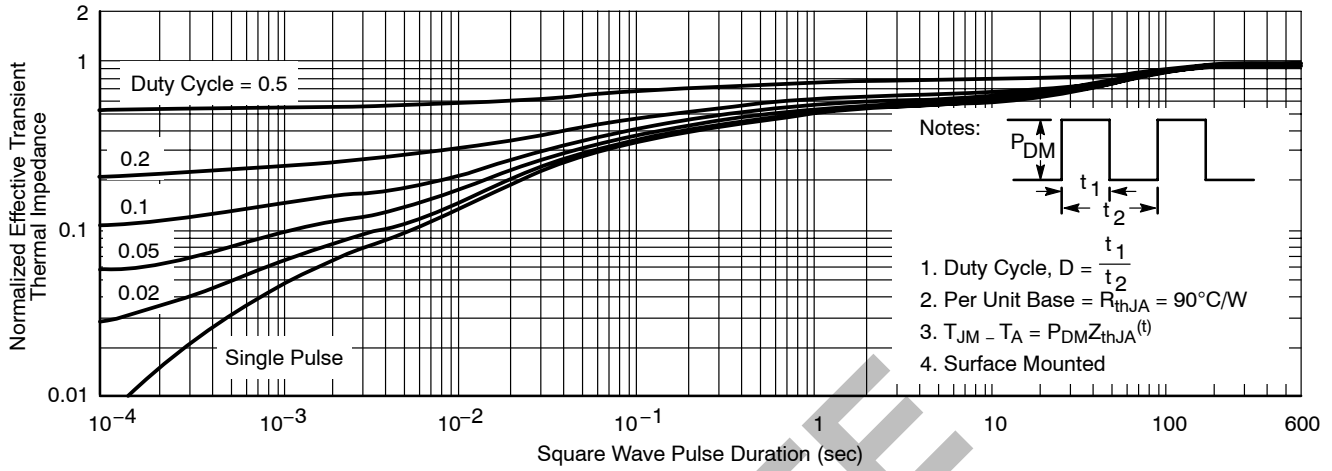


Figure 12. Normalized Thermal Transient Impedance, Junction-to-Ambient

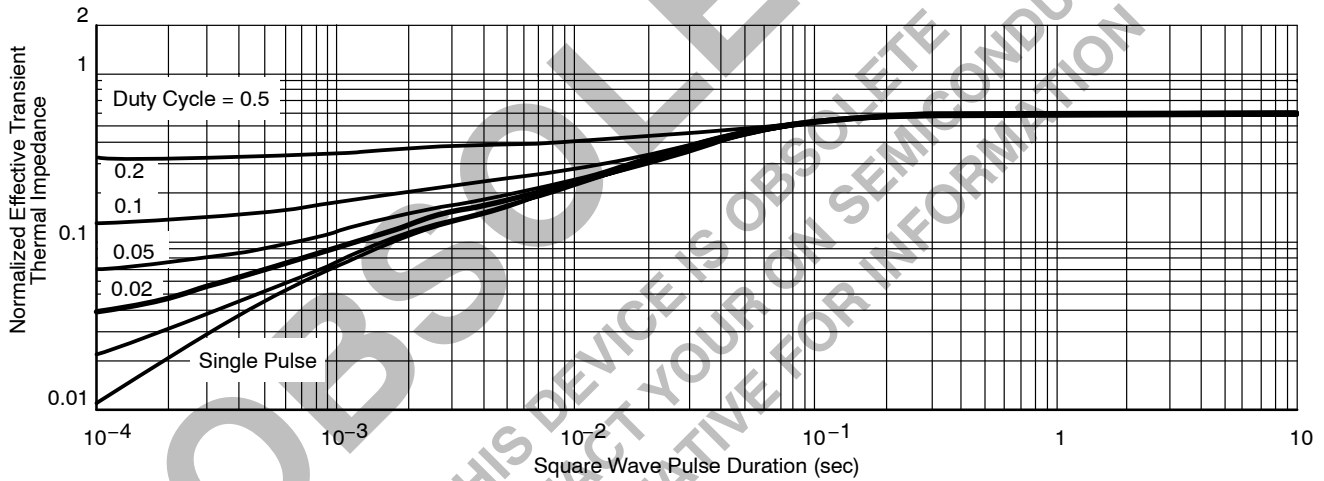


Figure 13. Normalized Thermal Transient Impedance, Junction-to-Foot

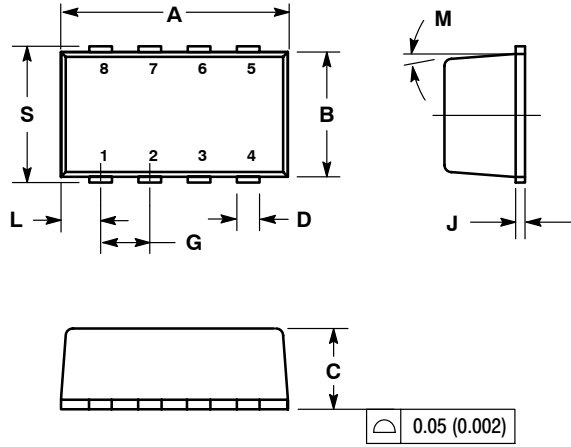
Notes

OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
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NTHD5904T1

PACKAGE DIMENSIONS

ChipFET
CASE 1206A-03
ISSUE C



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MOLD GATE BURRS SHALL NOT EXCEED 0.13 MM PER SIDE.
4. LEADFRAME TO MOLDED BODY OFFSET IN HORIZONTAL AND VERTICAL SHALL NOT EXCEED 0.08 MM.
5. DIMENSIONS A AND B EXCLUSIVE OF MOLD GATE BURRS.
6. NO MOLD FLASH ALLOWED ON THE TOP AND BOTTOM LEAD SURFACE.
7. 1206A-01 AND 1206A-02 OBSOLETE. NEW STANDARD IS 1206A-03.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.95	3.10	0.116	0.122
B	1.55	1.70	0.061	0.067
C	1.00	1.10	0.039	0.043
D	0.25	0.35	0.010	0.014
G	0.65 BSC		0.025 BSC	
J	0.10	0.20	0.004	0.008
K	0.28	0.42	0.011	0.017
L	0.55 BSC		0.022 BSC	
M	5° NOM		5° NOM	
S	1.80	2.00	0.072	0.080

STYLE 2:

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


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