Power MOSFET

-20 V, -3.0 A, Dual P-Channel ChipFET™

Features

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

Applications

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

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	5 secs	Steady State	Unit		
Drain-Source Voltage	V _{DS}	-20		V		
Gate-Source Voltage	V _{GS}	±12		±12		V
Continuous Drain Current ($T_J = 150^{\circ}C$) (Note 1) $T_A = 25^{\circ}C$ $T_A = 85^{\circ}C$	I _D	±3.0 ±2.2	±2.2 ±1.6	А		
Pulsed Drain Current	I _{DM}	±10		Α		
Continuous Source Current (Diode Conduction) (Note 1)	I _S	-3.0	-2.2	Α		
Maximum Power Dissipation (Note 1) T _A = 25°C T _A = 85°C	P _D	2.1 1.1	1.1 0.6	W		
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55 to +150		°C		

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

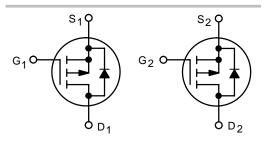
 Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.27 in sq [1 oz] including traces).



ON Semiconductor®

http://onsemi.com

V _{(BR)DSS}	R _{DS(on)} TYP	I _D MAX
-20 V	130 mΩ @ –4.5 V	-3.0 A
	215 mΩ @ -2.5 V	0.071



P-Channel MOSFET

P-Channel MOSFET



ChipFET CASE 1206A STYLE 2

PIN **MARKING** CONNECTIONS **DIAGRAM** 1 S₁ D_1 8 2 G₁ D_1 2 Ą 3 S₂ D_2 6 3 $\boxed{4}$ G_2 D_2 4 **)** 5

A7 = Specific Device Code

M = Month Code

= Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping [†]
NTHD5903T1	ChipFET	3000/Tape & Reel
NTHD5903T1G	ChipFET (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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Тур	Max	Unit
Maximum Junction-to-Ambient (Note 2) t ≤ 5 s Steady State	$R_{ hetaJA}$	50 90	60 110	°C/W
Maximum Junction-to-Foot (Drain) Steady State	$R_{ heta JF}$	30	40	°C/W

^{2.} Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.27 in sq [1 oz] including traces).

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

Characteristic	Symbol	Test Condition	Min	Тур	Max	Unit
Static			•			•
Gate Threshold Voltage	V _{GS(th)}	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	-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	μΑ
		$V_{DS} = -16 \text{ V}, V_{GS} = 0 \text{ V},$ $T_{J} = 85^{\circ}\text{C}$			-5.0	
On-State Drain Current (Note 3)	I _{D(on)}	$V_{DS} \le -5.0 \text{ V}, V_{GS} = -4.5 \text{ V}$	-10			Α
Drain-Source On-State Resistance (Note 3)	r _{DS(on)}	$V_{GS} = -4.5 \text{ V}, I_D = -2.2 \text{ A}$		0.130	0.155	Ω
		$V_{GS} = -3.6 \text{ V}, I_D = -2.0 \text{ A}$		0.150	0.180	
		$V_{GS} = -2.5 \text{ V}, I_D = -1.7 \text{ A}$		0.215	0.260	
Forward Transconductance (Note 3)	9 _{fs}	$V_{DS} = -10 \text{ V}, I_D = -2.2 \text{ A}$		5.0		S
Diode Forward Voltage (Note 3)	V_{SD}	$I_S = -2.2 \text{ A}, V_{GS} = 0 \text{ V}$		-0.8	-1.2	V
Dynamic (Note 4)	•		•	•	•	
Total Gate Charge	Qg			3.7	7.4	nC
Gate-Source Charge	ource Charge Q_{gs} $V_{DS} = -10 \text{ V},$			0.8		
Gate-Drain Charge	Q _{gd}	g =.=.··		1.3		
Turn-On Delay Time	t _{d(on)}			13	20	ns
Rise Time	t _r	$V_{DD} = -10 \text{ V}, R_L = 10 \Omega$		35	55	
Turn-Off Delay Time	t _{d(off)}	$I_D \cong -1.0 \text{ A}, V_{GEN} = -4.5 \text{ V},$ $R_G = 6 \Omega$		25	40	
Fall Time	t _f	1		25	40	1
Source-Drain Reverse Recovery Time	t _{rr}	$I_{\rm F} = -2.2 \text{A}, \text{di/dt} = 100 \text{A/us}$		40	80	1

Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
 Guaranteed by design, not subject to production testing.

TYPICAL ELECTRICAL CHARACTERISTICS

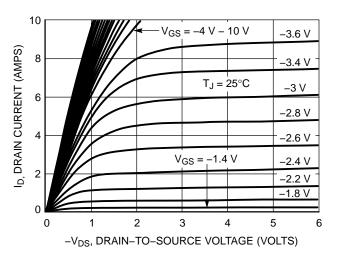


Figure 1. On-Region Characteristics

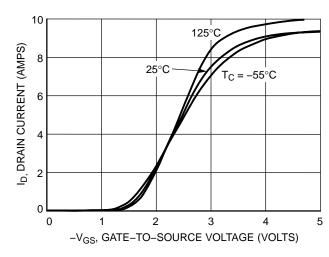


Figure 2. Transfer Characteristics

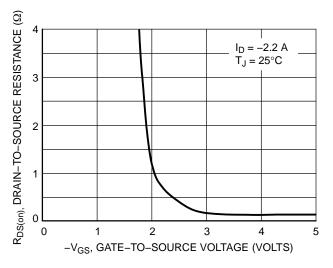


Figure 3. On-Resistance vs. Gate-to-Source Voltage

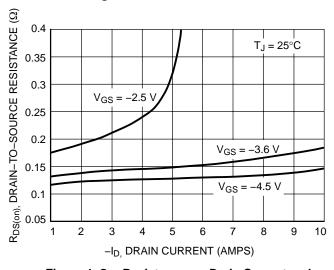


Figure 4. On–Resistance vs. Drain Current and Gate Voltage

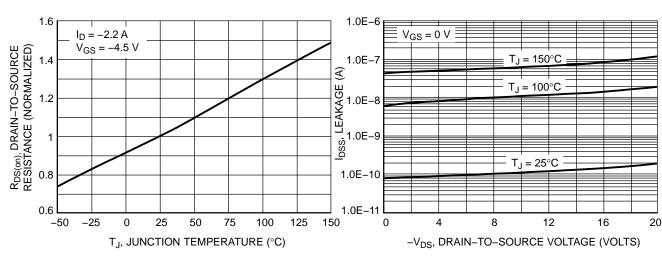
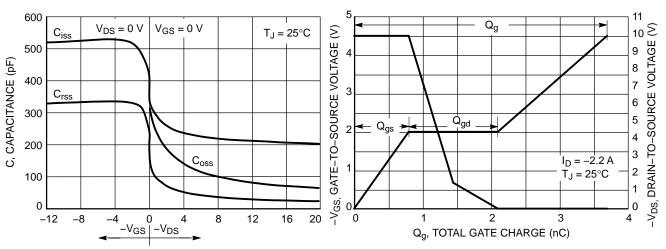


Figure 5. On–Resistance Variation with Temperature

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

TYPICAL ELECTRICAL CHARACTERISTICS



GATE-TO-SOURCE OR DRAIN-TO-SOURCE VOLTAGE (VOLTS)

Figure 7. Capacitance Variation

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

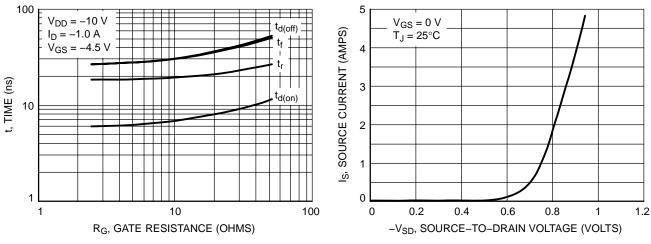


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

Figure 10. Diode Forward Voltage vs. Current

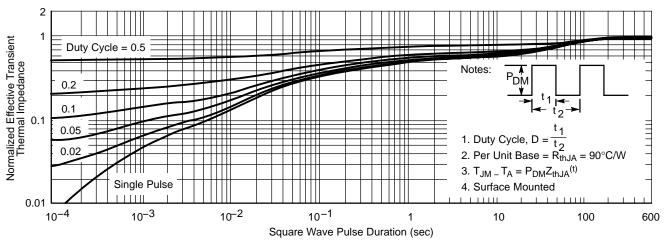
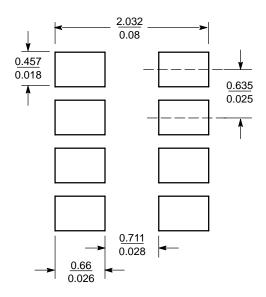


Figure 11. Normalized Thermal Transient Impedance, Junction-to-Ambient

SOLDERING FOOTPRINT*



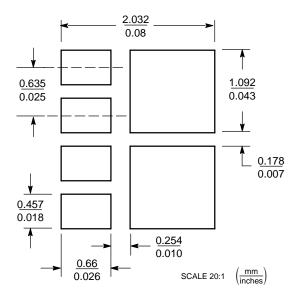


Figure 12. Basic

Figure 13. Style 2

BASIC PAD PATTERNS

The basic pad layout with dimensions is shown in Figure 12. This is sufficient for low power dissipation MOSFET applications, but power semiconductor performance requires a greater copper pad area, particularly for the drain leads.

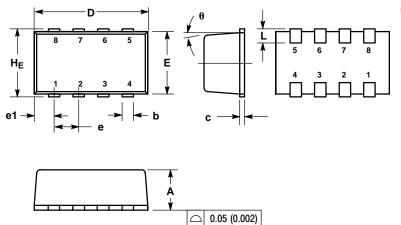
The minimum recommended pad pattern shown in Figure 13 improves the thermal area of the drain connections (pins 5, 6, 7, 8) while remaining within the

confines of the basic footprint. The drain copper area is 0.0019 sq. in. (or 1.22 sq. mm). This will assist the power dissipation path away from the device (through the copper leadframe) and into the board and exterior chassis (if applicable) for the single device. The addition of a further copper area and/or the addition of vias to other board layers will enhance the performance still further.

^{*}For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

ChipFET™ CASE 1206A-03 **ISSUE G**



- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982. CONTROLLING DIMENSION: MILLIMETER.
- MOLD GATE BURRS SHALL NOT EXCEED 0.13 MM PER SIDE. LEADFRAME TO MOLDED BODY OFFSET IN HORIZONTAL
- AND VERTICAL SHALL NOT EXCEED 0.08 MM.
 DIMENSIONS A AND B EXCLUSIVE OF MOLD GATE BURRS.
- NO MOLD FLASH ALLOWED ON THE TOP AND BOTTOM LEAD SURFACE

	MILLIMETERS			INCHES			
DIM	MIN	NOM	MAX	MIN	NOM	MAX	
Α	1.00	1.05	1.10	0.039	0.041	0.043	
b	0.25	0.30	0.35	0.010	0.012	0.014	
С	0.10	0.15	0.20	0.004	0.006	0.008	
D	2.95	3.05	3.10	0.116	0.120	0.122	
Е	1.55	1.65	1.70	0.061	0.065	0.067	
е	0.65 BSC			0.025 BSC			
e1	0.55 BSC			0.022 BSC			
L	0.28	0.35	0.42	0.011	0.014	0.017	
HE	1.80	1.90	2.00	0.071	0.075	0.079	
θ	5° NOM			5° NOM			

STYLE 2:

- PIN 1. SOURCE 1
 - 2. GATE 1 3. SOURCE 2

 - 4. GATE 2 5. DRAIN 2
 - 6. DRAIN 2

 - 7 DRAIN 1 8. DRAIN 1

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