# **Power MOSFET**

# -8.0 V, -7.5 A P-Channel ChipFET™

#### **Features**

- Offers an Ultra Low R<sub>DS(on)</sub> Solution in the ChipFET Package
- Miniature ChipFET Package 40% Smaller Footprint than TSOP-6 making it an Ideal Device for Applications where Board Space is at a Premium
- Low Profile (<1.1 mm) Allows it to Fit Easily into Extremely Thin Environments such as Portable Electronics
- Designed to Provide Low R<sub>DS(on)</sub> at Gate Voltage as Low as 1.8 V, the Operating Voltage used in many Logic ICs in Portable Electronics
- Simplifies Circuit Design since Additional Boost Circuits for Gate Voltages are not Required
- Operated at Standard Logic Level Gate Drive, Facilitating Future Migration to Lower Levels using the same Basic Topology
- Pb-Free Package is Available

#### **Applications**

- Optimized for Battery and Load Management Applications in Portable Equipment such as MP3 Players, Cell Phones, Digital Cameras, Personal Digital Assistant and other Portable Applications
- Charge Control in Battery Chargers
- Buck and Boost Converters

#### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit	
Drain-to-Source Voltage	V <sub>DSS</sub>	-8.0	V <sub>dc</sub>	
Gate-to-Source Voltage - Continuous	$V_{GS}$	±8.0	V <sub>dc</sub>	
Drain Current – Continuous – 5 seconds	I <sub>D</sub>	-5.4 -7.5	Α	
Total Power Dissipation  Continuous @ $T_A = 25^{\circ}C$ (5 sec) @ $T_A = 25^{\circ}C$ Continuous @ $85^{\circ}C$ (5 sec) @ $85^{\circ}C$	P <sub>D</sub>	1.3 2.5 0.7 1.3	W	
Continuous Source Current	ls	-1.1	Α	
Thermal Resistance (Note 1) Junction-to-Ambient, 5 sec Junction-to-Ambient, Continuous	$R_{ hetaJA}$	50 95	°C/W	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	TL	260	°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.

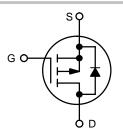
 Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.27 in sq [1 oz] including traces).



## ON Semiconductor®

#### http://onsemi.com

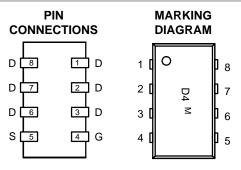
V <sub>(BR)DSS</sub>	Ultra Low R <sub>DS(on)</sub> TYP	I <sub>D</sub> MAX	
	19 m $\Omega$ @ $-4.5~V_{GS}$		
-8.0 V	25 m $\Omega$ @ –2.5 $V_{GS}$	–7.5 A	
	34 m $\Omega$ @ $-1.8$ V $_{GS}$		



P-Channel MOSFET



ChipFET CASE 1206A STYLE 1



D4 = Specific Device Code M = Month Code

#### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTHS2101PT1	ChipFET	3000/Tape & Reel
NTHS2101PT1G	ChipFET (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.

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

Characteristic	Symbol	Test Condition	Min	Тур	Max	Unit
OFF CHARACTERISTICS	•		•			
Drain-to-Source Breakdown Voltage (Note 2) Temperature Coefficient (Positive)	V <sub>(Br)DSS</sub>	$V_{GS} = 0 \ V_{dc}, \ I_{D} = -250 \ \mu A_{dc}$	-8.0			V <sub>dc</sub>
Gate-Body Leakage Current Zero	I <sub>GSS</sub>	$V_{DS} = 0 \ V_{dc}, \ V_{GS} = \pm 8.0 \ V_{dc}$			±100	nA <sub>dc</sub>
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	$\begin{aligned} V_{DS} &= -6.4 \ V_{dc}, \ V_{GS} = 0 \ V_{dc} \\ V_{DS} &= -6.4 \ V_{dc}, \ V_{GS} = 0 \ V_{dc}, \\ T_{J} &= 85^{\circ}C \end{aligned}$			-1.0 -5.0	μA <sub>dc</sub>
ON CHARACTERISTICS (Note 2)					_	
Gate Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_{D} = -250 \mu A_{dc}$	-0.45		-1.5	V <sub>dc</sub>
Static Drain-to-Source On-Resistance	R <sub>DS(on)</sub>	$\begin{aligned} &V_{GS} = -4.5 \ V_{dc}, \ I_{D} = -5.4 \ A_{dc} \\ &V_{GS} = -2.5 \ V_{dc}, \ I_{D} = -4.5 \ A_{dc} \\ &V_{GS} = -1.8 \ V_{dc}, \ I_{D} = -2.0 \ A_{dc} \end{aligned}$		19 25 34	25 36 48	mΩ
Forward Transconductance	9FS	$V_{DS} = -5.0 V_{dc}, I_{D} = -5.2 A_{dc}$		20		S
Diode Forward Voltage	V <sub>SD</sub>	$I_S = -1.1 A_{dc}, V_{GS} = 0 V_{dc}$		-0.62	-1.2	V
DYNAMIC CHARACTERISTIC						
Input Capacitance	C <sub>iss</sub>	$V_{DS} = -6.4 V_{dc}$		2400		pF
Output Capacitance	C <sub>oss</sub>	$V_{GS} = 0 V$ f = 1.0 MHz		550		
Transfer Capacitance	C <sub>rss</sub>	1 = 1.0 WH 12		420		
SWITCHING CHARACTERISTICS (Note 3)						
Turn-On Delay Time	t <sub>d(on)</sub>	$V_{DD} = -6.4 V_{dc}$		7.0		ns
Rise Time	t <sub>r</sub>	$V_{GS} = -4.5 V_{dc}$ $I_{D} = -5.4 A_{dc}$		28		
Turn-Off Delay Time	t <sub>d(off)</sub>	$R_G = 2.0 \Omega \text{ (Note 2)}$		73		
Fall Time	t <sub>f</sub>	, ,		60		
Gate Charge	$Q_{G}$	$V_{GS} = -4.5 V_{dc}$		15	30	nC
	Q <sub>GS</sub>	$I_{D} = -5.4 A_{dc}$		4.0		
	Q <sub>GD</sub>	$V_{DS} = -6.4 V_{dc}$		8.0		
Source-Drain Reverse Recovery Time	T <sub>rr</sub>	I <sub>F</sub> = -1.1 A, di/dt = 100 A/μs		90		ns

Pulse Test: Pulse Width = 250 μs, Duty Cycle = 2%.
 Switching characteristics are independent of operating junction temperatures.

#### TYPICAL ELECTRICAL CHARACTERISTICS

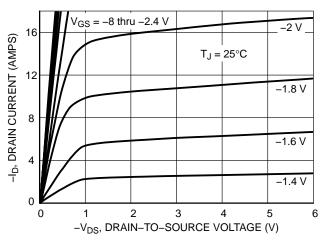


Figure 1. On-Region Characteristics

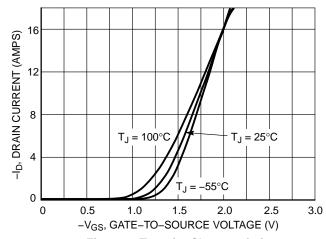


Figure 2. Transfer Characteristics

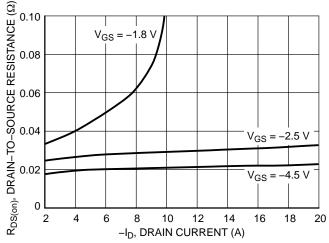


Figure 3. On–Resistance versus Drain Current and Gate Voltage

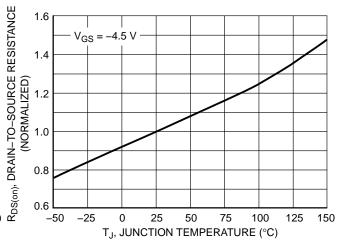


Figure 4. On–Resistance Variation with Temperature

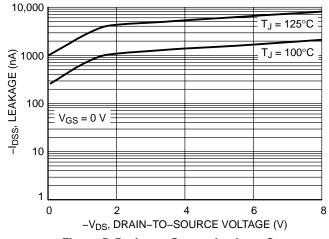
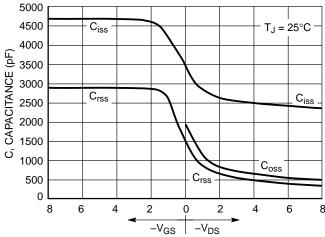


Figure 5. Drain-to-Source Leakage Current vs. Voltage



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

Figure 6. Capacitance Variation

#### TYPICAL ELECTRICAL CHARACTERISTICS

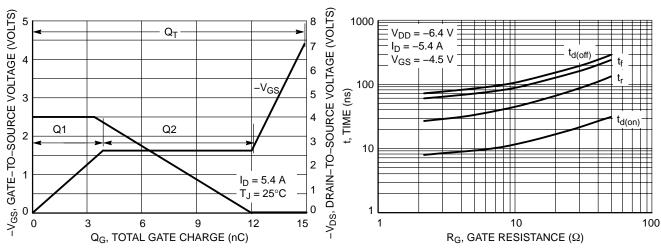


Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

Figure 8. Resistive Switching Time Variation vs. Gate Resistance

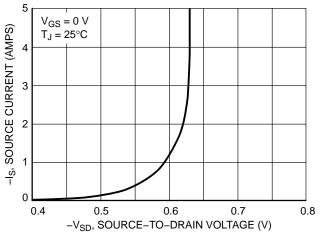


Figure 9. Diode Forward Voltage vs. Current

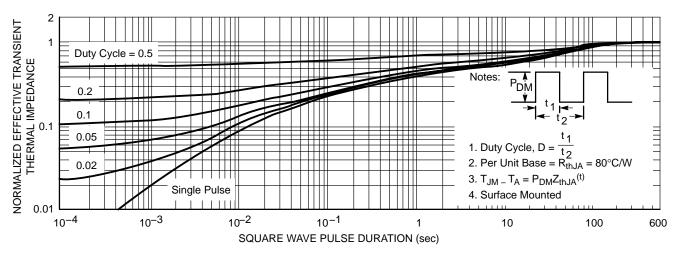
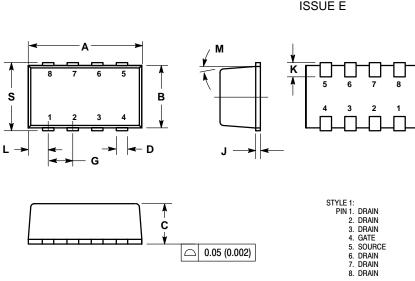


Figure 10. Normalized Thermal Transient Impedance, Junction-to-Ambient

#### **PACKAGE DIMENSIONS**

**ChipFET** CASE 1206A-03 **ISSUE E** 



- NOTES:

  1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

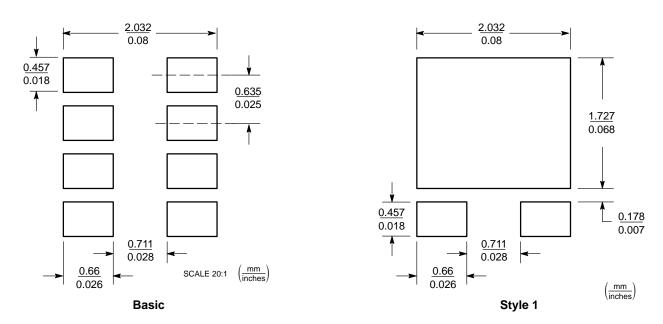
  2. CONTROLLING DIMENSION: MILLIMETER.

  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.
- USB MM.
   DIMENSIONS A AND B EXCLUSIVE OF MOLD GATE BURRS.
   NO MOLD FLASH ALLOWED ON THE TOP AND BOTTOM LEAD SURFACE.
   1206A-01 AND 1206A-02 OBSOLETE. NEW STANDARD IS 1206A-03.

	MILLIMETERS		INCHES		
DIM	MIN	MAX	MIN	MAX	
Α	2.95	3.10	0.116	0.122	
В	1.55	1.70	0.061	0.067	
С	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	

#### **SOLDERING FOOTPRINTS\***



<sup>\*</sup>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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