

# MMDF1300

## Power MOSFET 3 Amps, 25 Volts

### Complementary SO-8, Dual

These miniature surface mount MOSFETs feature ultra low  $R_{DS(on)}$  and true logic level performance. They are capable of withstanding high energy in the avalanche and commutation modes and the drain-to-source diode has a very low reverse recovery time. MiniMOS™ devices are designed for use in low voltage, high speed switching applications where power efficiency is important. Typical applications are dc-dc converters, and power management in portable and battery powered products such as computers, printers, cellular and cordless phones. They can also be used for low voltage motor controls in mass storage products such as disk drives and tape drives. The avalanche energy is specified to eliminate the guesswork in designs where inductive loads are switched and offer additional safety margin against unexpected voltage transients.

- Low  $R_{DS(on)}$  Provides Higher Efficiency and Extends Battery Life
- Logic Level Gate Drive – Can be Driven by Logic ICs
- Miniature SO-8 Surface Mount Package – Saves Board Space
- Diode Exhibits High Speed, with Soft Recovery

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DS}$	25	Vdc
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	Vdc
Drain Current – Continuous N-Channel P-Channel	$I_D$	3.0 2.0	A dc
Drain Current – Pulsed N-Channel P-Channel	$I_{DM}$	9.0 6.0	A pk
Operating and Storage Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	1.8	Watts
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ( $V_{DD} = 20 \text{ Vdc}$ , $V_{GS} = 10 \text{ Vdc}$ , $I_L = 3.0 \text{ Apk}$ , $L = 25 \text{ mH}$ , $R_G = 25 \Omega$ )	$E_{AS}$	113	mJ
Thermal Resistance – Junction-to-Ambient (Note 1.)	$R_{\theta JA}$	66.3	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 10 sec.	$T_L$	260	$^\circ\text{C}$

1. Mounted on 2" square FR4 board (1" sq. 2 oz. Cu 0.06" thick single sided), 10 sec. max.

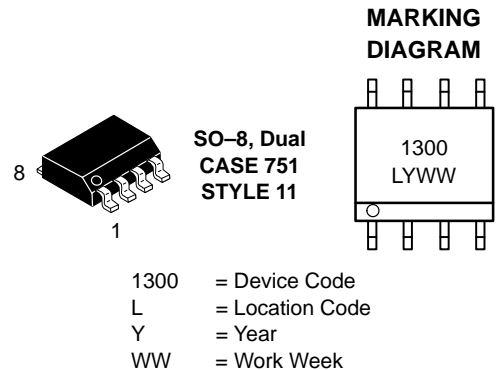
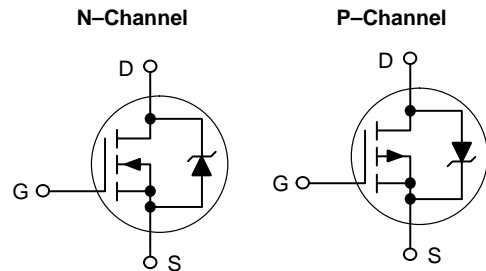


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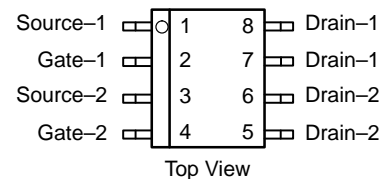
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**3 AMPERES  
25 VOLTS**

**$R_{DS(on)} = 100 \text{ m}\Omega$  (N-Channel)  
 $R_{DS(on)} = 210 \text{ m}\Omega$  (P-Channel)**



#### PIN ASSIGNMENT



#### ORDERING INFORMATION

Device	Package	Shipping
MMDF1300R2	SO-8	2500 Tape & Reel

# MMDF1300

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

Characteristic	Symbol	Polarity	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μAdc)	V <sub>(BR)DSS</sub>	-	30	-	-	Vdc
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 25 Vdc, V <sub>GS</sub> = 0 Vdc)	I <sub>DSS</sub>	(N) (P)	-	-	1.0 1.0	μAdc
Gate-Body Leakage Current (V <sub>GS</sub> = 20 Vdc, V <sub>DS</sub> = 0)	I <sub>GSS</sub>	-	-	-	±100	nAdc

### ON CHARACTERISTICS (Notes 2. & 3.)

Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc)	V <sub>GS(th)</sub>	(N) (P)	1.0 1.0	1.5 2.0	2.0 3.0	Vdc
Drain-to-Source On-Resistance (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 2.0 Adc)	R <sub>DS(on)</sub>	(N) (P)	-	0.09 0.16	0.10 0.21	Ohms
Drain-to-Source On-Resistance (V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 1.0 Adc)	R <sub>DS(on)</sub>	(N) (P)	-	0.13 0.30	0.16 0.375	Ohms
Forward Transconductance (V <sub>DS</sub> = 3.0 Vdc, I <sub>D</sub> = 1.5 Adc)	g <sub>FS</sub>	(N) (P)	1.0 1.0	-	-	mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 16 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	(N) (P)	-	215 200	301 300	pF
Output Capacitance		C <sub>oss</sub>	(N) (P)	-	111 100	158 160	
Transfer Capacitance		C <sub>rss</sub>	(N) (P)	-	30 40	60 75	

### SWITCHING CHARACTERISTICS (Note 4.)

Turn-On Delay Time	(V <sub>DD</sub> = 10 Vdc, I <sub>D</sub> = 2.0 Adc, V <sub>GS</sub> = 4.5 Vdc, R <sub>G</sub> = 6.0 Ω)	t <sub>d(on)</sub>	(N) (P)	-	18 14	36 28	ns
Rise Time		t <sub>r</sub>	(N) (P)	-	98 95	196 180	
Turn-Off Delay Time		t <sub>d(off)</sub>	(N) (P)	-	16 22	32 45	
Fall Time		t <sub>f</sub>	(N) (P)	-	30 40	60 80	
Total Gate Charge	(V <sub>DS</sub> = 16 Vdc, I <sub>D</sub> = 2.0 Adc, V <sub>GS</sub> = 4.5 Vdc)	Q <sub>T</sub>	(N) (P)	-	3.3 7.0	5.0 10	nC
		Q <sub>1</sub>	(N) (P)	-	1.2 1.2	-	
		Q <sub>2</sub>	(N) (P)	-	2.0 2.5	-	
		Q <sub>3</sub>	(N) (P)	-	1.9 3.5	-	

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Negative signs for P-Channel device omitted for clarity.
4. Switching characteristics are independent of operating junction temperature.

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## ELECTRICAL CHARACTERISTICS – continued ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic		Symbol	Polarity	Min	Typ	Max	Unit
<b>SOURCE-DRAIN DIODE CHARACTERISTICS</b> (Note 5.)							
Forward On-Voltage (Note 6.)	( $I_S = 3.0 \text{ Adc}$ , $V_{GS} = 0 \text{ Vdc}$ )	$V_{SD}$	(N)	–	1.0	1.4	Vdc
	( $I_S = 2.0 \text{ Adc}$ , $V_{GS} = 0 \text{ Vdc}$ )		(P)	–	1.3	1.7	
Reverse Recovery Time	(N)  ( $I_D = 2.0 \text{ Adc}$ , $V_{GS} = 0 \text{ Vdc}$ $dI_S/dt = 100 \text{ A}/\mu\text{s}$ )	$t_{rr}$	(N)	–	23	–	ns
			(P)	–	20	–	
		$t_a$	(N)	–	18	–	
			(P)	–	13	–	
Reverse Recovery Stored Charge		QRR	(N)	–	0.02	–	$\mu\text{C}$
			(P)	–	0.02	–	

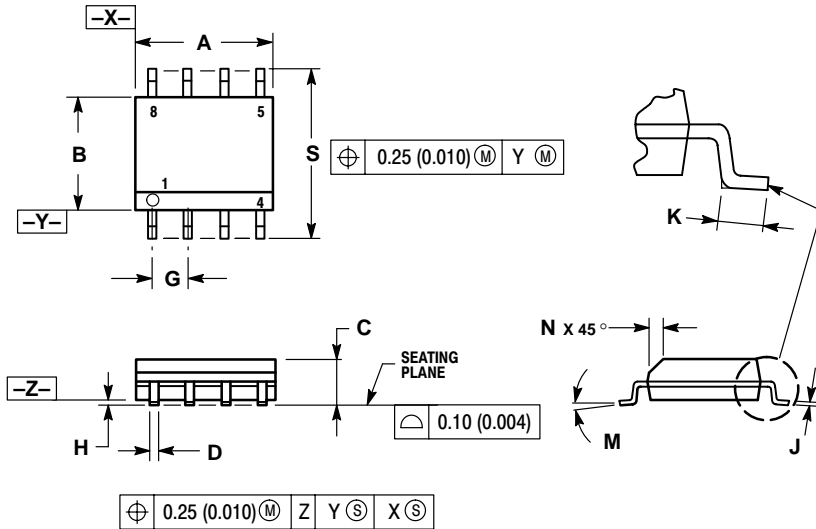
5. Negative signs for P-Channel device omitted for clarity.

6. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

# MMDF1300

## PACKAGE DIMENSIONS

SO-8  
CASE 751-07  
ISSUE V



### NOTES:


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

### STYLE 11:

- 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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