

Product Preview

Medium Power Surface Mount Products TMOS Dual P-Channel with Monolithic Zener ESD Protected Gate

EZFETs™ are an advanced series of power MOSFETs which utilize Motorola's High Cell Density TMOS process and contain monolithic back-to-back zener diodes. These zener diodes provide protection against ESD and unexpected transients. 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. EZFET 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.

- Zener Protected Gates Provide Electrostatic Discharge Protection
- Ultra 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 Is Characterized for Use In Bridge Circuits
- Diode Exhibits High Speed, With Soft Recovery
- I_{DSS} Specified at Elevated Temperature
- Mounting Information for SO-8 Package Provided

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	20	Vdc
Drain-to-Gate Voltage ($R_{GS} = 1.0\text{ M}\Omega$)	V_{DGR}	20	Vdc
Gate-to-Source Voltage — Continuous	V_{GS}	± 8.0	Vdc
Drain Current — Continuous @ $T_A = 25^\circ\text{C}$ (1) — Continuous @ $T_A = 70^\circ\text{C}$ (1) — Pulsed Drain Current (4)	I_D I_D I_{DM}	2.4 2.0 12	Adc Adc Apk
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (1) Linear Derating Factor (1)	P_D	2.0 16	Watts mW/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (2) Linear Derating Factor (2)	P_D	1.39 11.11	Watts mW/ $^\circ\text{C}$
Operating and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$

THERMAL RESISTANCE

Rating	Symbol	Typ.	Max.	Unit
Thermal Resistance — Junction to Ambient, PCB Mount (1) — Junction to Ambient, PCB Mount (2)	$R_{\theta JA}$ $R_{\theta JA}$	— —	62.5 90	$^\circ\text{C/W}$

* Negative sign for P-Channel device omitted for clarity

(1) When mounted on 1 inch square FR-4 or G-10 board ($V_{GS} = 10\text{ V}$, @ 4.5 Seconds)

(2) When mounted on minimum recommended FR-4 or G-10 board ($V_{GS} = 4.5\text{ V}$, @ Steady State)

DEVICE MARKING

ORDERING INFORMATION

D2P01Z	Device	Reel Size	Tape Width	Quantity
	MMDF2P01ZR2	13"	12 mm embossed tape	2500 units

This document contains information on a new product. Specifications and information are subject to change without notice.

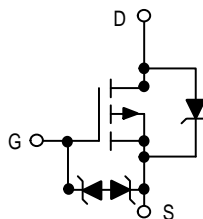
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Preferred devices are Motorola recommended choices for future use and best overall value.

MMDF2P01Z

Motorola Preferred Device

DUAL TMOS
POWER MOSFET
2.0 AMPERES
20 VOLTS
 $R_{DS(on)} = 0.160\text{ OHM}$



CASE 751-05, Style 11
SO-8

Source-1	1	8	Drain-1
Gate-1	2	7	Drain-1
Source-2	3	6	Drain-2
Gate-2	4	5	Drain-2

Top View

MMDF2P01Z

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) *

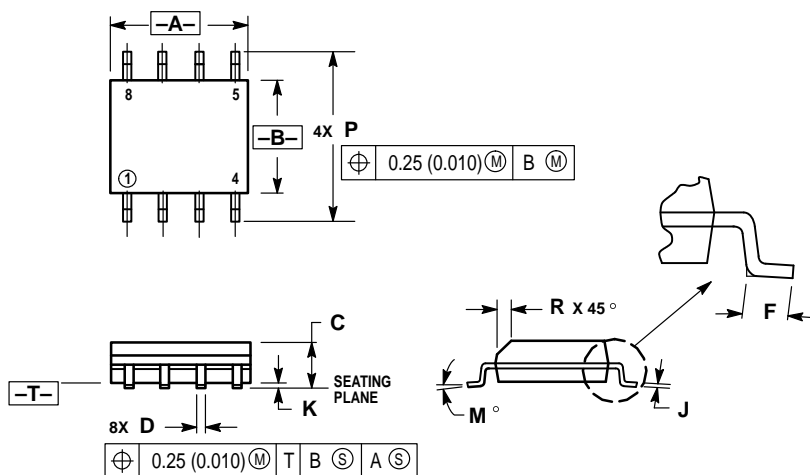
Characteristic	Symbol	Min	Typ	Max	Unit	
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage (V _{GS} = 0 Vdc, I _D = 0.25 mAdc) Temperature Coefficient (Positive)	V _{(BR)DSS}	20 —	— TBD	— —	Vdc mV/°C	
Zero Gate Voltage Drain Current (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc, T _J = 125°C)	I _{DSS}	— —	— —	2.0 10	μAdc	
Gate-Body Leakage Current (V _{GS} = ± 8.0 Vdc, V _{DS} = 0 Vdc)	I _{GSS}	—	—	5.0		
ON CHARACTERISTICS(1)						
Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = 0.25 mAdc) Threshold Temperature Coefficient (Negative)	V _{GS(th)}	0.7 —	0.9 TBD	1.1 —	Vdc mV/°C	
Static Drain-to-Source On-Resistance (V _{GS} = 4.5 Vdc, I _D = 2.4 Adc) (V _{GS} = 2.7 Vdc, I _D = 1.2 Adc)	R _{DS(on)}	— —	120 170	160 190	mΩ	
Forward Transconductance (V _{DS} = 2.5 Vdc, I _D = 1.0 Adc)	g _{FS}	3.0	4.0	—	Mhos	
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V _{DS} = 10 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz)	C _{iss}	—	345	pF	
Output Capacitance		C _{oss}	—	360		
Transfer Capacitance		C _{rss}	—	125		
SWITCHING CHARACTERISTICS(2)						
Turn-On Delay Time	(V _{DS} = 6.0 Vdc, I _D = 2.4 Adc, V _{GS} = 4.5 Vdc, R _G = 6.0 Ω)	t _{d(on)}	—	60	ns	
Rise Time		t _r	—	325		
Turn-Off Delay Time		t _{d(off)}	—	400		
Fall Time		t _f	—	485		
Turn-On Delay Time	(V _{DS} = 6.0 Vdc, I _D = 2.4 Adc, V _{GS} = 2.7 Vdc, R _G = 6.0 Ω)	t _{d(on)}	—	120	ns	
Rise Time		t _r	—	1060		
Turn-Off Delay Time		t _{d(off)}	—	225		
Fall Time		t _f	—	530		
Gate Charge (see figure 8)	(V _{DS} = 10 Vdc, I _D = 2.4 Adc, V _{GS} = 4.5 Vdc)	Q _T	—	10	nC	
		Q ₁	—	0.65		
		Q ₂	—	4.8		
		Q ₃	—	3.3		
SOURCE-DrAIN DIODE CHARACTERISTICS						
Forward On-Voltage	(I _S = 2.4 Adc, V _{GS} = 0 Vdc) (I _S = 2.4 Adc, V _{GS} = 0 Vdc, T _J = 125°C)	V _{SD}	— —	1.2 TBD	1.5 —	Vdc
Reverse Recovery Time	(I _S = 2.4 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/μs)	t _{rr}	—	500	ns	
		t _a	—	150		
		t _b	—	350		
Reverse Recovery Storage Charge		Q _{RR}	—	2.8	—	μC

* Negative sign for P-Channel device omitted for clarity

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

(2) Switching characteristics are independent of operating junction temperature.

PACKAGE DIMENSIONS



NOTES:


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS 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	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.18	0.25	0.007	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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

CASE 751-05
SO-8
ISSUE M

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