MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

Advance Information

Power Field Effect Transistor

P-Channel Enhancement-Mode Silicon Gate TMOS

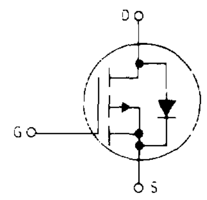
MTP20P06

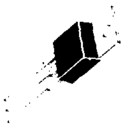
TMOS POWER FET
20 AMPERES
$r_{DS(on)}$ = 0.2 OHM
60 VOLTS

TMOS

This TMOS Power FET is designed for high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

- Silicon Gate for Fast Switching Speeds — Switching Times Specified at 100°C
- Designer's Data — I_{DSS}, $V_{DS(on)}$, $V_{GS(th)}$ and SOA Specified at Elevated Temperature
- Rugged — SOA is Power Dissipation Limited
- Source-to-Drain Diode Characterized for Use With Inductive Loads





CASE 221A-04
TO-220AB

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	60	Vdc
Drain-Gate Voltage (R_{GS} = 1 MΩ)	V_{DGR}	60	Vdc
Gate-Source Voltage Continuous Non-repetitive ($t_p \leq 50\ \mu s$)	 V_{GS} V_{GSM}	 ±20 ±40	 Vdc Vpk
Drain Current — Continuous — Pulsed	I_D I_{DM}	20 72	Adc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	125 0.8	Watts W/°C
Operating and Storage Temperature Range	T_J, T_{stg}	−65 to 150	°C

THERMAL CHARACTERISTICS

Thermal Resistance — Junction to Case	$R_{\theta JC}$	1.25	°C/W
— Junction to Ambient	$R_{\theta JA}$	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 5 seconds	T_L	275	°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	*Symbol*	*Min*	*Max*	*Unit*
OFF CHARACTERISTICS				
Drain-Source Breakdown Voltage (V_{GS} = 0, I_D = 0.25 mA)	$V_{(BR)DSS}$	60	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = Rated V_{DSS}, V_{GS} = 0) (V_{DS} = Rated V_{DSS}, V_{GS} = 0, T_J = 125°C)	I_{DSS}	 — —	 10 100	μAdc
Gate-Body Leakage Current, Forward (V_{GSF} = 20 Vdc, V_{DS} = 0)	I_{GSSF}	—	100	nAdc
Gate-Body Leakage Current, Reverse (V_{GSR} = 20 Vdc, V_{DS} = 0)	I_{GSSR}	—	100	nAdc

(continued)

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

ELECTRICAL CHARACTERISTICS — continued (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
ON CHARACTERISTICS*					
Gate Threshold Voltage ($V_{DS} = V_{GS}$, I_D = 1 mA) T_J = 100°C		$V_{GS(th)}$	 2 1.5	 4.5 4	Vdc
Static Drain-Source On-Resistance (V_{GS} = 10 Vdc, I_D = 10 Adc)		$r_{DS(on)}$	—	0.2	Ohm
Drain-Source On-Voltage (V_{GS} = 10 V) (I_D = 20 Adc) (I_D = 10 Adc, T_J = 100°C)		$V_{DS(on)}$	 — —	 4.2 4	Vdc
Forward Transconductance (V_{DS} = 15 V, I_D = 10 A)		g_{FS}	5	—	mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance	(V_{DS} = 25 V, V_{GS} = 0, f = 1 MHz) See Figure 11	C_{iss}	—	1400	pF
Output Capacitance		C_{oss}	—	700	
Reverse Transfer Capacitance		C_{rss}	—	300	
SWITCHING CHARACTERISTICS* (T_J = 100°C)					
Turn-On Delay Time	(V_{DD} = 25 V, I_D = 10 Amp, R_{gen} = 50 ohms) See Figures 9, 13 and 14	$t_{d(on)}$	—	60	ns
Rise Time		t_r	—	350	
Turn-Off Delay Time		$t_{d(off)}$	—	150	
Fall Time		t_f	—	160	
Total Gate Charge	(V_{DS} = 0.8 Rated V_{DSS}, I_D = 20 Amp, V_{GS} = 10 V) See Figure 12	Q_g	30 (Typ)	60	nC
Gate-Source Charge		Q_{gs}	20 (Typ)	—	
Gate-Drain Charge		Q_{gd}	10 (Typ)	—	
SOURCE DRAIN DIODE CHARACTERISTICS*					
Forward On-Voltage	(I_S = 20 Amp, V_{GS} = 0)	V_{SD}	4 (Typ)	4.2	Vdc
Forward Turn-On Time		t_{on}	100 (Typ)	—	ns
Reverse Recovery Time		t_{rr}	120 (Typ)	—	ns
INTERNAL PACKAGE INDUCTANCE (TO-220)					
Internal Drain Inductance (Measured from the contact screw on tab to center of die) (Measured from the drain lead 0.25″ from package to center of die)		L_d	 3.5 (Typ) 4.5 (Typ)	 — —	nH
Internal Source Inductance (Measured from the source lead 0.25″ from package to center of pad)		L_s	7.5 (Typ)	—	

*Pulse Test. Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.