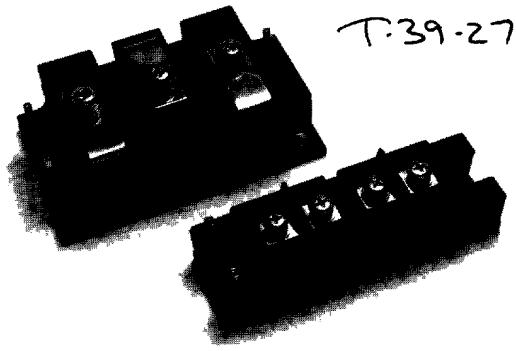
T-39-27

FUJI ELECTRIC

MOSFET Modules



MOSFET Modules

250V
500V

MOSFET Module advantages:
- Increase carrier frequencies
- Improve control accuracy

MOSFET Modules are used on:
- Switch-mode power supplies (SMPS)
- Linear power supplies (no secondary breakdown)
- High-performance motor controls
- Uninterruptible power supplies (UPS)
- Other high-frequency (>20kHz) applications

MOSFET Modules are designed for:
- 120VAC (250V) and 240VAC (500V) systems
- Currents of 50A, 100A, & 200A
- Typical switching frequencies of >20kHz
- Split-dual and standard-dual package topologies

MOSFET modules are voltage-controlled devices requiring very low gate-drive power. Ultra-fast switching devices, they are particularly well suited for low voltage (120VAC, 240VAC) applications. Not only are MOSFET modules excellent for high-frequency switching, but also in linear applications, where the absence of forward-biased secondary breakdown is an asset. MOSFET modules are supplied with or without Schottky forward and fast-recovery antiparallel diodes. Gate drive hybrids are also available to simplify designs.

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CSD 110 • JULY, 1991

MOSFET Modules

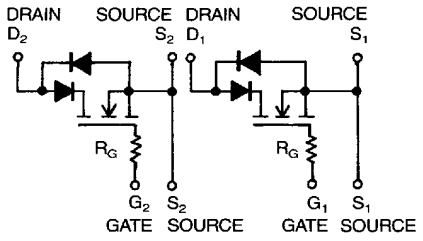
Device Type	Ratings at T_C = 25°C			Characteristics at T_C = 25°C				Package
	Drain-Source Voltage	Drain Current	Power Dissipation	Drain-Source On-State Resistance	Forward Transfer Conductance	Switching Times		
	V_{DS} (V)	I_D (A)	P_D (W)	$r_{DS\ (on)}$ (mΩ)	g_{fs} (S)	t_{on} (ns)	t_{off} (ns)	
2MI50F-050	500	50	400	110	45	530	780	Module
2MI50S-050	500	50	400	110	45	530	780	Module
2MI100F-025	250	100	400	32	55	–	–	Module
2MI100F-050	500	100	800	62	105	185	630	M210
2MI200F-025	250	200	800	15	150	175	600	M210
6MI15FS-050	500	15	60	400	13	130	560	SIL
6MI20FS-025	250	20	40	160	12	80	300	SIL

2MI50F-050 Ratings and Characteristics

ABSOLUTE MAXIMUM RATINGS AT TC = 25°C

Parameter	Symbols	Ratings	Units
Drain-Source Voltage	V_{DS}	500	V
Drain Current	I_D	50	A
Pulsed Drain Current	$I_{D\ (puls)}$	150	A
Reverse Drain Current	I_{DR}	50	A
Gate-Source Voltage	V_{GS}	±20	V
Power Dissipation	P_D	400	W
Maximum Junction Temperature	T_J	150	°C
Storage Temperature	T_{stg}	-40 to +125	°C
Isolation Voltage	V_{iso}	2500	V

EQUIVALENT CIRCUIT SCHEMATIC



ELECTRICAL CHARACTERISTICS at T_C = 25°C

Parameter	Symbols	Test Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	$V_{(BR)\ DSS}$	V_{GS} = 0V, I_D = 1mA	500			V
Gate-Source Threshold Voltage	$V_{GS\ (th)}$	V_{DS} = V_{GS}, I_D = 10mA	2.1	3.0	4.0	V
Off-State Drain Current	I_{DSS}	V_{GS} = 0V, V_{DS} = 500V, T_J = 25°C			1.0	mA
Gate Leakage Current	I_{GSS}	V_{DS} = 0V, V_{GS} = ± 20V			100	nA
Drain-Source On-State Resistance	$r_{DS\ (on)}$	V_{GS} = 15V, I_D = 25A			110	mΩ
Forward Transfer Conductance	g_{fs}	V_{DS} = 25V, I_D = 25A		45		S
Input Capacitance	Ciss	V_{GS} = 0V		7.8	13	nF
Output Capacitance	Coss	V_{DS} = 25V		0.9	1.5	
Reverse Transfer Capacitance	Crss	f = 1 MHz		0.4	0.6	
Switching Turn-On Delay Time	$t_{d\ (on)}$	V_{CC} = 100V, R_G = 5Ω		250	350	ns
Switching Rise Time	t_r			280	400	
Switching Turn-Off Delay Time	$t_{d\ (off)}$	I_D = 25A, tp = 20µs		700	1000	
Switching Fall Time	t_f	V_{GS} = 15V		80	110	
Source-Drain Voltage	V_{SD}	I_F = 50A, V_{GS} = 0V		1.4	1.8	V
Reverse Recovery Time	t_{rr}	I_F = 50A, - di/dt = 100A/µs, V_{GS} = 0V			150	ns
Reverse Recovery Charge	Qrr	I_F = 50A, - di/dt = 100A/µs, V_{GS} = 0V			1.0	µCb

THERMAL CHARACTERISTICS

Parameter	Symbols	Test Conditions	Min	Typ	Max	Units
Thermal Resistance, Junction to case	$R_{\theta JC}$	Channel-to-Case			0.312	°C/W
Thermal Resistance, Junction to Case (Schottky Diode)	$R_{\theta JC}$	Junction-to-Case			1.56	°C/W
Thermal Resistance, Case to Fin	$R_{\theta CF}$	Case-to-Fin		0.06		°C/W

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TYPICAL CHARACTERISTICS OF A 2MI50F-050 MODULE

TYPICAL OUTPUT CHARACTERISTICS

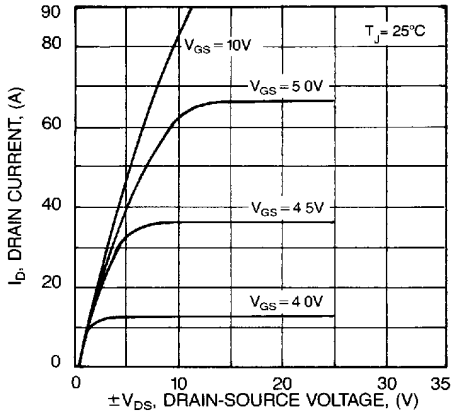

FIG. 1

$r_{DS\ (on)}$, T_J CHARACTERISTICS

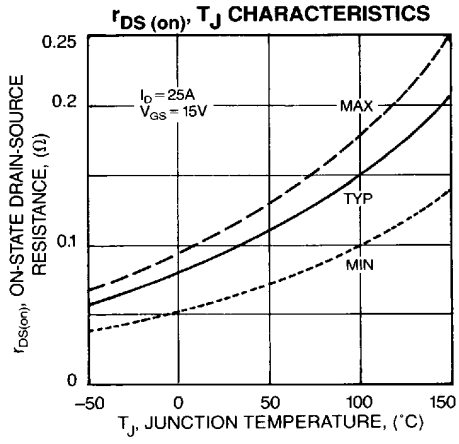

FIG. 2

TURN-ON CHARACTERISTICS

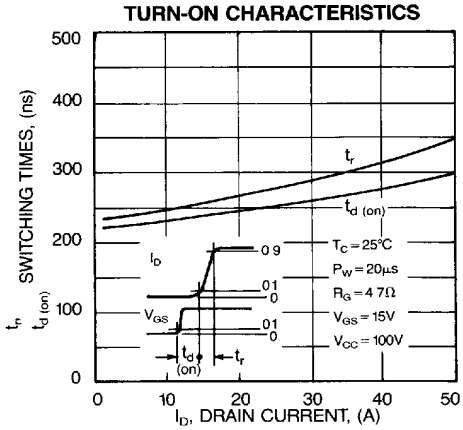

FIG. 3

TURN-OFF CHARACTERISTICS

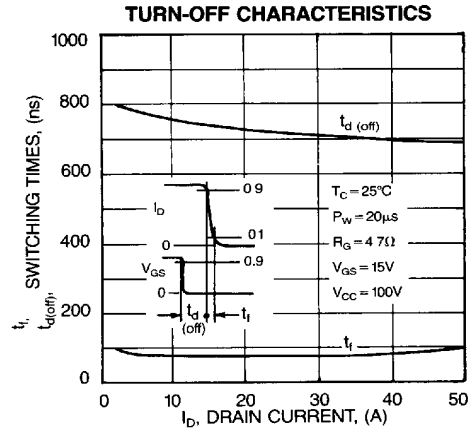

FIG. 4

TYPICAL INPUT CHARGE

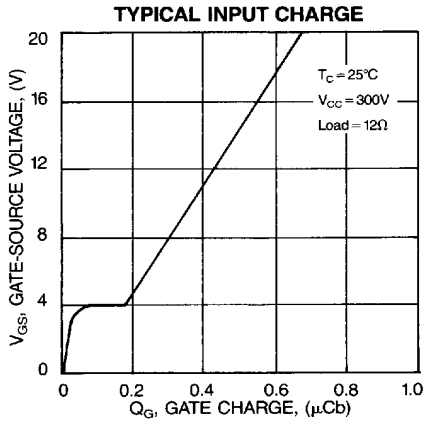

FIG. 5

TYPICAL TRANSFER CHARACTERISTICS

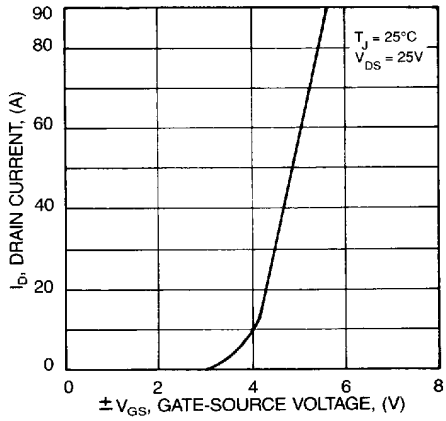

FIG. 6

MOSFET Modules

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TYPICAL CHARACTERISTICS OF A 2MI50F-050 MODULE

REVERSE RECOVERY CHARACTERISTICS OF APD

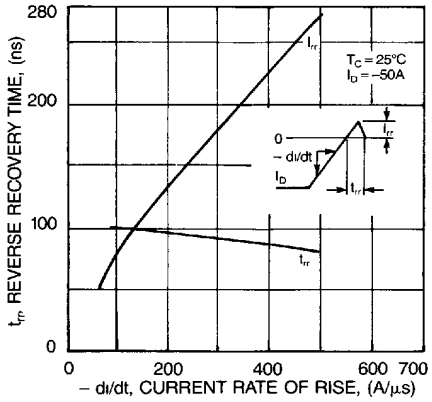


FIG. 7

FORWARD VOLTAGE OF APD

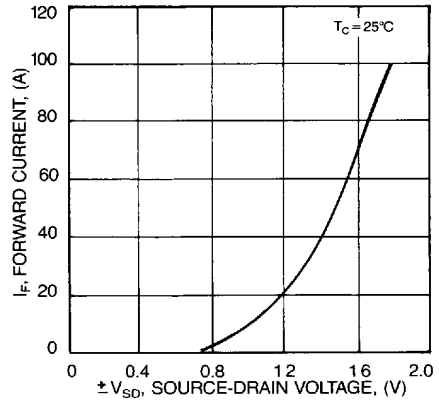


FIG. 8

SAFE OPERATING AREA

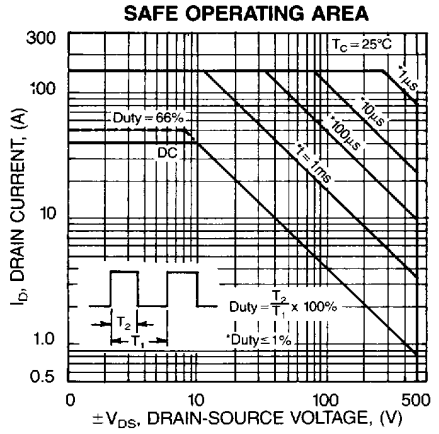
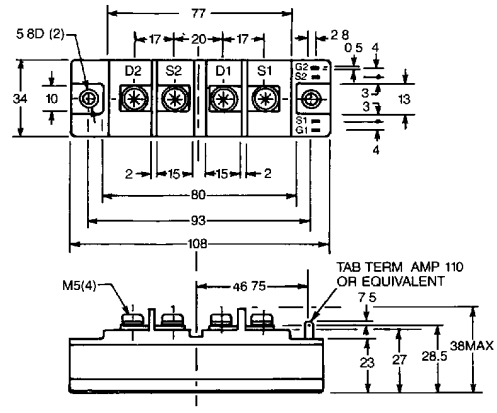
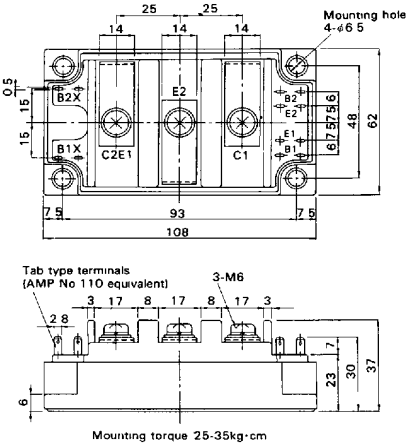


FIG. 9

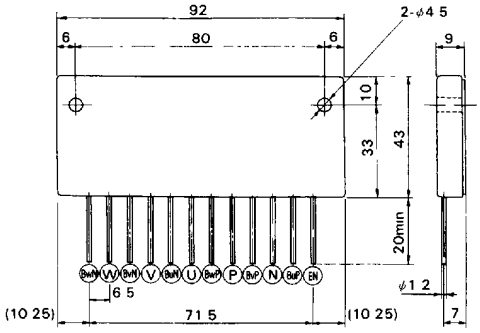
OUTLINE DRAWINGS (DIMENSIONS IN MILLIMETERS)



MODULE



M2IO



SIL