

FMH20N50E

FUJI POWER MOSFET

Super FAP-E³ series

N-CHANNEL SILICON POWER MOSFET

■ Features

Maintains both low power loss and low noise Lower $R_{DS}(on)$ characteristic More controllable switching dv/dt by gate resistance Smaller V_{GS} ringing waveform during switching Narrow band of the gate threshold voltage (3.0±0.5V) High avalanche durability

Applications

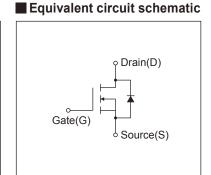
Switching regulators UPS (Uninterruptible Power Supply) DC-DC converters

■ Maximum Ratings and Characteristics

● Absolute Maximum Ratings at Tc=25°C (unless otherwise specified)

TO-3P(Q) 15.5mg 45.2 m. 1 15.5mg 1 10.06.2 m. 1 10.06.2	4.5 in.2 97.2 in		
(† + † () (2) (§	CONNECTION ① BASE ② COLLECTOR ③ EMITTER EIAJ: SC-65		

■ Outline Drawings [mm]



Description	Symbol	Characteristics	Unit	Remarks
Dunin Course Voltage	V _{DS}	500	V	
Drain-Source Voltage	V _{DSX}	500	V	V _{GS} = -30V
Continuous Drain Current	Io	±20	А	
Pulsed Drain Current	IDP	±80	А	
Gate-Source Voltage	V _{GS}	±30	V	
Repetitive and Non-Repetitive Maximum Avalanche Current	Iar	20	А	Note*1
Non-Repetitive Maximum Avalanche Energy	Eas	582.5	mJ	Note*2
Repetitive Maximum Avalanche Energy	Ear	23.5	mJ	Note*3
Peak Diode Recovery dV/dt	dV/dt	7.4	kV/μs	Note*4
Peak Diode Recovery -di/dt	-di/dt	100	A/µs	Note*5
Maximum Dawar Dissination	PD	2.5	10/	Ta=25°C
Maximum Power Dissipation		235	W	Tc=25°C
Operating and Storage	Tch	150	°C	
Temperature range	Tsto	-55 to +150	°C	

● Electrical Characteristics at Tc=25°C (unless otherwise specified)

Description	Symbol	Conditions		min.	typ.	max.	Unit	
Drain-Source Breakdown Voltage	BVDSS	I _D =250μA, V _{GS} =0V		500	-	-	V	
Gate Threshold Voltage	V _{GS} (th)	In=250µA, Vns=Vgs	I _D =250μA, V _{DS} =V _{GS}		3.0	3.5	V	
Zero Gate Voltage Drain Current		V _{DS} =500V, V _{GS} =0V	T _{ch} =25°C	-	-	25		
	Ipss	V _{DS} =400V, V _{GS} =0V	T _{ch} =125°C	-	-	250	μA	
Gate-Source Leakage Current	Igss	V _{GS} =±30V, V _{DS} =0V		-	10	100	nA	
Drain-Source On-State Resistance	R _{DS} (on)	I _D =10A, V _{GS} =10V		-	0.27	0.31	Ω	
Forward Transconductance	g fs	I _D =10A, V _{DS} =25V		11	22	-	S	
Input Capacitance	Ciss	V _{DS} =25V		-	2650	3980		
Output Capacitance	Coss	V _{GS} =0V		-	250	375	pF	
Reverse Transfer Capacitance	Crss	f=1MHz		-	19	28.5	1	
Turn-On Time	td(on)	V _{cc} =300V V _{ds} =10V I _D =10A R _G =10Ω		-	22	33	ns	
	tr			-	11	16.5		
Turn-Off Time	td(off)			-	120	180		
	tf			-	21	31.5		
Total Gate Charge	QG	Vcc=250V		-	77	115.5		
Gate-Source Charge	Qgs	I _D =20A		-	17	25.5	nC	
Gate-Drain Charge	Q _{GD}	V _{GS} =10V		-	22	33	l	
Avalanche Capability	lav	L=1.07mH, Tch=25°C		20	-	-	Α	
Diode Forward On-Voltage	V _{SD}	I _F =20A, V _{GS} =0V, T _{ch} =25°C		-	0.90	1.35	V	
Reverse Recovery Time	trr	I _F =20A, V _{GS} =0V		-	0.5	-	μs	
Reverse Recovery Charge	Qrr	-di/dt=100A/µs, Tch=25	°C	-	7	-	μC	

Thermal Characteristics

Description	Symbol	Test Conditions	min.	typ.	max.	Unit
Thermal resistance	Rth (ch-c)	Channel to Case			0.532	°C/W
	Rth (ch-a)	Channel to Ambient			50.0	°C/W

Note *1 : Tch≤150°C

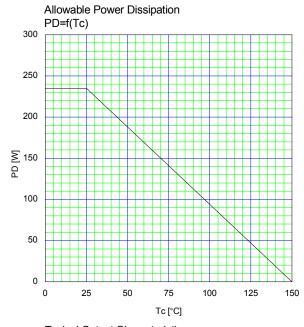
Note '2 : Stating Tch=25°C, Ias=8A, L=16.7mH, Vcc=50V, Rs=50Ω
Eas limited by maximum channel temperature and avalanche current.
See to 'Avalanche Energy' graph.

Note *3 : Repetitive rating : Pulse width limited by maximum channel temperature.

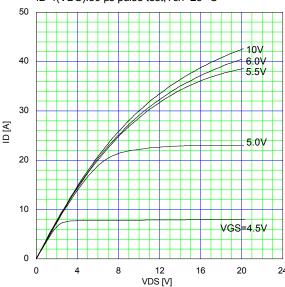
See to the 'Transient Themal impeadance' graph.

Note *4 : Ir≤-lp, -di/dt=100A/µs, Vcc≤BVbss, Tch≤150°C.

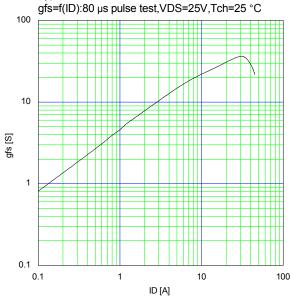
Note *5 : Ir≤-lp, dv/dt=7.4kV/µs, Vcc≤BVbss, Tch≤150°C.



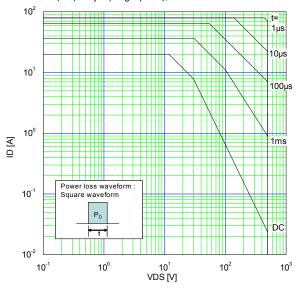
Typical Output Characteristics ID=f(VDS):80 µs pulse test,Tch=25 °C



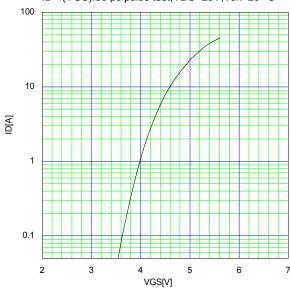
Typical Transconductance qfs=f(ID):80 µs pulse test,VDS=25V,Tch=25 °C



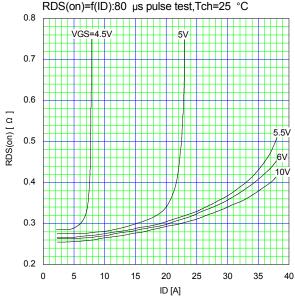
Safe Operating Area I_D=f(V_{DS}):Duty=0(Single pulse),Tc=25 °c



Typical Transfer Characteristic ID=f(VGS):80 µs pulse test,VDS=25V,Tch=25 °C



Typical Drain-Source on-state Resistance RDS(on)=f(ID):80 µs pulse test,Tch=25 °C



0 [

0.00

0.25

0.50

0.75

1.00

VSD [V]

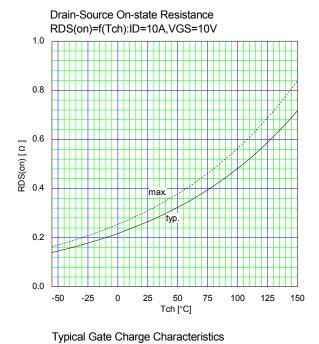
1.25

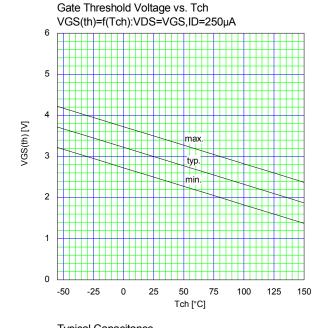
1.50

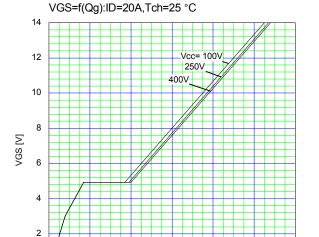
1.75

2.00

20

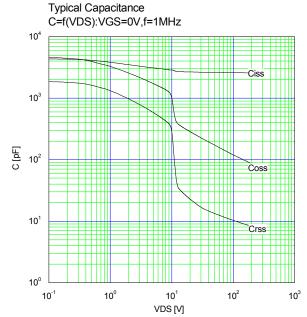


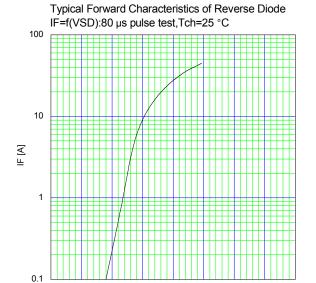


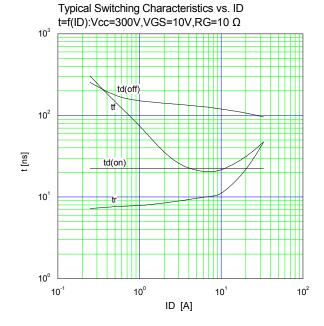


60

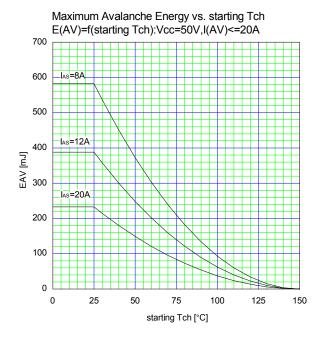
Qg [nC]

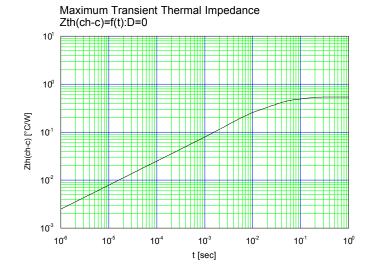






120





WARNING

- 1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of October 2008.

 The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sure to obtain the latest specifications.
- 2. All applications described in this Catalog exemplify the use of Fuji's products for your reference only. No right or license, either express or implied, under any patent, copyright, trade secret or other intellectual property right owned by Fuji Electric Device Technology Co., Ltd. is (or shall be deemed) granted. Fuji Electric Device Technology Co., Ltd. makes no representation or warranty, whether express or implied, relating to the infringement or alleged infringement of other's intellectual property rights which may arise from the use of the applications described herein.
- 3. Although Fuji Electric Device Technology Co., Ltd. is enhancing product quality and reliability, a small percentage of semiconductor products may become faulty. When using Fuji Electric semiconductor products in your equipment, you are requested to take adequate safety measures to prevent the equipment from causing a physical injury, fire, or other problem if any of the products become faulty. It is recommended to make your design fail-safe, flame retardant, and free of malfunction.
- 4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
 - Computers
- OA equipment
- Communications equipment (terminal devices)
- Measurement equipment

- Machine tools
- Audiovisual equipment
- Electrical home appliances
- Personal equipment
- Industrial robots etc.
- 5. If you need to use a product in this Catalog for equipment requiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric Device Technology Co., Ltd. to obtain prior approval. When using these products for such equipment, take adequate measures such as a backup system to prevent the equipment from malfunctioning even if a Fuji's product incorporated in the equipment becomes faulty.
 - Transportation equipment (mounted on cars and ships)
 - Traffic-signal control equipment
- Trunk communications equipment
- Gas leakage detectors with an auto-shut-off feature
- Emergency equipment for responding to disasters and anti-burglary devices
- Safety devices

- Medical equipment
- 6. Do not use products in this Catalog for the equipment requiring strict reliability such as the following and equivalents to strategic equipment (without limitation).
 - Space equipment
- Aeronautic equipment
- Nuclear control equipment

- Submarine repeater equipment
- 7. Copyright ©1996-2008 by Fuji Electric Device Technology Co., Ltd. All rights reserved.

 No part of this Catalog may be reproduced in any form or by any means without the express permission of Fuji Electric Device Technology Co., Ltd.
- 8. If you have any question about any portion in this Catalog, ask Fuji Electric Device Technology Co., Ltd. or its sales agents before using the product.
 - Neither Fuji Electric Device Technology Co., Ltd. nor its agents shall be liable for any injury caused by any use of the products not in accordance with instructions set forth herein.