2SK3593-01

FUJI ELECTRIC

200304

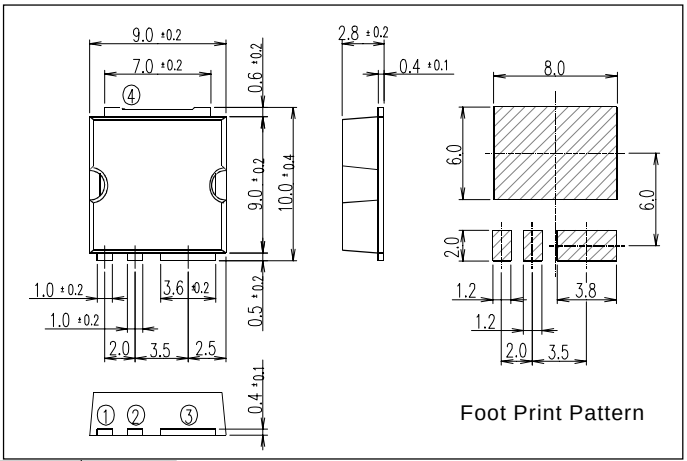
FUJI POWER MOSFET
Super FAP-G Series

N-CHANNEL SILICON POWER MOSFET

■ Features
- High speed switching
- Low on-resistance
- No secondary breadown
- Low driving power
- Avalanche-proof

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

■ Outline Drawings (mm)



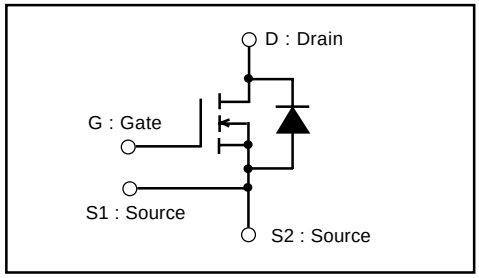
■ Maximum ratings and characteristic

Absolute maximum ratings
(Tc=25°C unless otherwise specified)

Item	Symbol		Ratings	Unit
Drain-source voltage	V_{DS}		150	V
	V_{DSX} *5		120	V
Continuous drain current	I_D		±57	A
			±5.4 **	A
Pulsed drain current	$I_{D(puls)}$		±228	A
Gate-source voltage	V_{GS}		±30	V
Non-repetitive Avalanche current	I_{AS} *2		57	A
Maximum Avalanche Energy	E_{AS} *1		272.5	mJ
Maximum Drain-Source dV/dt	dV_{DS}/dt *4		20	kV/µs
Peak Diode Recovery dV/dt	dV/dt *3		5	kV/µs
Max. power dissipation	P_D	Ta=25°C	2.4 **	W
		Tc=25°C	270	
Operating and storage temperature range	T_{ch}		+150	°C
	T_{stg}		-55 to +150	°C

** Surface mounted on 1000mm², t=1.6mm FR-4 PCB(Drain pad area : 500mm²) Ta=25°C
*1 L=123µH, Vcc=48V, See to Avalanche Energy Graph *2 Tch ≦150°C
*3 I_F≦ -I_D, -di/dt=50A/µs, Vcc≦ BV_{DSS}, Tch≦150°C *4 V_{DS} ≦ 150V *5 V_{GS}=-30V

■ Equivalent circuit schematic



● Electrical characteristics (T_c =25°C unless otherwise specified)

Item	Symbol	Test Conditions		Min.	Typ.	Max.	Units
Drain-source breakdown voltaget	$V_{(BR)DSS}$	I_D= 250µA V_{GS}=0V		150			V
Gate threshold voltage	$V_{GS(th)}$	I_D= 250µA V_{DS}=V_{GS}		3.0		5.0	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=150V V_{GS}=0V	Tch=25°C			25	µA
		V_{DS}=120V V_{GS}=0V	Tch=125°C			250	
Gate-source leakage current	I_{GSS}	V_{GS}=±30V V_{DS}=0V			10	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	I_D=20A V_{GS}=10V			31	41	mΩ
Forward transcondutance	g_{fs}	I_D=20A V_{DS}=25V		13	26		S
Input capacitance	C_{iss}	V_{DS}=75V			1940	2910	pF
Output capacitance	C_{oss}	V_{GS}=0V			310	465	
Reverse transfer capacitance	C_{rss}	f=1MHz			24	36	
Turn-on time t_{on}	$t_{d(on)}$	V_{CC}=48V I_D=20A			20	30	ns
	t_r	V_{GS}=10V			26	39	
Turn-off time t_{off}	$t_{d(off)}$	R_{GS}=10 Ω			50	75	
	t_f				20	30	
Total Gate Charge	Q_G	V_{CC}=75V			52	78	nC
Gate-Source Charge	Q_{GS}	I_D=40A			15	22.5	
Gate-Drain Charge	Q_{GD}	V_{GS}=10V			18	27	
Avalanche capability	I_{AV}	L=123µH Tch=25°C		57			A
Diode forward on-voltage	V_{SD}	I_F=40A V_{GS}=0V Tch=25°C			1.10	1.65	V
Reverse recovery time	t_{rr}	I_F=40A V_{GS}=0V			0.14		µs
Reverse recovery charge	Q_{rr}	-di/dt=100A/µs Tch=25°C			0.77		µC

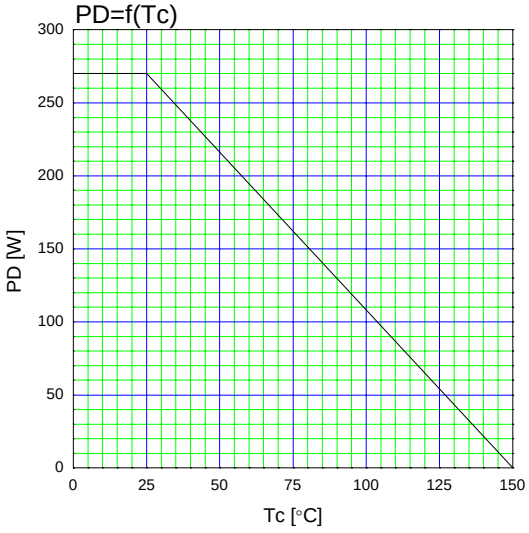
● Thermalcharacteristics

Item	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal resistance	$R_{th(ch-c)}$	channel to case			0.463	°C/W
	$R_{th(ch-a)}$	channel to ambient			87.0	°C/W
	$R_{th(ch-a)}$ **	channel to ambient			52.0	°C/W

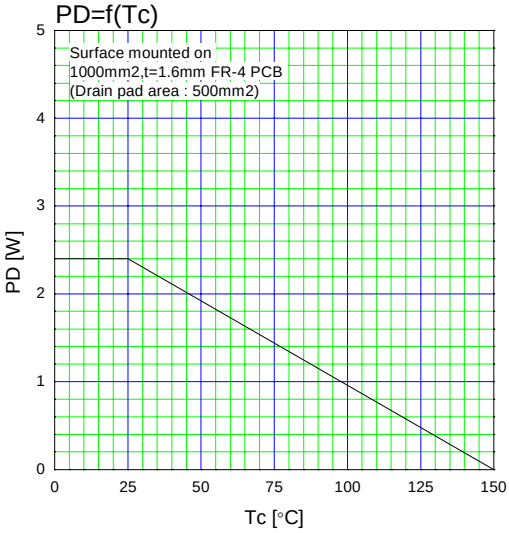
** Surface mounted on 1000mm², t=1.6mm FR-4 PCB(Drain pad area : 500mm²)

Characteristics

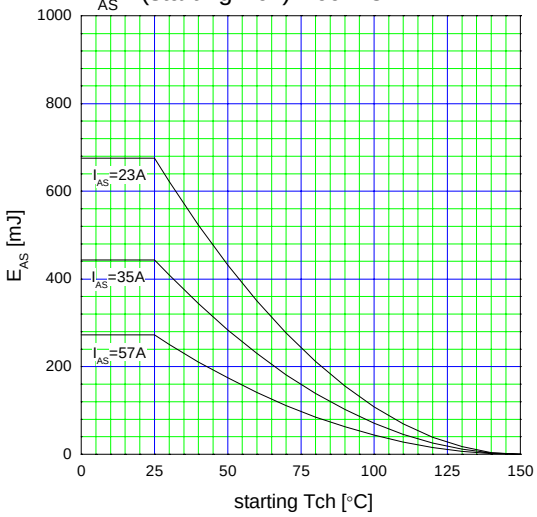
Allowable Power Dissipation
PD=f(Tc)



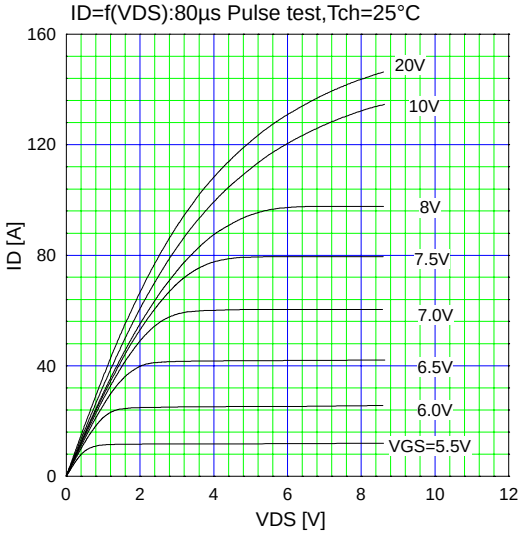
Allowable Power Dissipation
PD=f(Tc)



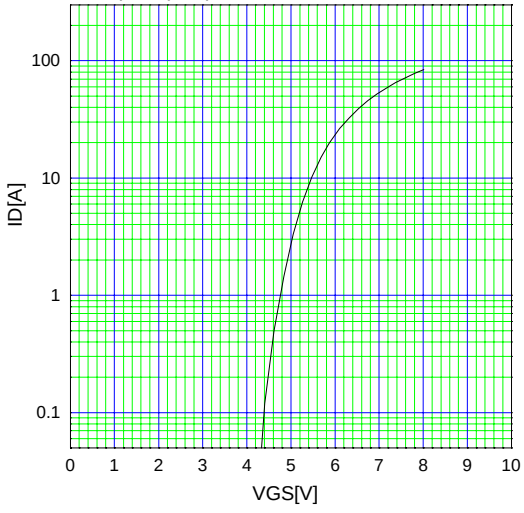
Maximum Avalanche Energy vs. starting Tch
E_{AS}=f(starting Tch):Vcc=48V



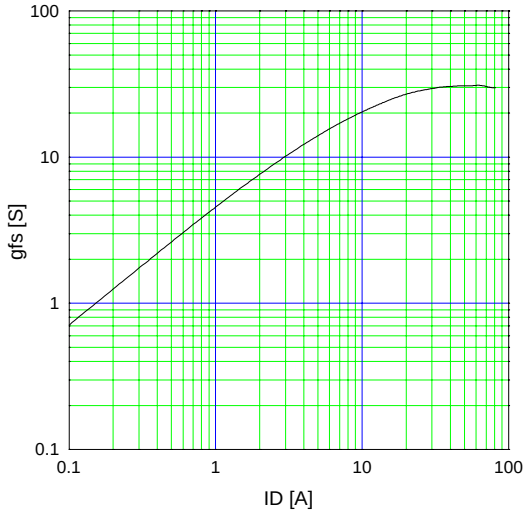
Typical Output Characteristics
ID=f(VDS):80µs Pulse test,Tch=25°C



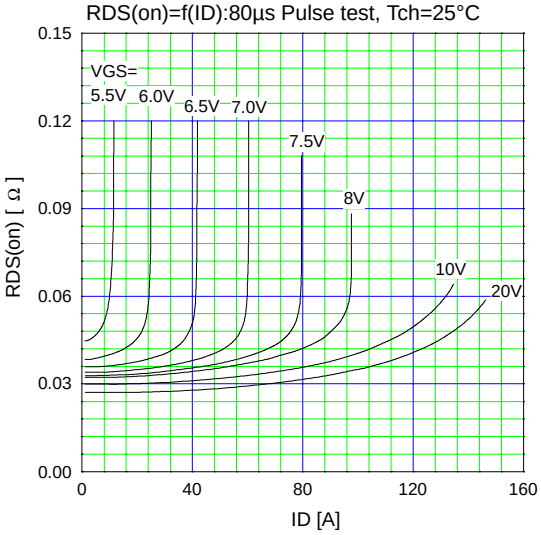
Typical Transfer Characteristic
ID=f(VGS):80µs Pulse test, VDS=25V,Tch=25°C



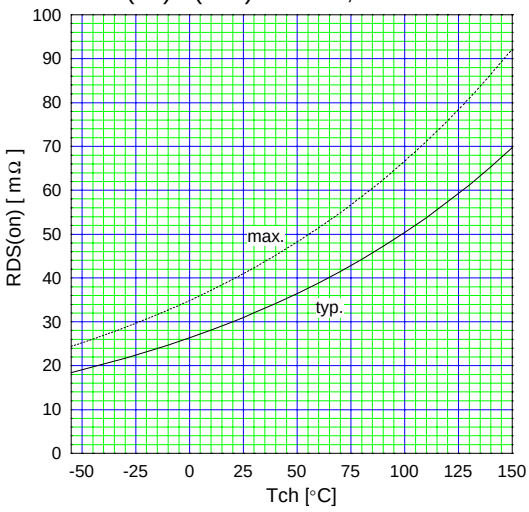
Typical Transconductance
gfs=f(ID):80µs Pulse test, VDS=25V,Tch=25°C



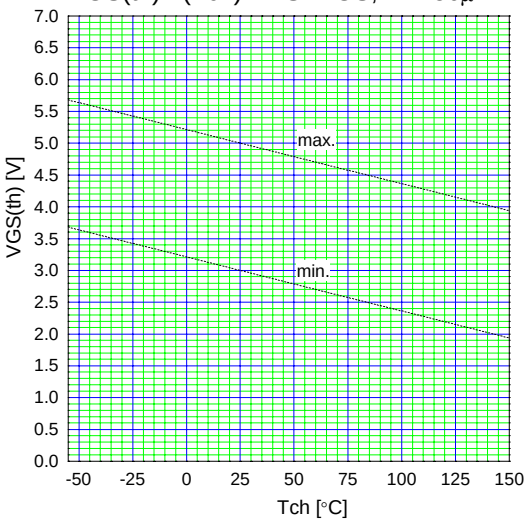
Typical Drain-Source on-state Resistance
RDS(on)=f(ID):80μs Pulse test, Tch=25°C



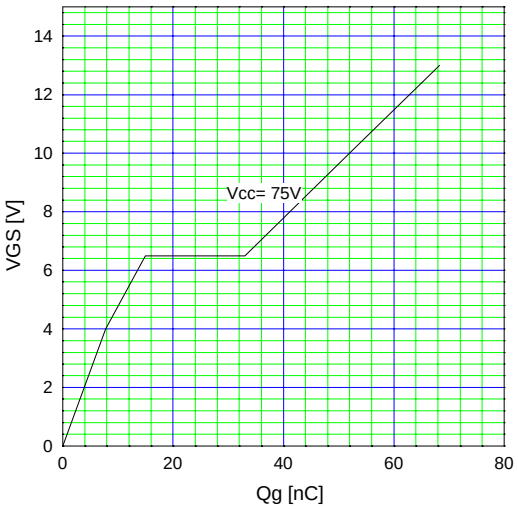
Drain-Source On-state Resistance
RDS(on)=f(Tch):ID=20A,VGS=10V



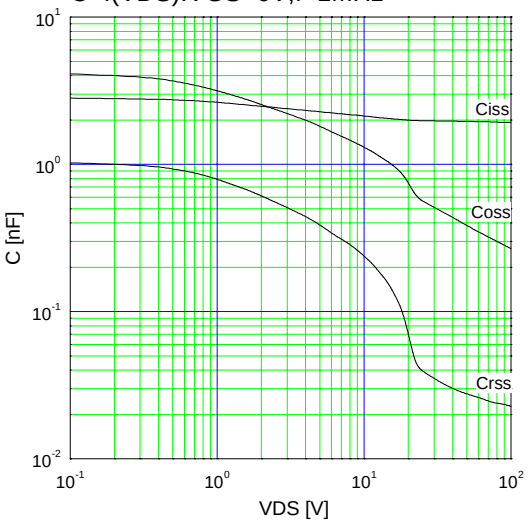
Gate Threshold Voltage vs. Tch
VGS(th)=f(Tch):VDS=VGS,ID=250μA



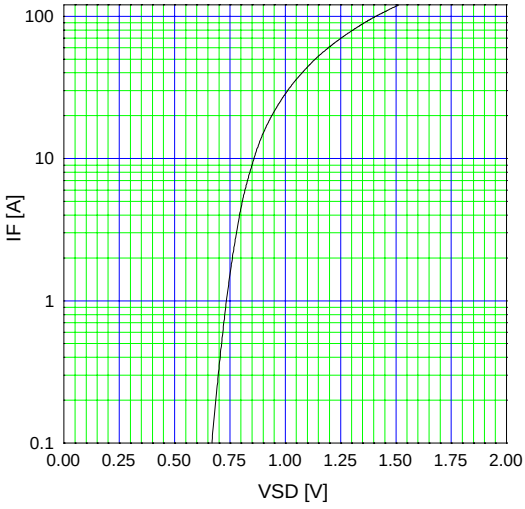
Typical Gate Charge Characteristics
VGS=f(Qg):ID=40A, Tch=25°C



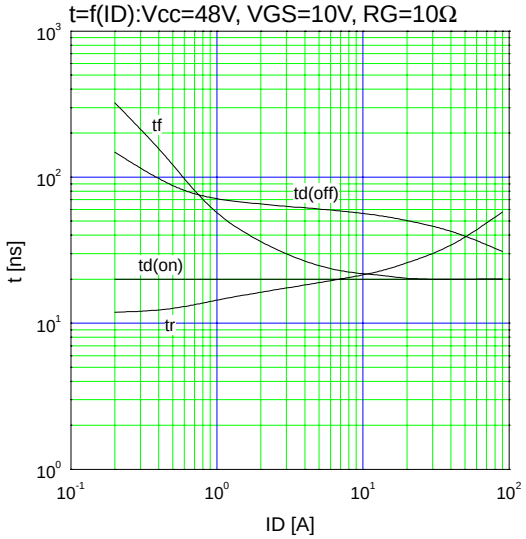
Typical Capacitance
C=f(VDS):VGS=0V,f=1MHz



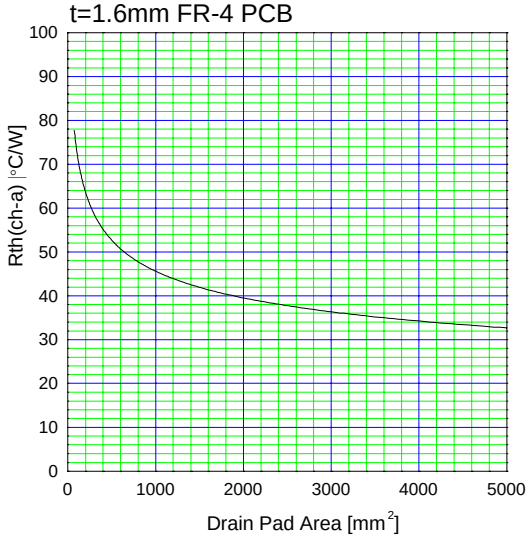
Typical Forward Characteristics of Reverse Diode
IF=f(VSD):80μs Pulse test,Tch=25°C



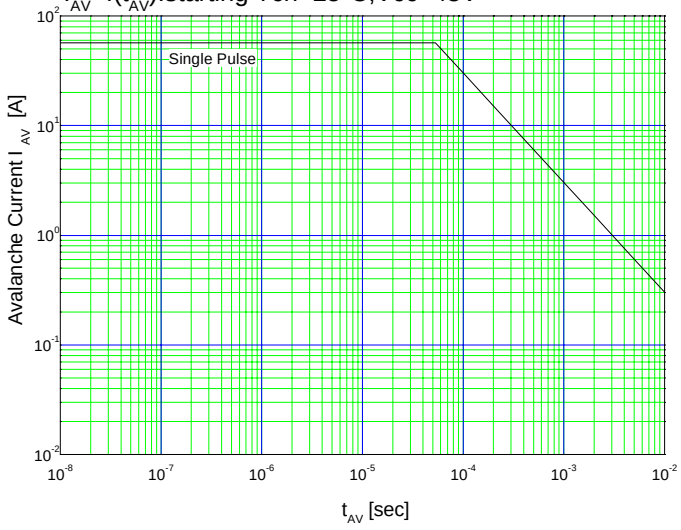
Typical Switching Characteristics vs. ID
t=f(ID):Vcc=48V, VGS=10V, RG=10Ω



Thermal Resistance vs. Drain Pad area
t=1.6mm FR-4 PCB



Maximum Avalanche Current Pulsewidth
I_{AV}=f(t_{AV}):starting Tch=25°C,Vcc=48V



Maximum Transient Thermal Impedance
Zth(ch-c)=f(t):D=0