e-Front runners

FMV11N60E

FUJI POWER MOSFET

Super FAP-E^3 series

N-CHANNEL SILICON POWER MOSFET

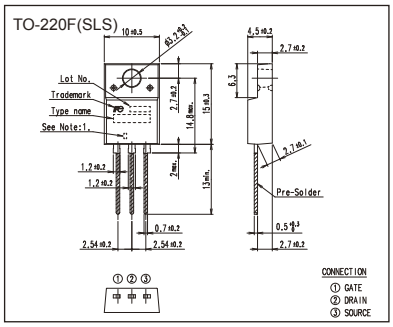
Features

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

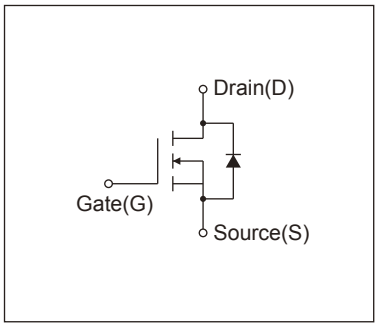
Applications

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

Outline Drawings [mm]



Equivalent circuit schematic



Maximum Ratings and Characteristics

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

Description	Symbol	Characteristics	Unit	Remarks
Drain-Source Voltage	V_{DS}	600	V	
	V_{DSX}	600	V	V_{GS} = -30V
Continuous Drain Current	I_D	±11	A	
Pulsed Drain Current	I_{DP}	±44	A	
Gate-Source Voltage	V_{GS}	±30	V	
Repetitive and Non-Repetitive Maximum AvalancheCurrent	I_{AR}	11	A	Note*1
Non-Repetitive Maximum Avalanche Energy	E_{AS}	384	mJ	Note*2
Repetitive Maximum Avalanche Energy	E_{AR}	6.5	mJ	Note*3
Peak Diode Recovery dV/dt	dV/dt	4.9	kV/μs	Note*4
Peak Diode Recovery -di/dt	-di/dt	100	A/μs	Note*5
Maximum Power Dissipation	P_D	2.16	W	Ta=25°C
		65		Tc=25°C
Operating and Storage Temperature range	T_{ch}	150	°C	
	T_{stg}	-55 to + 150	°C	

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

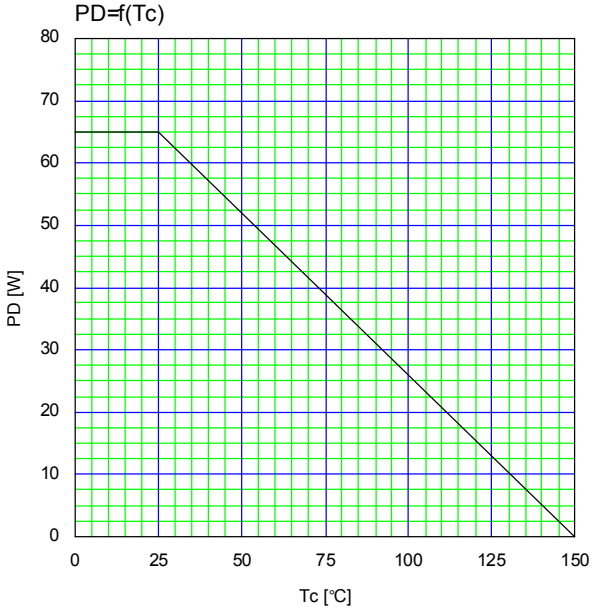
Description	Symbol	Conditions		min.	typ.	max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=250μA, V_{GS}=0V		600	-	-	V
Gate Threshold Voltage	V_{GS} (th)	I_D=250μA, V_{DS}=V_{GS}		2.5	3.0	3.5	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=600V, V_{GS}=0V	T_{ch}=25°C	-	-	25	μA
		V_{DS}=480V, V_{GS}=0V	T_{ch}=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=5.5A, V_{GS}=10V		-	0.641	0.75	Ω
Forward Transconductance	g_{fs}	I_D=5.5A, V_{DS}=25V		6	12	-	S
Input Capacitance	Ciss	V_{DS}=25V		-	1700	2550	pF
Output Capacitance	Coss	V_{GS}=0V		-	150	225	
Reverse Transfer Capacitance	Crss	f=1MHz		-	11	16.5	
Turn-On Time	td(on)	V_{cc}=300V		-	21	31.5	ns
	tr	V_{GS}=10V		-	9.5	14.5	
Turn-Off Time	td(off)	I_D=5.5A		-	100	150	
	tf	R_G=15Ω		-	19	28.5	
Total Gate Charge	Q_G	V_{cc}=300V		-	48.5	73	nC
Gate-Source Charge	Q_{GS}	I_D=11A		-	12.5	19	
Gate-Drain Charge	Q_{GD}	V_{GS}=10V		-	14	21	
Avalanche Capability	I_{AV}	L=2.64mH, T_{ch}=25°C		11	-	-	A
Diode Forward On-Voltage	V_{SD}	I_F=11A, V_{GS}=0V, T_{ch}=25°C		-	0.86	1.30	V
Reverse Recovery Time	trr	I_F=11A, V_{GS}=0V		-	0.52	-	μS
Reverse Recovery Charge	Qrr	-di/dt=100A/μs, Tch=25°C		-	5.5	-	μC

● Thermal Characteristics

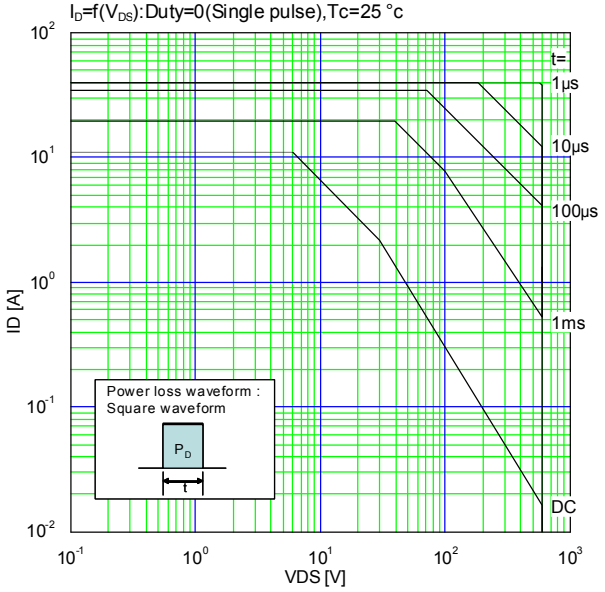
Description	Symbol	Test Conditions	min.	typ.	max.	Unit
Thermal resistance	Rth (ch-c)	Channel to Case			1.920	°C/W
	Rth (ch-a)	Channel to Ambient			58.0	°C/W

Note *1 : Tch≤150°C
Note *2 : Stating Tch=25°C, I_{AS}=5A, L=28.2mH, Vcc=60V, R_G=50Ω
E_{AS} 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 : I_F≤-I_D, -di/dt=100A/μs, Vcc≤BV_{DSS}, Tch≤150°C.
Note *5 : I_F≤-I_D, dv/dt=4.4kV/μs, Vcc≤BV_{DSS}, Tch≤150°C.

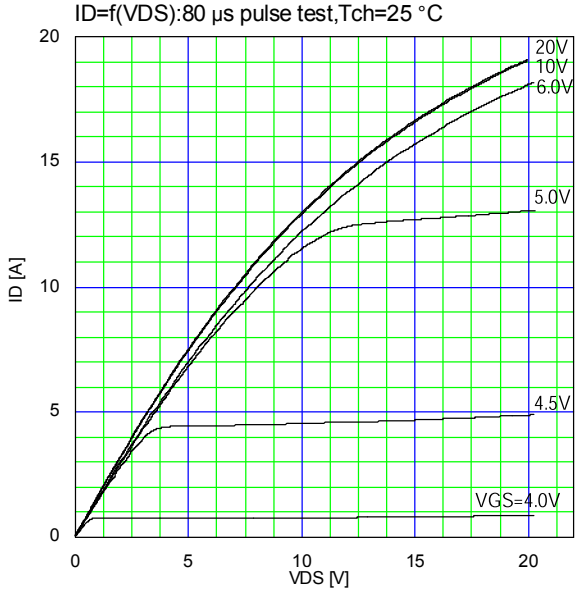
Allowable Power Dissipation
PD=f(Tc)



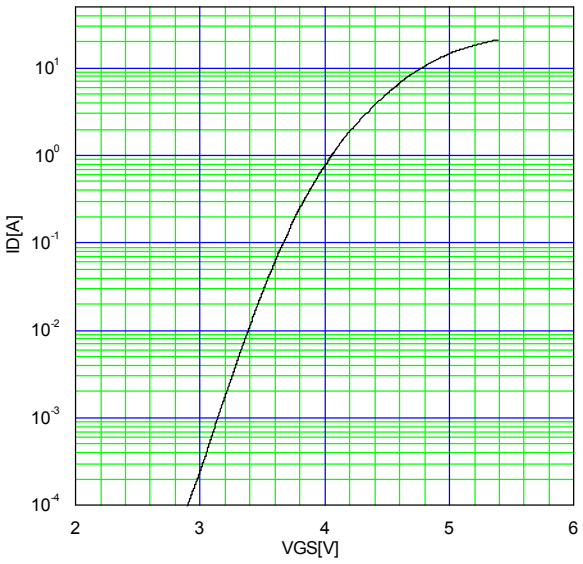
Safe Operating Area
$I_D=f(V_{DS})$:Duty=0(Single pulse),Tc=25 °c



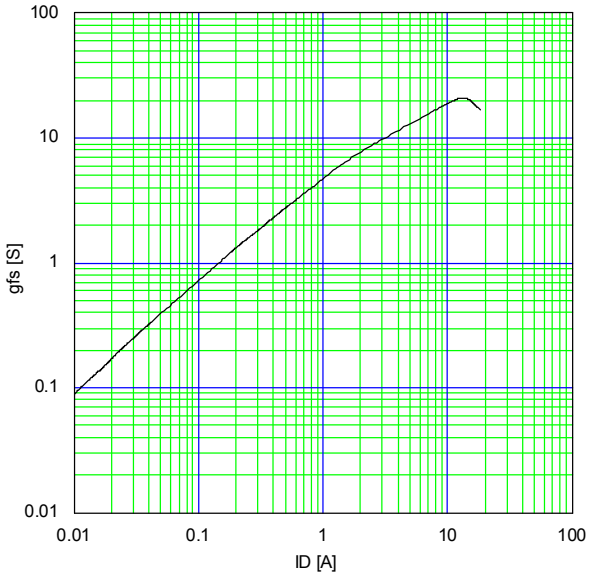
Typical Output Characteristics
ID=f(VDS):80 µs pulse test,Tch=25 °C



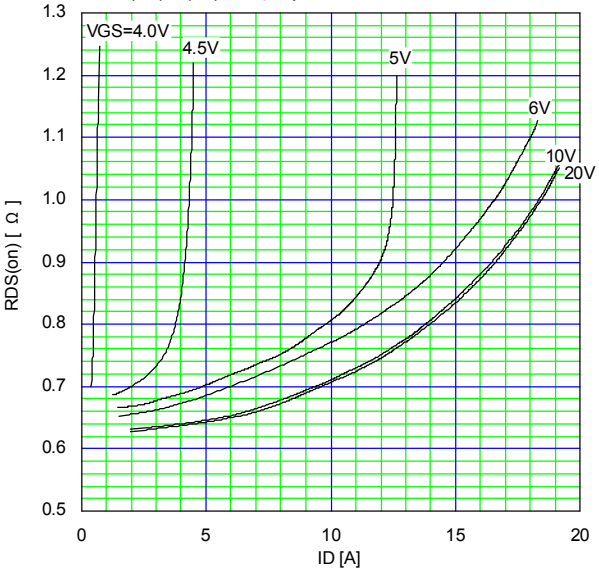
Typical Transfer Characteristic
ID=f(VGS):80 µs pulse test,VDS=25V,Tch=25 °C



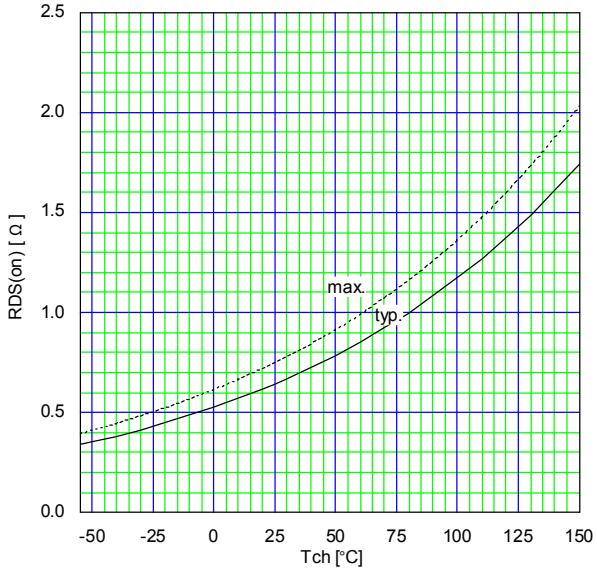
Typical Transconductance
gfs=f(ID):80 µs pulse test,VDS=25V,Tch=25 °C



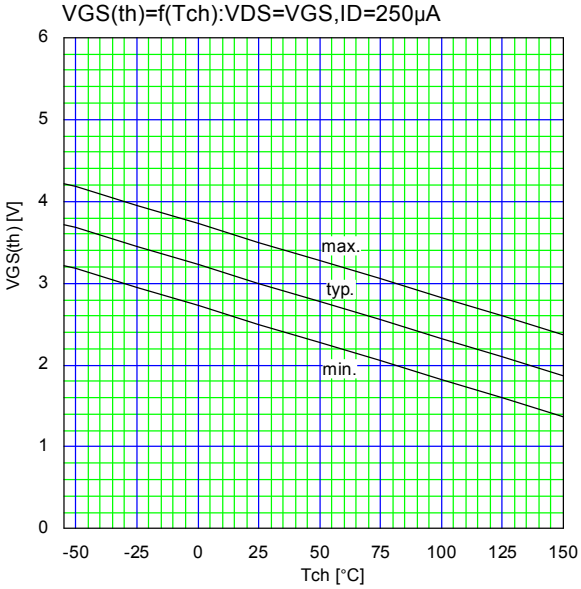
Typical Drain-Source on-state Resistance
RDS(on)=f(ID):80 µs pulse test,Tch=25 °C



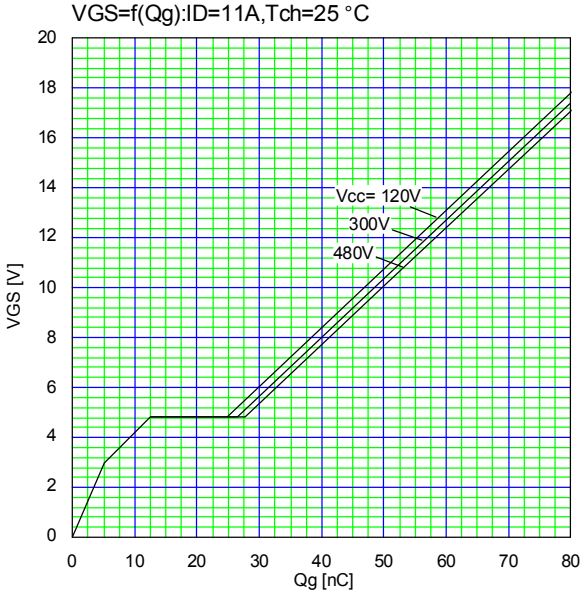
Drain-Source On-state Resistance
RDS(on)=f(Tch):ID=5.5A,VGS=10V



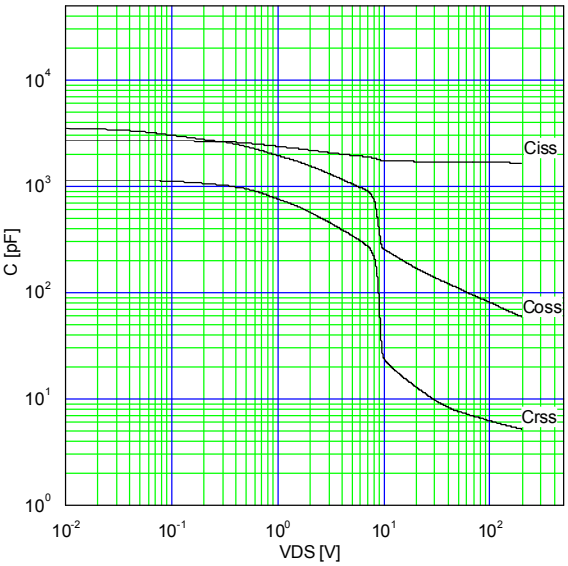
Gate Threshold Voltage vs. Tch
VGS(th)=f(Tch):VDS=VGS,ID=250μA



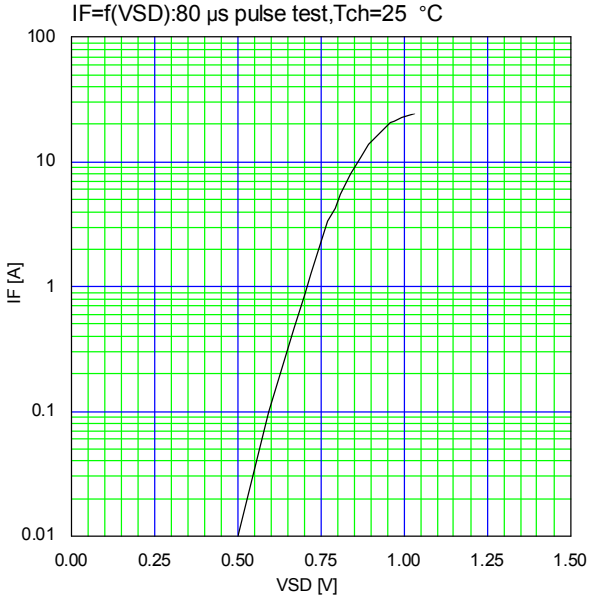
Typical Gate Charge Characteristics
VGS=f(Qg):ID=11A,Tch=25 °C



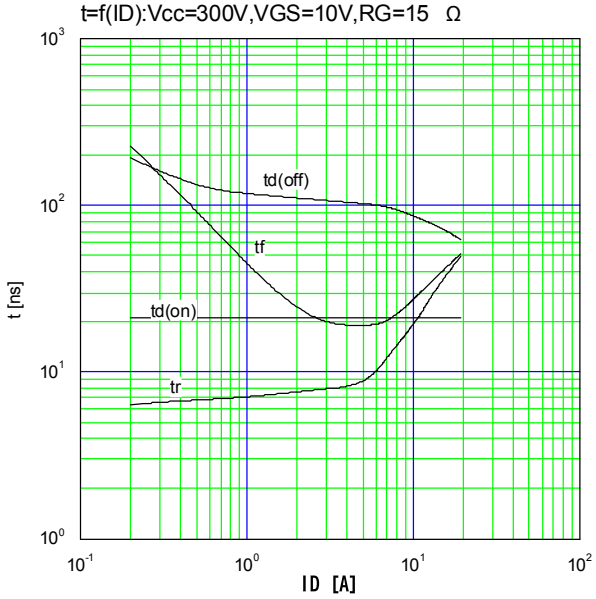
Typical Capacitance
C=f(VDS):VGS=0V,f=1MHz



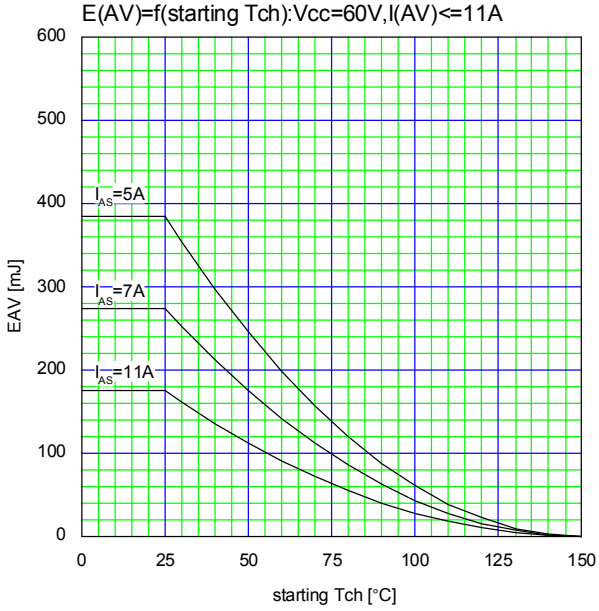
Typical Forward Characteristics of Reverse Diode
IF=f(VSD):80 μs pulse test,Tch=25 °C



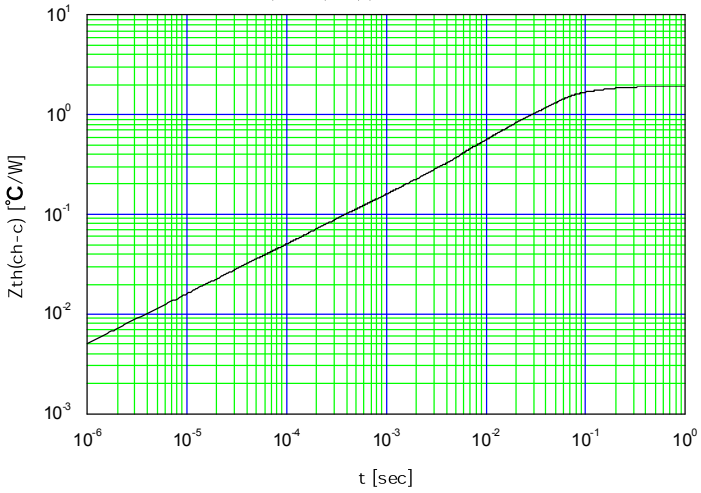
Typical Switching Characteristics vs. ID
t=f(ID):Vcc=300V,VGS=10V,RG=15 Ω



Maximum Avalanche Energy vs. starting Tch
E(AV)=f(starting Tch):Vcc=60V,I(AV)<=11A



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



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