e-Front runners

FMI20N50ES

FUJI POWER MOSFET

Super FAP-E[3S] series

N-CHANNEL SILICON POWER MOSFET

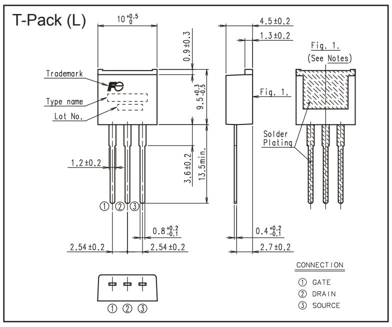
Features

- 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 (4.2±0.5V)
- High avalanche durability

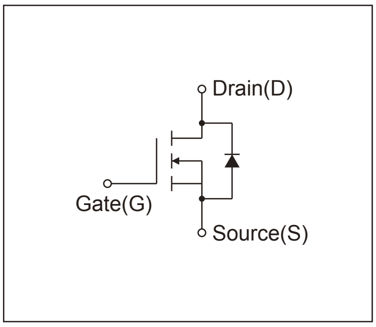
Applications

- 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}	500	V	
	V_{DSX}	500	V	V_{GS} = -30V
Continuous Drain Current	I_D	±20	A	
Pulsed Drain Current	I_{DP}	±80	A	
Gate-Source Voltage	V_{GS}	±30	V	
Repetitive and Non-Repetitive Maximum Avalanche Current	I_{AR}	20	A	Note*1
Non-Repetitive Maximum Avalanche Energy	E_{AS}	582.5	mJ	Note*2
Repetitive Maximum Avalanche Energy	E_{AR}	27	mJ	Note*3
Peak Diode Recovery dV/dt	dV/dt	4.6	kV/μs	Note*4
Peak Diode Recovery -di/dt	-di/dt	100	A/μs	Note*5
Maximum Power Dissipation	P_D	1.67	W	Ta=25°C
		270		Tc=25°C
Operating and Storage Temperature range	T_{ch}	150	°C	
	T_{stg}	-55 to + 150	°C	

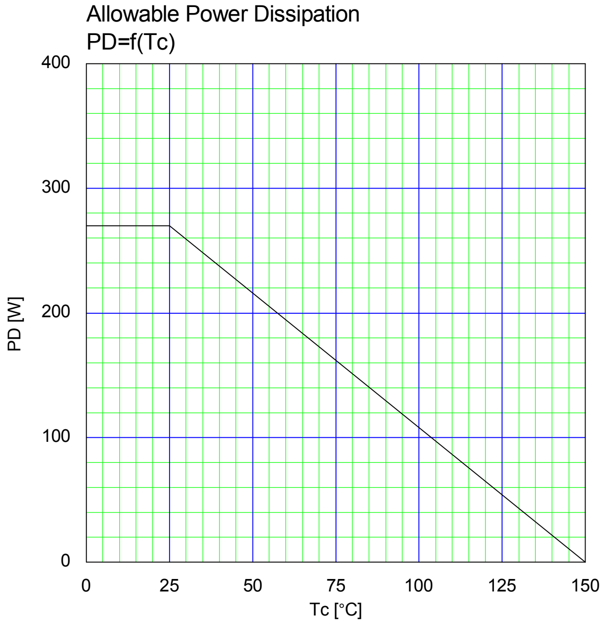
● Electrical Characteristics at Tc=25°C (unless otherwise specified)

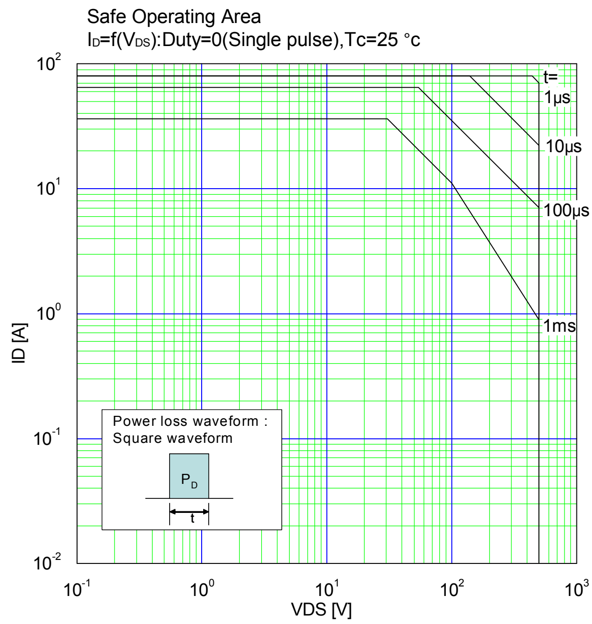
Description	Symbol	Conditions		min.	typ.	max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=250μA, V_{GS}=0V		500	-	-	V
Gate Threshold Voltage	V_{GS} (th)	I_D=250μA, V_{DS}=V_{GS}		3.7	4.2	4.7	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=500V, V_{GS}=0V	T_{ch}=25°C	-	-	25	μA
		V_{DS}=400V, V_{GS}=0V	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=10A, V_{GS}=10V		-	0.27	0.31	Ω
Forward Transconductance	g_{fs}	I_D=10A, V_{DS}=25V		5	10	-	S
Input Capacitance	Ciss	V_{DS}=25V V_{GS}=0V f=1MHz		-	2100	3150	pF
Output Capacitance	Coss			-	250	375	
Reverse Transfer Capacitance	Crss			-	15	22.5	
Turn-On Time	td(on)	V_{cc}=300V V_{GS}=10V I_D=10A R_{GS}=15Ω		-	40	60	ns
	tr			-	38	57	
Turn-Off Time	td(off)			-	85	127.5	
	tf			-	17	25.5	
Total Gate Charge	Q_G	V_{cc}=250V I_D=20A V_{GS}=10V		-	57	85.5	nC
Gate-Source Charge	Q_{GS}			-	21	31.5	
Gate-Drain Charge	Q_{GD}			-	21	31.5	
Gate-Drain Crossover Charge	Q_{SW}			-	10	15	
Avalanche Capability	I_{AV}	L=1.07mH, T_{ch}=25°C		20	-	-	A
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 -di/dt=100A/μs, Tch=25°C		-	0.5	-	μs
Reverse Recovery Charge	Qrr			-	7.0	-	μC

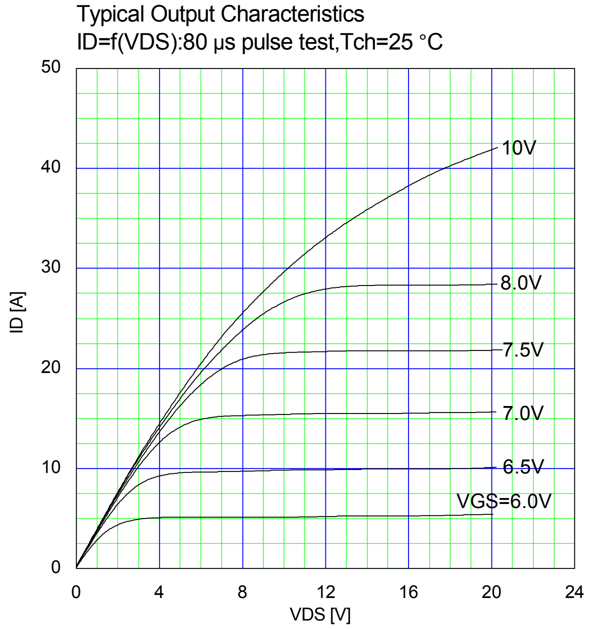
● Thermal Characteristics

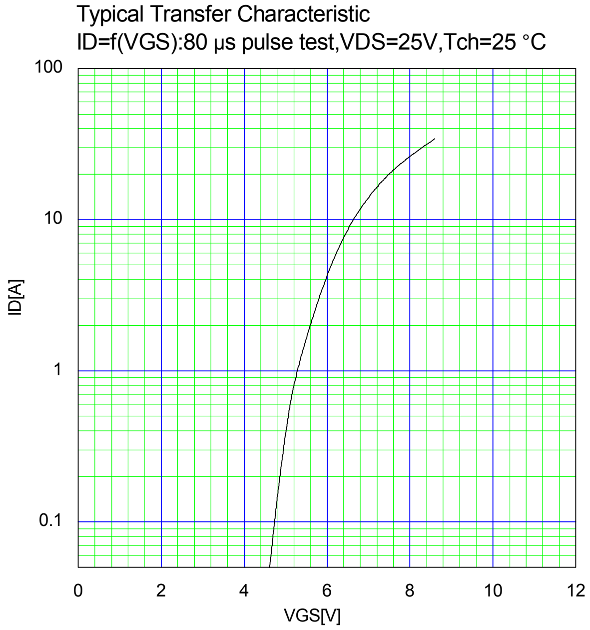
Description	Symbol	Test Conditions	min.	typ.	max.	Unit
Thermal resistance	Rth (ch-c)	Channel to Case			0.460	°C/W
	Rth (ch-a)	Channel to Ambient			75.0	°C/W

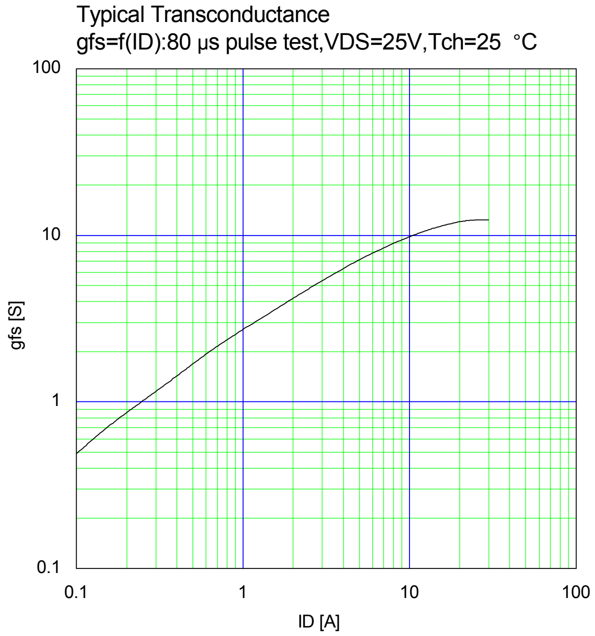
Note *1 : Tch≤150°C.
Note *2 : Stating Tch=25°C, I_{AS}=8A, L=16.7mH, Vcc=50V, R_G=50Ω.
E_{AS} limited by maximum channel temperature and avalanche current.
See to 'Avalanche Energy' graph.
Note *3 : Repetitive rating : Pulse width limited by maximum channel temperature.
See to the 'Transient Themal 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=4.6kV/μs, Vcc≤BV_{DSS}, Tch≤150°C.

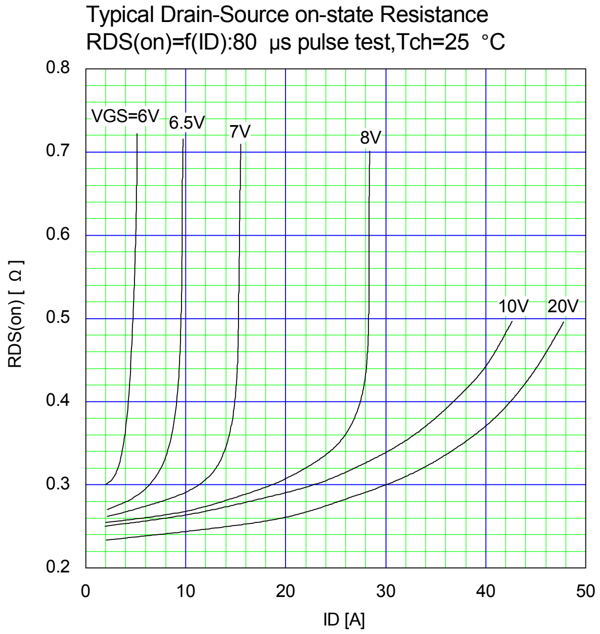

Allowable Power Dissipation
PD=f(Tc)
400
300
200
100
0
PD [W]
0
25
50
75
100
125
150
Tc [°C]


Safe Operating Area
ID=f(VDS):Duty=0(Single pulse),Tc=25 °c
t=
1μs
10μs
100μs
1ms
ID [A]
Power loss waveform :
Square waveform
PD
t
VDS [V]

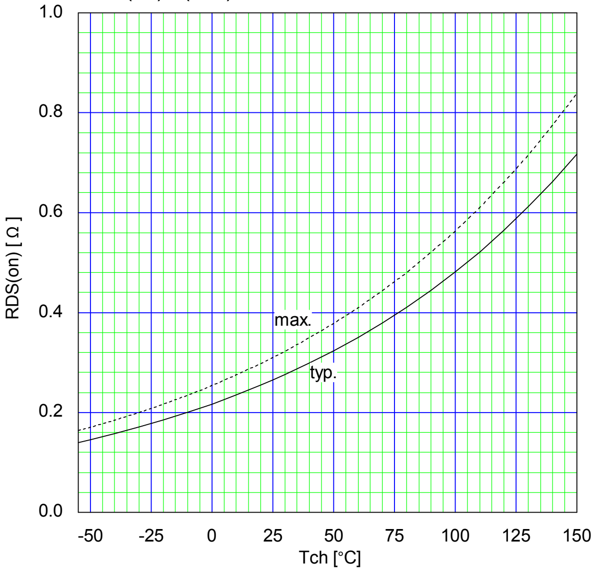

Typical Output Characteristics
ID=f(VDS):80 μs pulse test,Tch=25 °C
10V
8.0V
7.5V
7.0V
6.5V
VGS=6.0V
ID [A]
VDS [V]


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

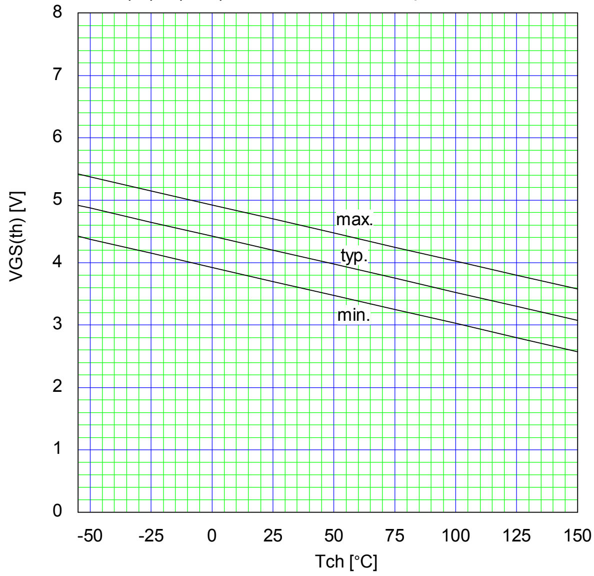

Typical Transconductance
gfs=f(ID):80 μs pulse test,VDS=25V,Tch=25 °C
gfs [S]
ID [A]


Typical Drain-Source on-state Resistance
RDS(on)=f(ID):80 μs pulse test,Tch=25 °C
VGS=6V
6.5V
7V
8V
10V
20V
RDS(on) [Ω]
ID [A]

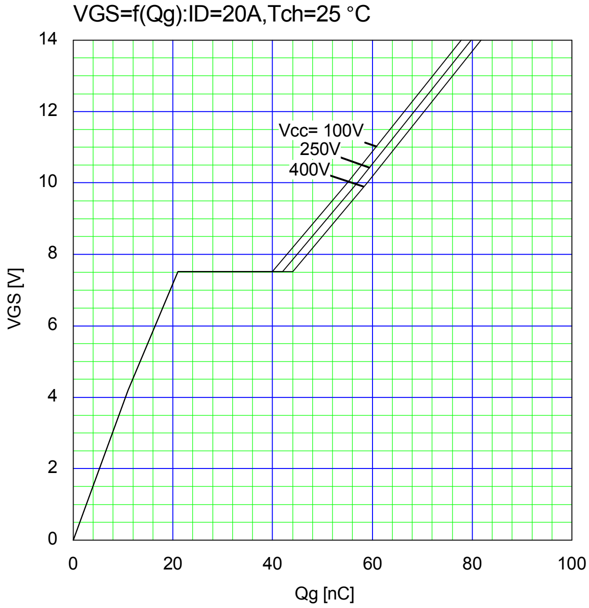
Drain-Source On-state Resistance
RDS(on)=f(Tch):ID=10A,VGS=10V



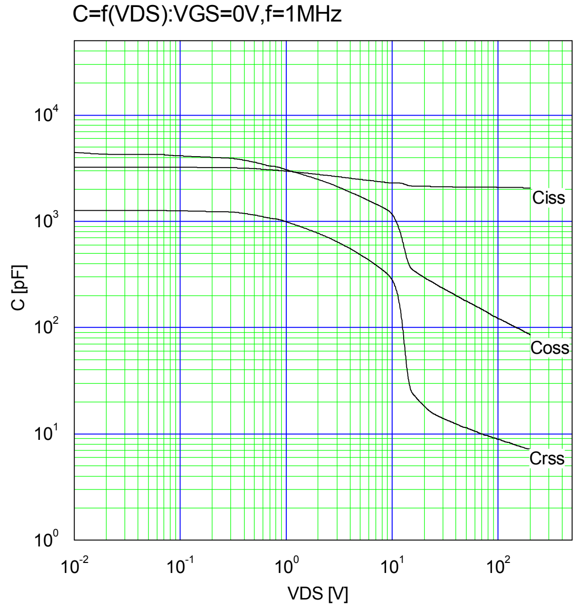
Gate Threshold Voltage vs. Tch
VGS(th)=f(Tch):VDS=VGS,ID=250μA



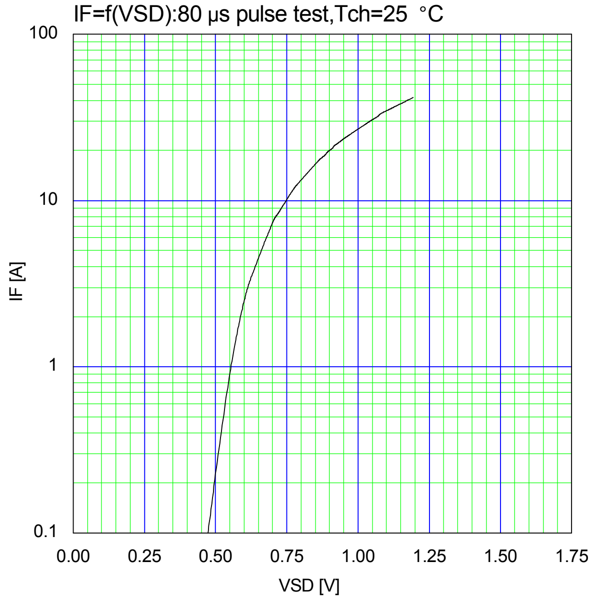
Typical Gate Charge Characteristics
VGS=f(Qg):ID=20A,Tch=25 °C



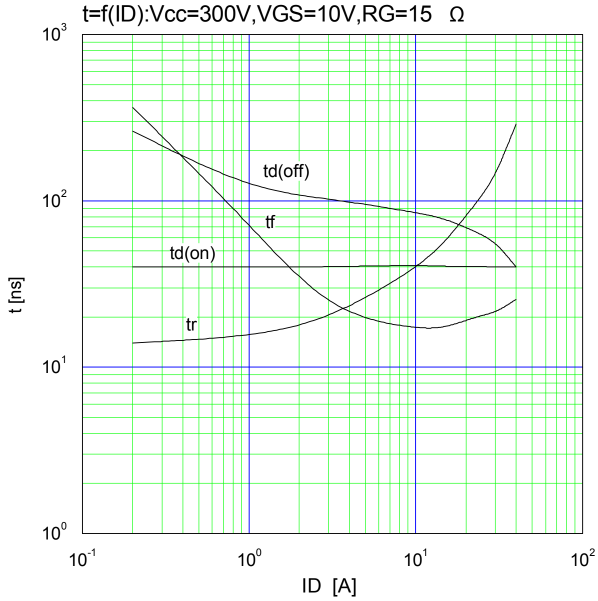
Typical Capacitance
C=f(VDS):VGS=0V,f=1MHz



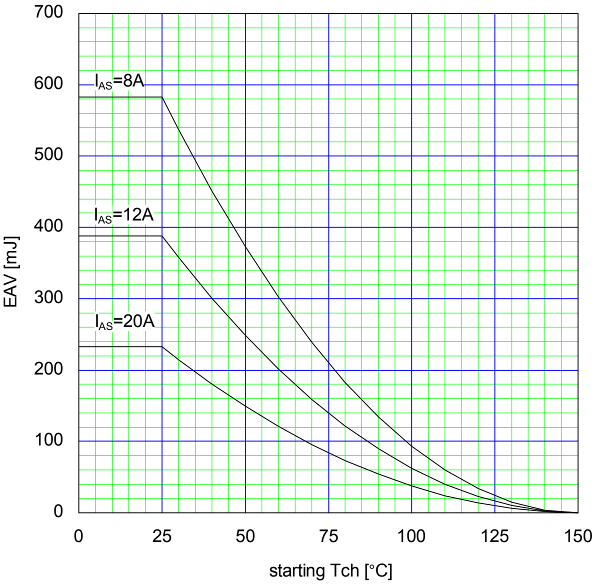
Typical Forward Characteristics of Reverse Diode
IF=f(VSD):80 μs pulse test,Tch=25 °C



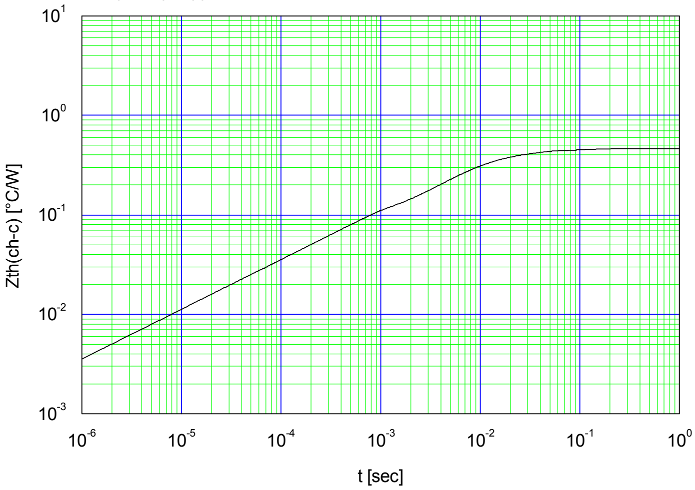
Typical Switching Characteristics vs. ID
t=f(ID):Vcc=300V,VGS=10V,RG=15 Ω



Maximum Avalanche Energy vs. starting Tch
E(AV)=f(starting Tch):Vcc=50V,I(AV)<=20A



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



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