FMY47N60S1A

Automotive

FUJI POWER MOSFET

Super J-MOS^{TM} series

N-Channel enhancement mode power MOSFET

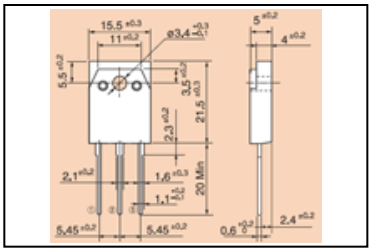
■Features

Low on-state resistance
Low switching loss
Easy to use
(more controllable switching dV/dt by Rg)
The reliability trial conforms to AEC Q101.
100% avalanche tested

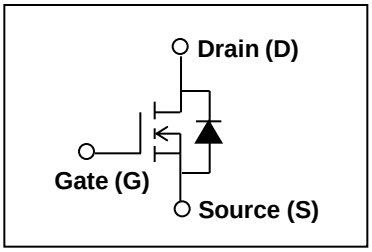
■Applications

Automotive switching applications

■Outline Drawings [mm]



■Equivalent circuit schematic



■Absolute Maximum Ratings at Tc=25℃(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	±47	A	Tc=25℃ Note*1
Pulsed Drain Current	I_{DP}	±141	A	
Gate-Source Voltage	V_{GS}	30	V	
		±30	V	AC
Non-Repetitive Maximum Avalanche current	I_{AS}	11	A	Note*2
Non-Repetitive Maximum Avalanche Energy	E_{AS}	875	mJ	Note*3
Peak Diode Recovery dV/dt	dV/dt	13	kV/μs	Note*4
Peak Diode Recovery di/dt	-di/dt	80	A/μs	Note*5
Maximum Power Dissipation	P_D	390	W	Tc=25℃
Operating and Storage Temperature range	T_{ch}	150	℃	
	T_{stg}	-55 to +150	℃	

Note*1 : Limited by maximum channel temperature
Note*2 : Tch≦150℃,See Fig.1 and Fig.2
Note*3 : Starting Tch=25℃,IAS=11A,L=13.3mH,VDD=60V,RG=50Ω,See Fig.1 and Fig.2
EAS limied by maximum channel temperature and avalanche current.
Note*4 : IF≦-23.5A,-di/dt=80A/μs,VDD≦300V, Tch≦150℃
Note*5 : IF≦-23.5A,dV/dt=13kV/μs,VDD≦300V, Tch≦150℃

■Electrical Characteristics at Tc=25℃(unless otherwise specified)

Static Ratings

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	Ta=25℃	—	2	10	μA
		V_{DS}= 480V V_{GS}=0V	Ta=150℃	—	1	10	
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=23.5A V_{GS}=10V		—	0.059	0.07	Ω

Dynamic Ratings

Description	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Transconductance	g_{fS}	I_D=23.5A V_{DS}=10V	19	—	—	S
Input Capacitance	C_{iSS}	V_{DS}=10V V_{GS}=0V f=1MHz	—	4000	—	pF
Output Capacitance	C_{oSS}		—	8400	—	
Reverse Transfer Capacitance	C_{rSS}		—	770	—	
Turn-On Time	$t_{d(on)}$	V_{DD}=400V, V_{GS}=10V I_D=23.5A, R_G=8.2Ω See Fig.3 and Fig.4	—	90	—	ns
	t_r		—	24	—	
Turn-Off Time	$t_{d(off)}$		—	135	—	
	t_f		—	17	—	
Total Gate Charge	Q_G	V_{DD}=400V, I_D=47A V_{GS}=10V See Fig.5	—	125	—	nC
Gate-Source Charge	Q_{GS}		—	29	—	
Gate-Drain Charge	Q_{GD}		—	46	—	

Note*6 : Co(er) is a fixed capacitance that gives the same stored energy as Coss while VDS is rising from 0 to 80% BVDSS.
Note*7 : Co(tr) is a fixed capacitance that gives the same charging times as Coss while VDS is rising from 0 to 80% BVDSS.

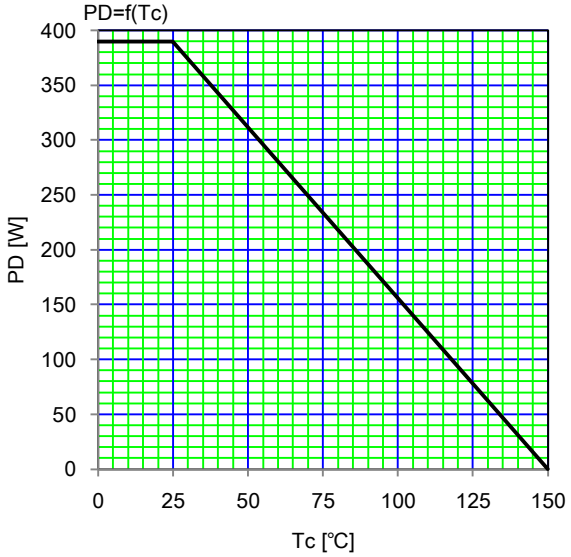
Reverse Ratings

Description	Symbol	Conditions	Min.	Typ.	Max.	Unit
Avalanche Capability	I_{AV}	L=13.3mH, T_{ch}=25℃ See Fig.1 and Fig.2	11	—	—	A
Diode Forward On- Voltage	V_{SD}	I_F=47A, V_{GS}=0V T_{ch}=25℃	—	1.0	1.35	V
Reverse Recovery Time	t_{rr}	I_F=23.5A, V_{GS}=0V V_{DD}=300V -di/dt=80A/μs See Fig.6	—	470	—	ns
Reverse Recovery Charge	Q_{rr}		—	8.7	—	μC

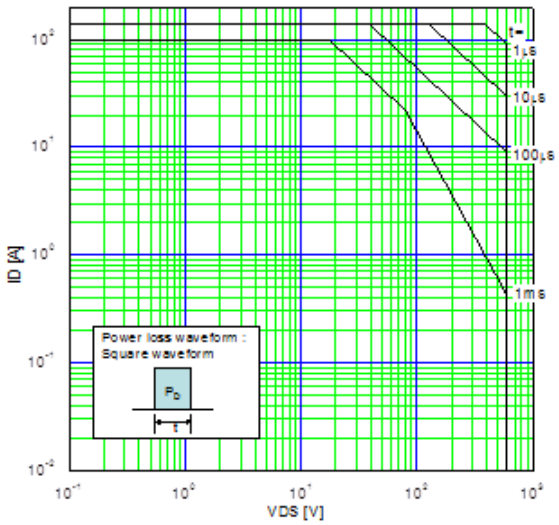
■Thermal Characteristics

Description	Symbol	Min.	Typ.	Max.	Unit
Cannel to Case	$R_{th(ch-c)}$	—	—	0.32	℃/W
Cannel to Ambient	$R_{th(ch-a)}$	—	—	50	℃/W

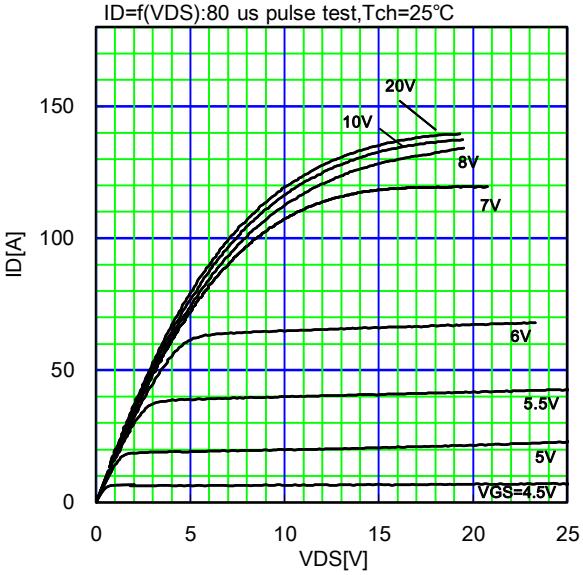
Allowable Power Dissipation
PD=f(Tc)



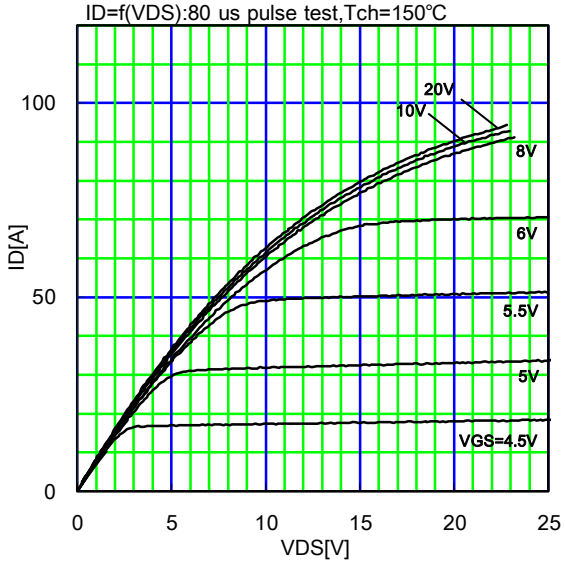
Safe Operating Area
I_D=f(V_{DS}):Duty=0(Single pulse),Tc=25 ℃



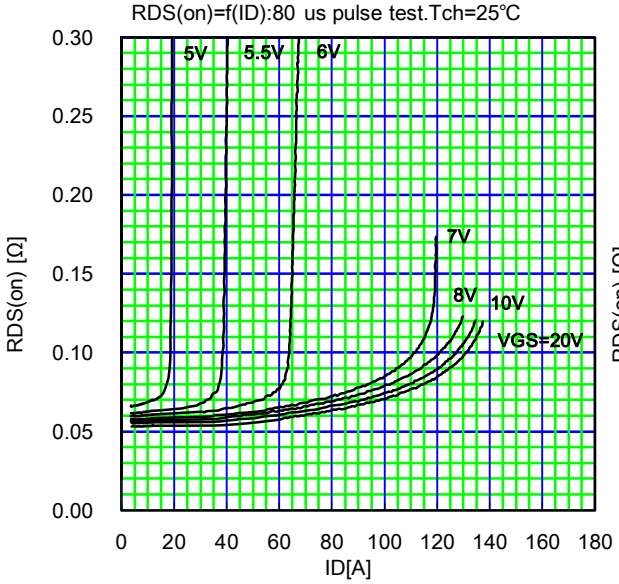
Typical Output Characteristics
ID=f(VDS):80 us pulse test,Tch=25℃



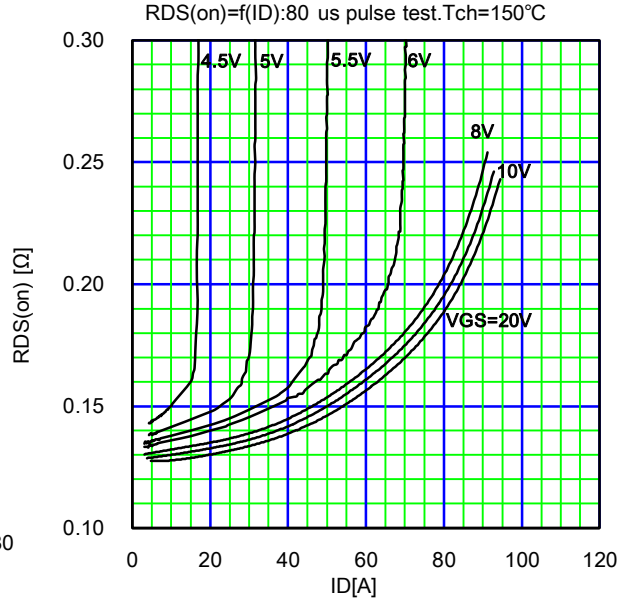
Typical Output Characteristics
ID=f(VDS):80 us pulse test,Tch=150℃



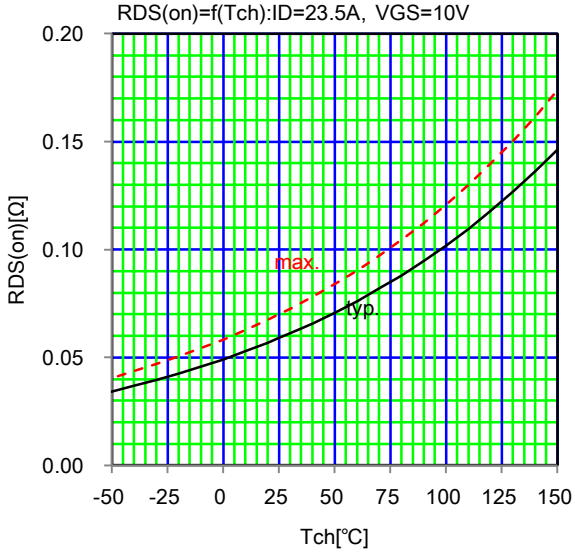
Typical Drain-Source on-state Resistance
RDS(on)=f(ID):80 us pulse test.Tch=25℃



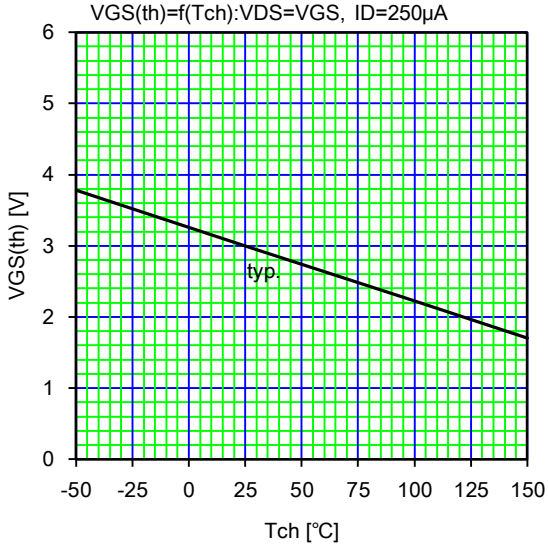
Typical Drain-Source on-state Resistance
RDS(on)=f(ID):80 us pulse test.Tch=150℃



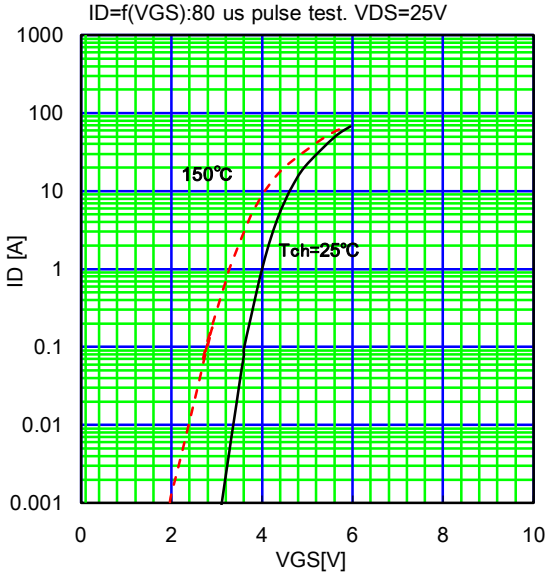
Drain-Source On-state Resistance
RDS(on)=f(Tch):ID=23.5A, VGS=10V



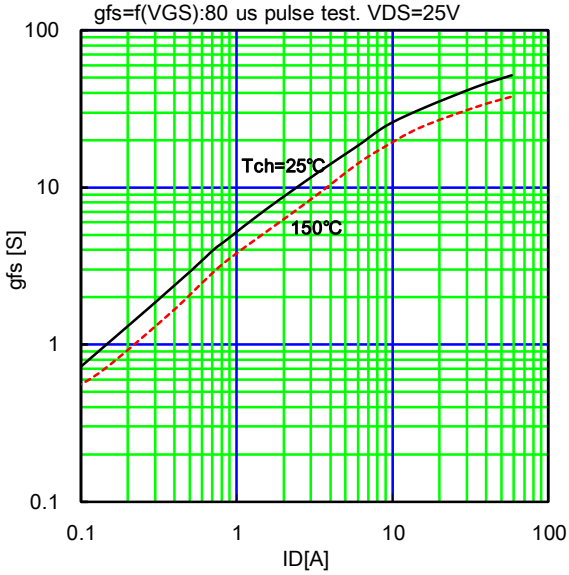
Gate Thres hold Voltage vs. Tch
VGS(th)=f(Tch):VDS=VGS, ID=250μA



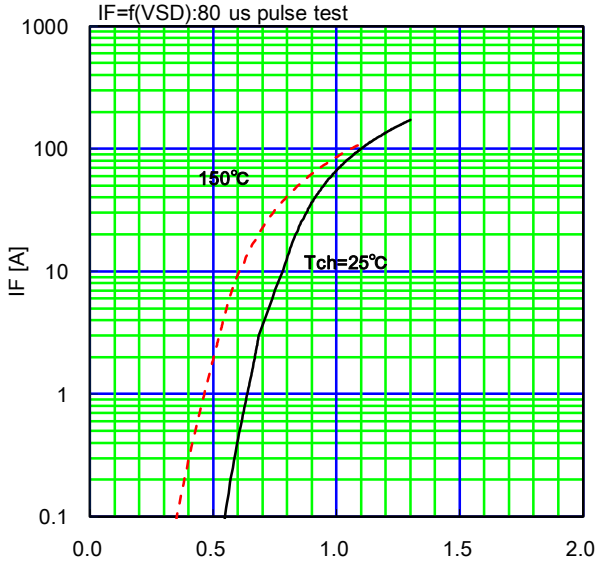
Tyipical Transfer Characteristics
ID=f(VGS):80 us pulse test. VDS=25V



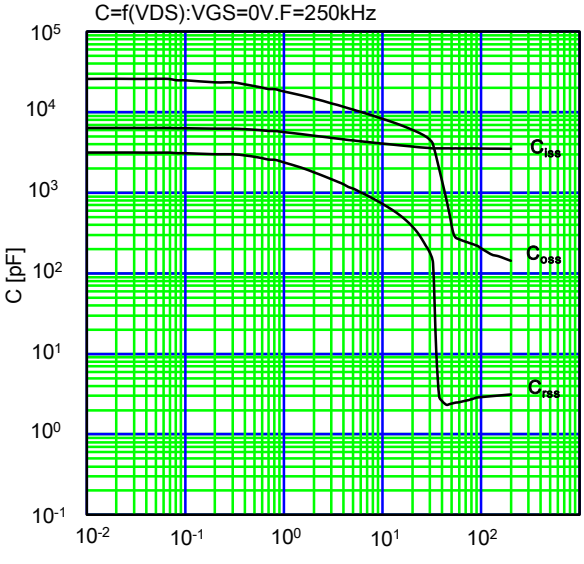
Tyipical Trans conductance
gfs=f(VGS):80 us pulse test. VDS=25V



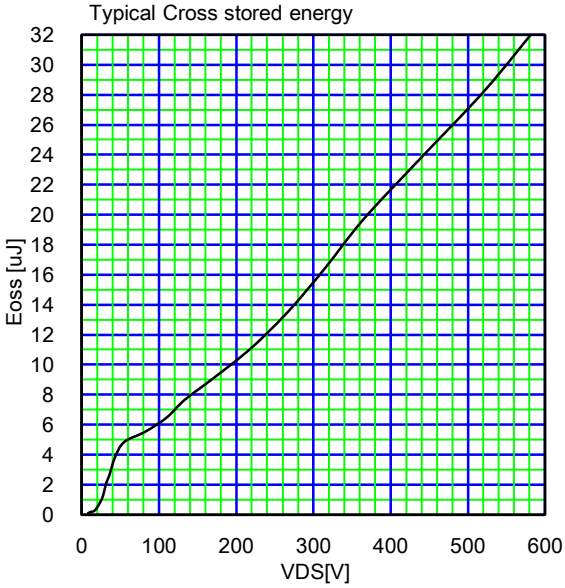
Tyipical Forward Characteristics of Reverce Diode
IF=f(VSD):80 us pulse test



Tyipical Capacitance
C=f(VDS):VGS=0V.F=250kHz

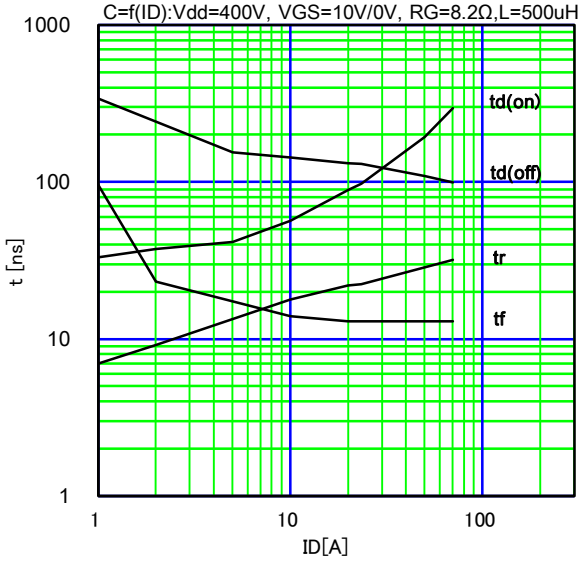


Typical Cross stored energy



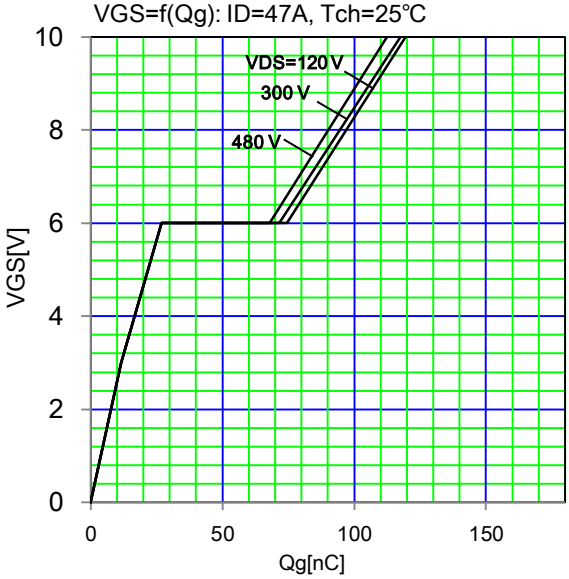
Tyipical Switching Characteristics vs.ID Tch=25℃

C=f(ID):Vdd=400V, VGS=10V/0V, RG=8.2Ω,L=500uH



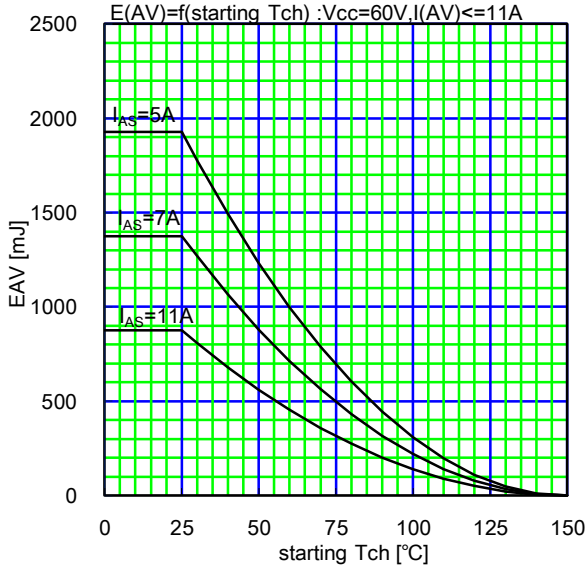
Typical Gate Characteristics

VGS=f(Qg): ID=47A, Tch=25℃



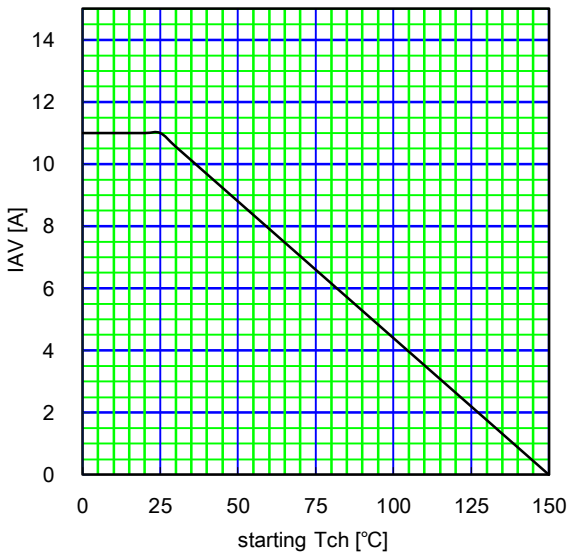
Maximum Avaranche Current vs. starting Tch

E(AV)=f(starting Tch) :Vcc=60V,I(AV)<=11A



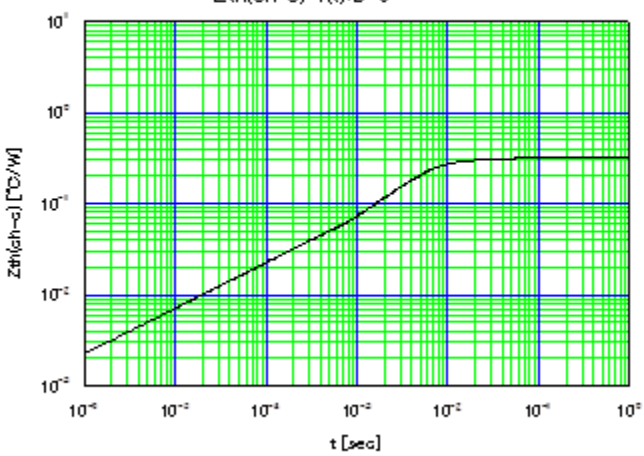
Maximum Avaranche Current vs. starting Tch

I(AV)=f(starting Tch), single pulse



Transient Thermal Impedance

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



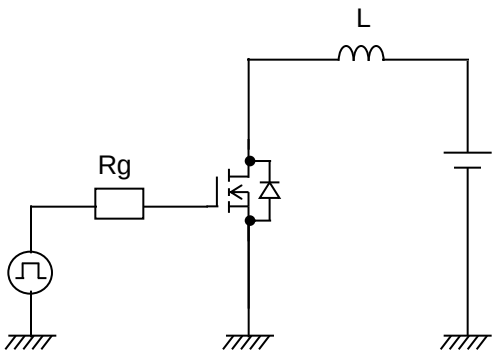


Fig.1 Avalanche Test circuit

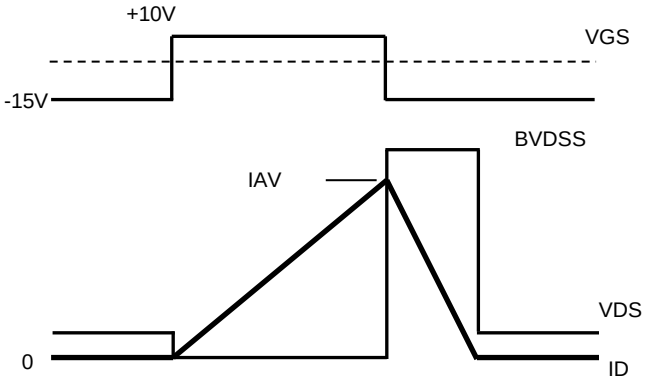


Fig.2 Operating waveforms of Avalanche Test

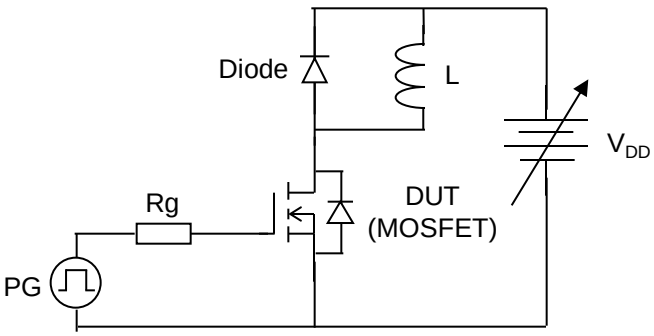


Fig.3 Switching Test circuit

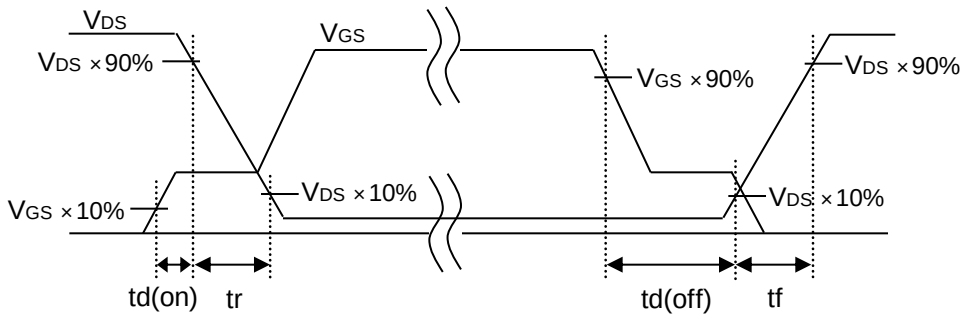


Fig.4 Operating waveform of Switching Test

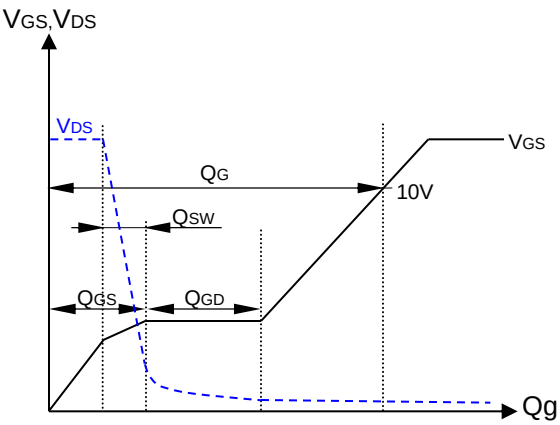


Fig.5 Operating waveform of Gate charge Test

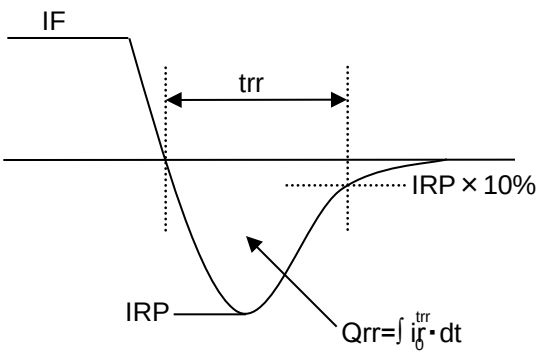


Fig.6 Operating waveform of
Body diode Recovery Test

WARNING

1.This Data Sheet contains the product specifications, characteristics, data, materials, and structures as of Aug2014.

The contents are subject to change without notice changes or other reasons.

When using a product listed in this Data Sheet, be sure to obtain the latest specifications.

2.All applications described in this Data Sheet exemplify the use of Fuji's products for reference only.

No right or license, either express or implied, under any patent, trade secret or other intellectual property right owned by Fuji Electric Co., Ltd. is (or shall be deemed) granted.

Fuji Electric 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 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 design failsafe, flame retardant, and free of malfunction.

4.The produced introduced in this Data Sheet are intended for use in the following electronic and electrical equipment which has normal reliability requirements.

・Automotive ・Computers ・OA equipment ・Communications equipment (Terminal devices)
・Machine tools ・AV equipment ・Measurement equipment ・Personal equipment ・Industrial robots
・Electrical home appliances etc.

5.If you need to use a product in this Data Sheet for enquiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric 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 equipment becomes faulty.

・Backbone network equipment ・Transportation equipment (automobiles, trains, ships, etc.)
・Traffic-signal control equipment ・Gas alarms, leakage gas auto breakers
・Medical equipment ・Burglar alarms, fire alarms, emergency equipment etc.

6.Do not use products in this Data Sheet for the equipment requiring strict reliability such as the following and equivalents strategic equipment (without limitation).

・Aerospace equipment ・Aeronautical equipment
・Nuclear control equipment ・Submarine repeater equipment

7. As for a part of this Data Sheet or all the reprint reproductions, the approval of Fuji Electric Co., Ltd. by the document is necessary.

8.If you have any question about any portion in this Data Sheet , ask Fuji Electric Co., Ltd. or its sales agents before using the product.

Neither Fuji Electric 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.