FMY31N60ES

Automotive

FUJI POWER MOSFET

Super FAP-E^{3S} Low Qg series

N-Channel enhancement mode power MOSFET

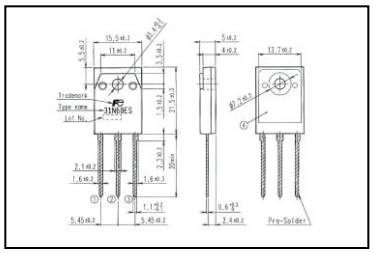
■Features

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

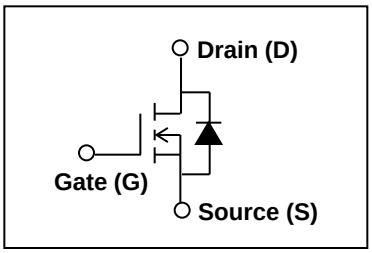
■Applications

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	±31	A	
Pulsed Drain Current	I_{DP}	±124	A	
Gate-Source Voltage	V_{GS}	±30	V	
Non-Repetitive Maximum Avalanche current	I_{AS}	31	A	Note*1
Non-Repetitive Maximum Avalanche Energy	E_{AS}	631	mJ	Note*2
Peak Diode Recovery dV/dt	dV/dt	4.7	kV/μs	Note*3
Peak Diode Recovery di/dt	-di/dt	100	A/μs	Note*4
Maximum Power Dissipation	P_D	495	W	
Operating and Storage Temperature range	T_{ch}	150	℃	
	T_{stg}	-55 to +150	℃	

Note*1 : Tch≦150℃,See Fig.1 and Fig.2
Note*2 : Starting Tch=25℃,L=1200μH,V_{CC}=60V,RG=50Ω,See Fig.1 and Fig.2
E_{AS} limited by maximum channel temperature and avalanche current.
See to Avalanche Energy graph of page 5
Note*3 : IF≦-ID,-di/dt=100A/μs,V_{CC}≦BV_{DSS}, Tch≦150℃
Note*4 : IF≦-ID,dV/dt=4.7kV/μs,V_{CC}≦BV_{DSS}, 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=1mA V_{GS}=0V		600	—	—	V
	BV_{DSX}	I_D=1mA V_{GS}=-30V		600	—	—	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}= 600V V_{GS}=0V	Ta=25℃	—	0.7	10	μA
		V_{DS}= 480V V_{GS}=0V	Ta=125℃	—	25	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=15.5A V_{GS}=10V		—	170	200	mΩ

Dynamic Ratings

Description	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Transconductance	g_{fS}	I_D=15.5A V_{DS}=25V	11	—	—	S
Input Capacitance	C_{iSS}	V_{DS}=25V V_{GS}=0V f=1MHz	—	4810	—	pF
Output Capacitance	C_{oSS}		—	535	—	
Reverse Transfer Capacitance	C_{rSS}		—	32	—	
Turn-On Time	$t_{d(on)}$	V_{CC}=300V, V_{GS}=10V I_D=15.5A, R_G=10Ω See Fig.3 and Fig.4	—	55	—	ns
	t_r		—	80	—	
Turn-Off Time	$t_{d(off)}$		—	130	—	
	t_f		—	30	—	
Total Gate Charge	Q_G	V_{DD}=300V, I_D=31A V_{GS}=10V See Fig.5	—	125	—	nC
Gate-Source Charge	Q_{GS}		—	45	—	
Gate-Drain Charge	Q_{GD}		—	55	—	

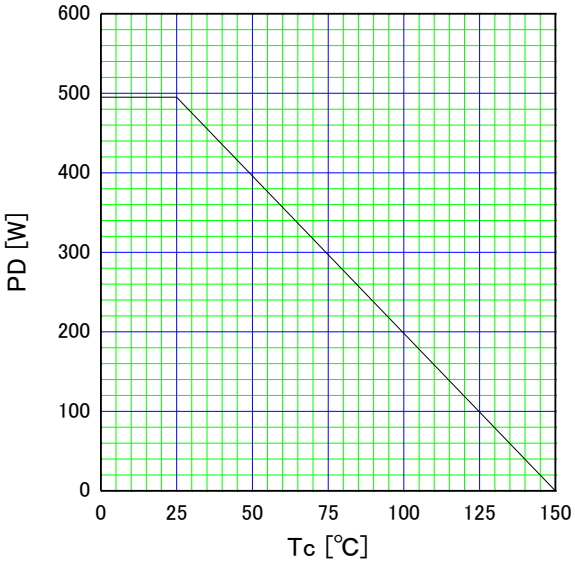
Reverse Ratings

Description	Symbol	Conditions	Min.	Typ.	Max.	Unit
Avalanche Capability	I_{AV}	L=1200μH, T_{ch}=25℃ See Fig.1 and Fig.2	31	—	—	A
Diode Forward On- Voltage	V_{SD}	I_F=31A, V_{GS}=0V T_{ch}=25℃	—	1.10	1.5	V
Reverse Recovery Time	t_{rr}	I_F=31A, V_{GS}=0V -di/dt=100A/μs T_{ch}=25℃	—	700	—	ns
Reverse Recovery Charge	Q_{rr}		—	18	—	μC

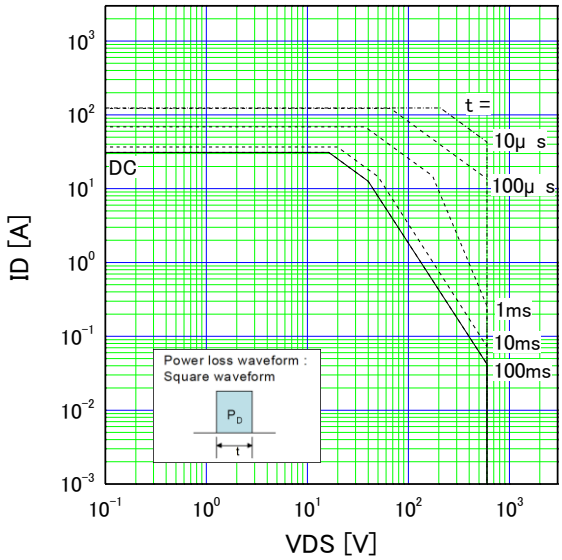
■Thermal Characteristics

Description	Symbol	Min.	Typ.	Max.	Unit
Cannel to Case	$R_{th(ch-c)}$	—	—	0.252	℃/W
Cannel to Ambient	$R_{th(ch-a)}$	—	—	50.0	℃/W

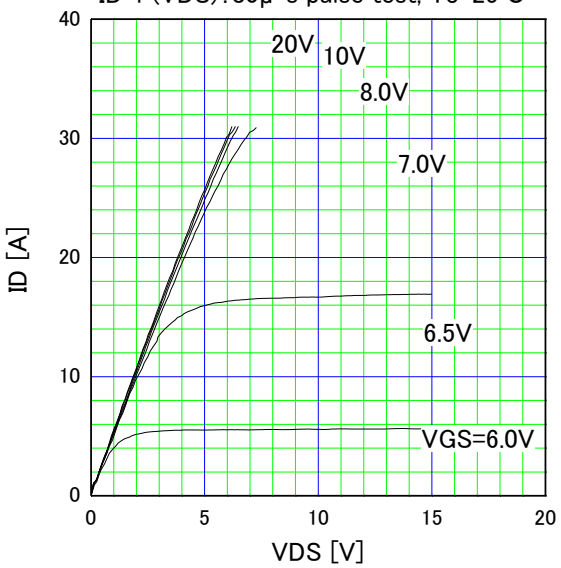
Power Dissipation
PD=f (Tc)



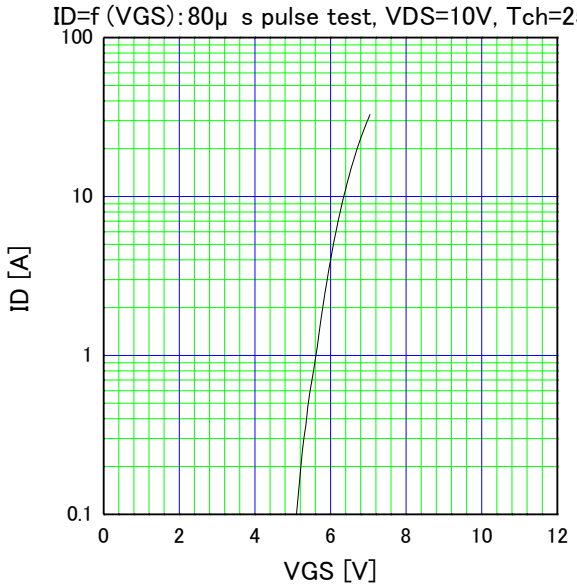
Safe operating area
ID=f (VDS) : Single pulse (D=0), Tc=25℃



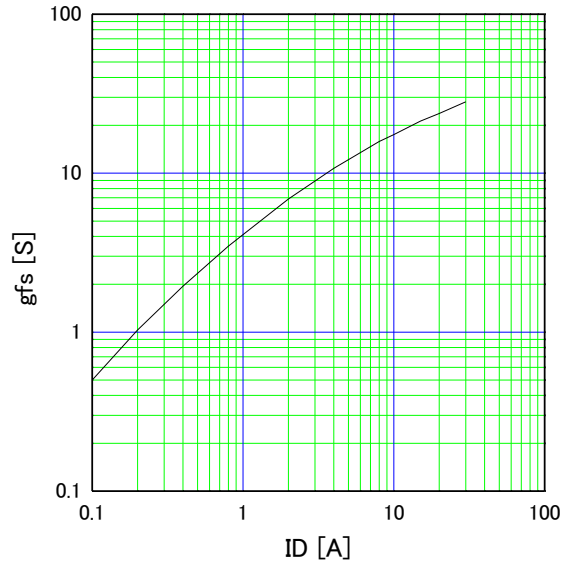
Typical output characteristics
ID=f (VDS) : 80μ s pulse test, Tc=25℃



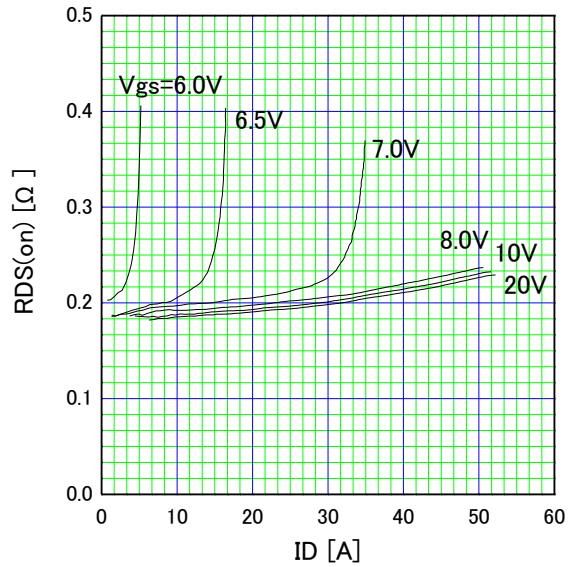
Typical transfer characteristics
ID=f (VGS) : 80μ s pulse test, VDS=10V, Tch=25℃



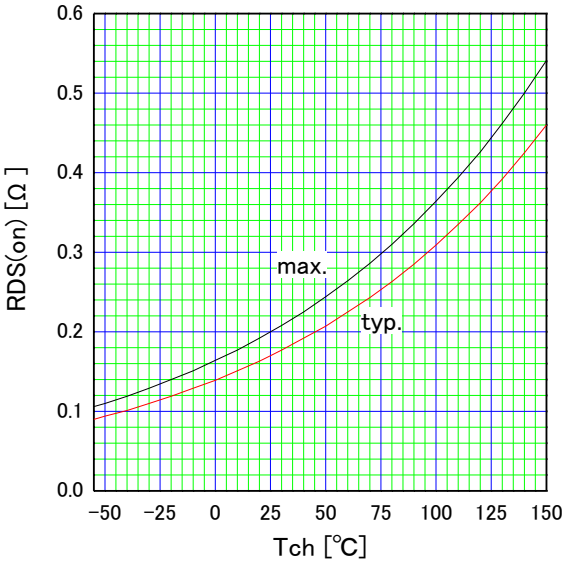
Typical Transconductance
gfs=f(ID):80μ s pulse test, VDS=25V, Tch=25℃



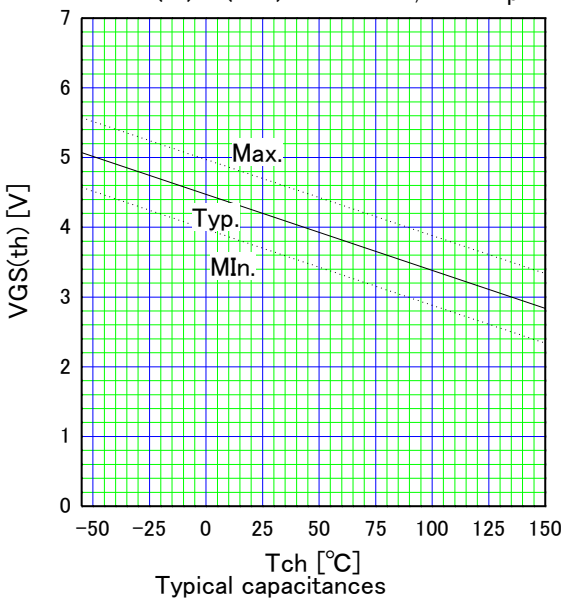
Typical Drain-Source on-State Resistance
RDS(on)=f (ID) : 80μ s pulse test, Tch=25℃



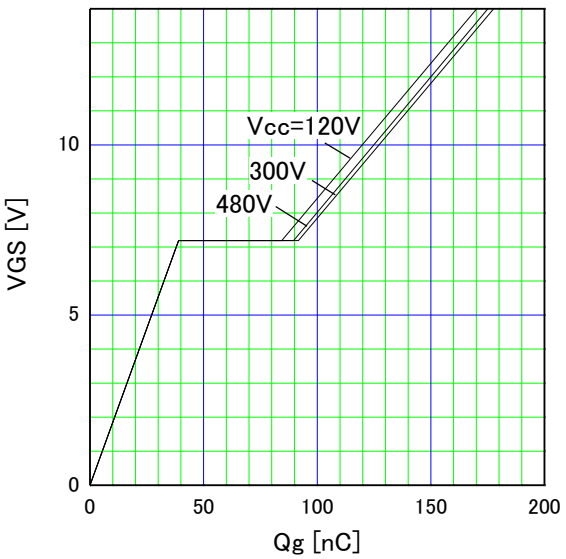
Drain-source on-state resistance
RDS(on)=f (Tch):ID=15.5A, VGS=10V



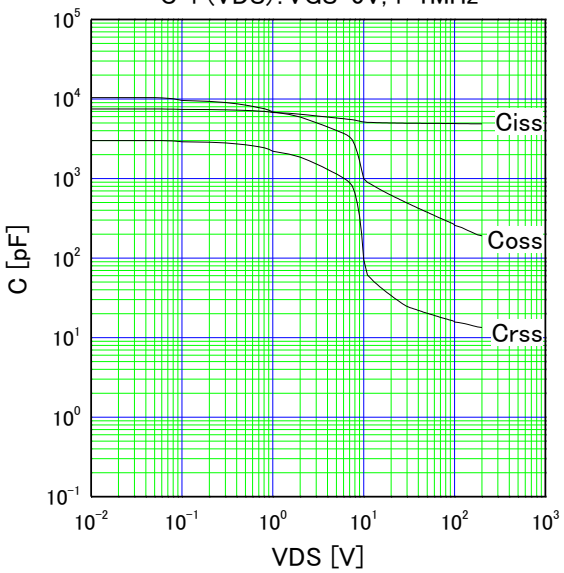
Gate Threshold Voltage vs. Tch
VGS(th)=f (Tch):VDS=VGS, ID=250μ A



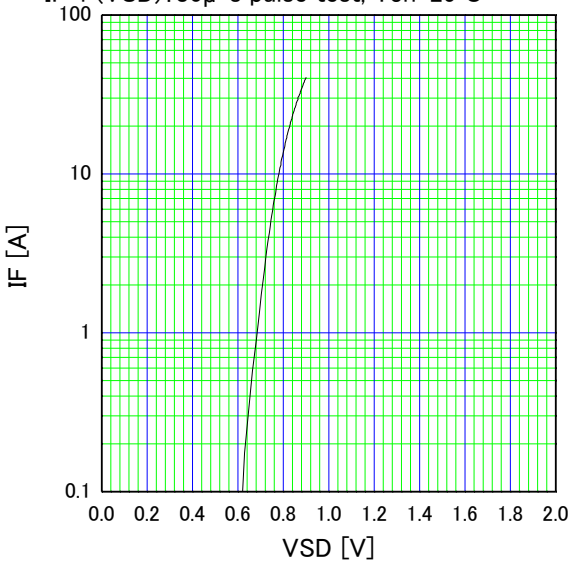
Typical Gate Charge Characteristics
VGS=f (Qg):ID=31A, Tch=25℃



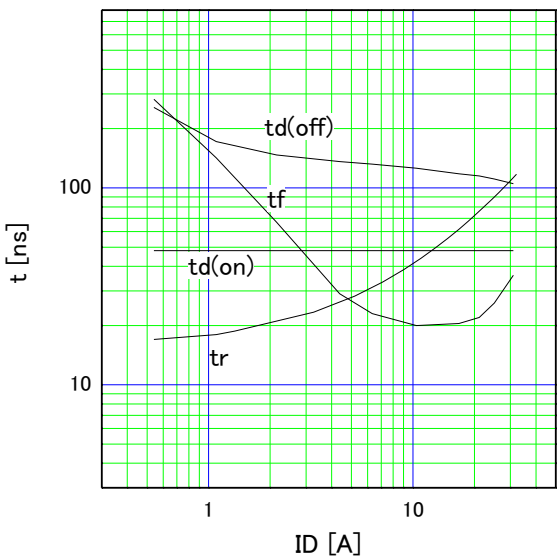
Typical capacitances
C=f (VDS):VGS=0V, f=1MHz



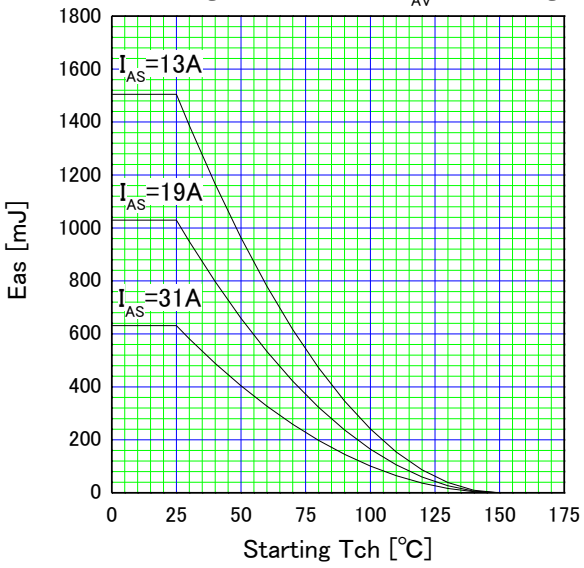
Typcal Forward Characteristics of Reverse Diode
IF=f (VSD):80μ s pulse test, Tch=25℃



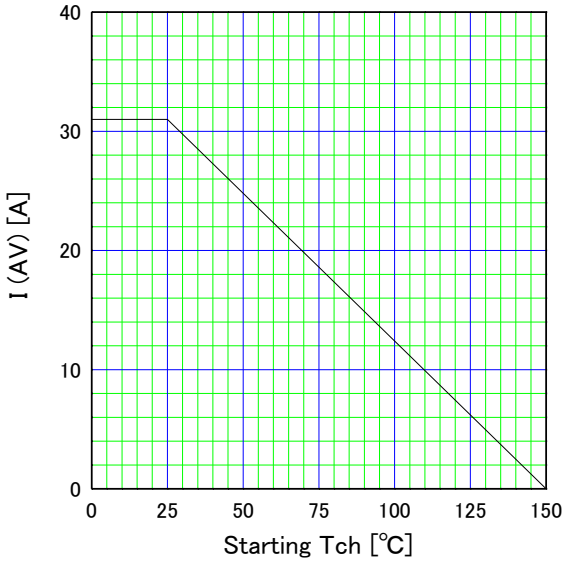
Typical Switdhing Characteristics vs. ID
t=f (ID):Vcc=300V, VGS=10V, RG=10Ω



Maximum Avalanche energy vs. starting Tch
Eas=f (starting Tch): Vcc=60V, I_{AV}<=31A, single pulse



Maximum Avalanche Current vs. starting Tch
I (AV) =f (starting Tch), single pulse



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

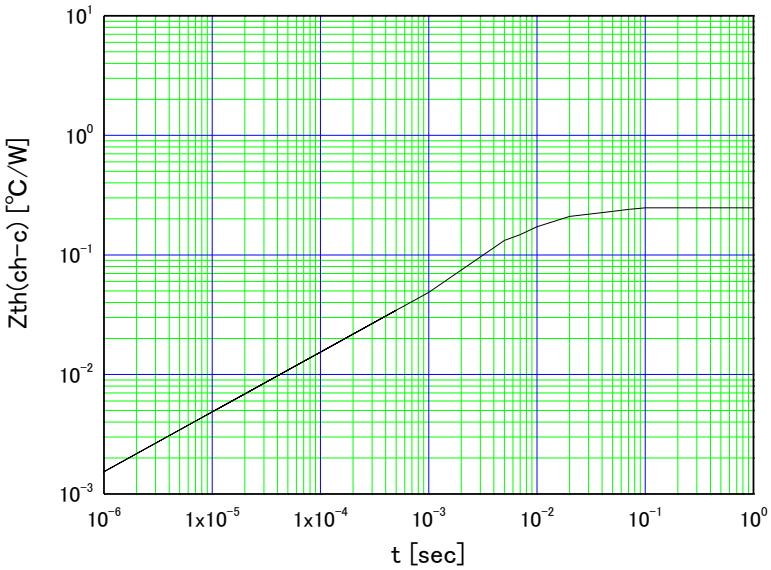


Fig.1 Avalanche Test circuit

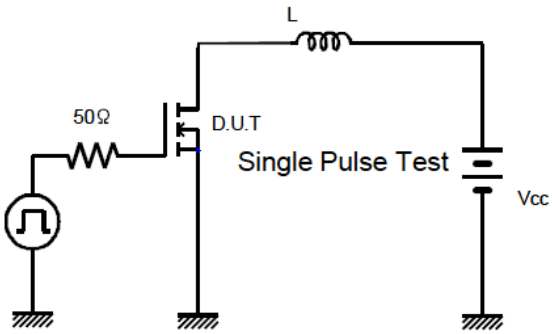


Fig.2 Operating waveforms of Avalanche Test

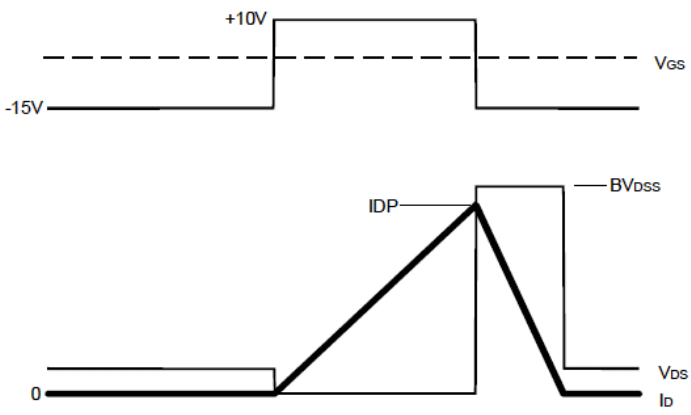


Fig.3 Switching Test circuit

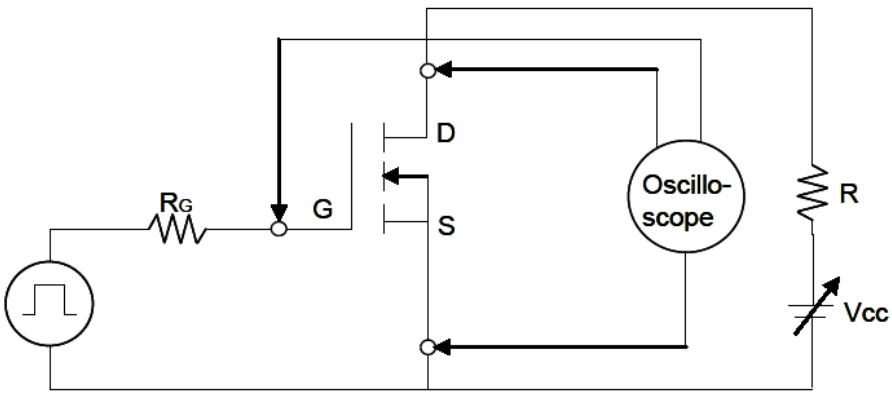


Fig.4 Operating waveform of Switching Test

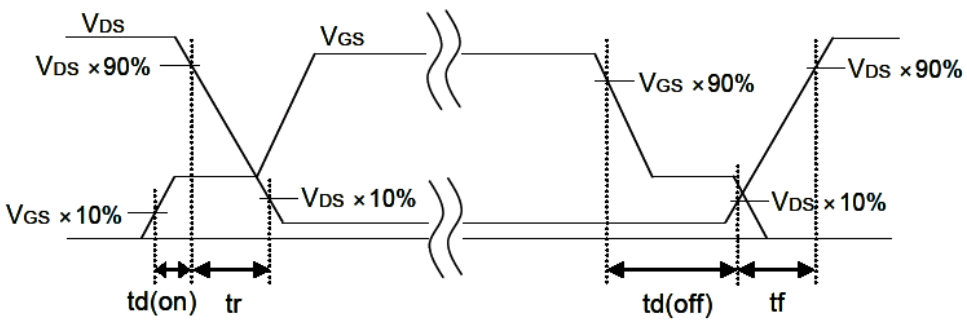


Fig.5 Operating waveform of Gate charge Test

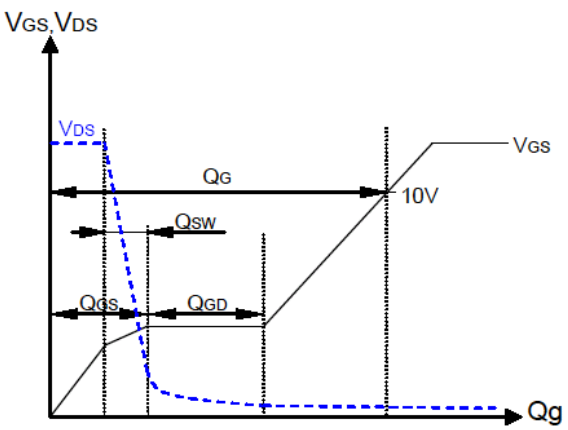
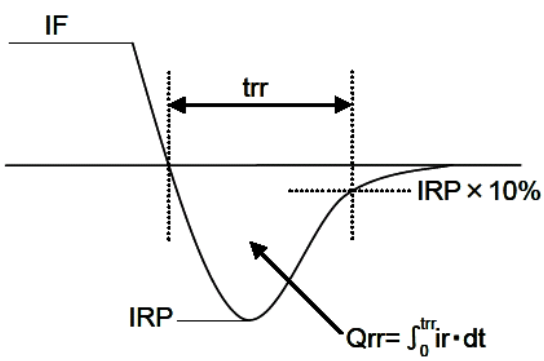
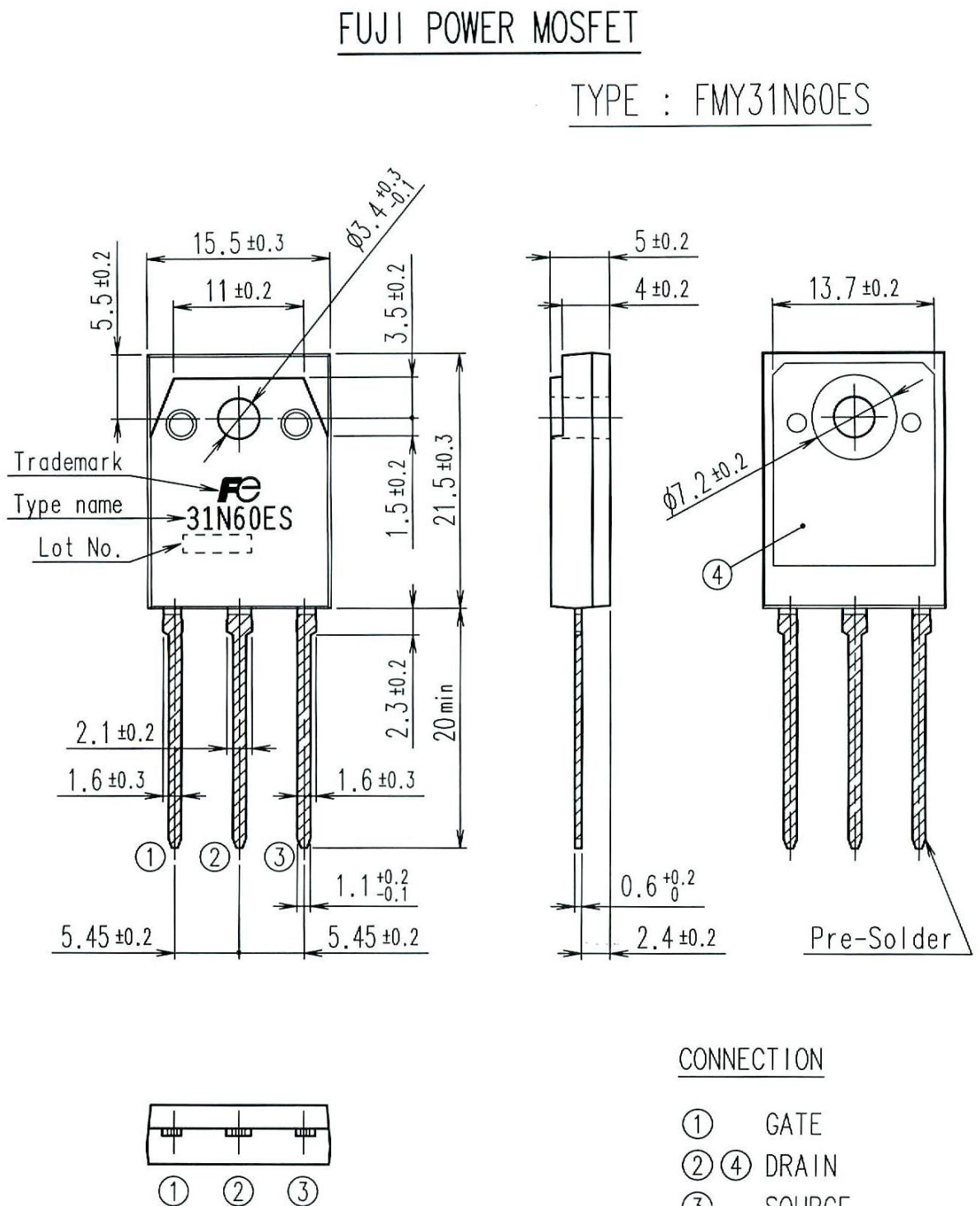


Fig.6 Operating waveform of Body diode Recovery Test



■Out view


FUJI POWER MOSFET
TYPE : FMY31N60ES
15.5 ±0.3
11 ±0.2
5.5 ±0.2
3.5 ±0.2
1.5 ±0.2
21.5 ±0.3
2.3 ±0.2
20 min
2.1 ±0.2
1.6 ±0.3
1.6 ±0.3
1.1 +0.2 -0.1
5.45 ±0.2
5.45 ±0.2
5 ±0.2
4 ±0.2
13.7 ±0.2
0.6 +0.2 0
2.4 ±0.2
Trademark
Type name
31N60ES
Lot No.
Pre-Solder
CONNECTION
① GATE
②④ DRAIN
③ SOURCE
JEDEC:TO-247
DIMENSIONS ARE IN MILLIMETERS.

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