Fuji Electric

Innovating Energy Technology

FMY60N125S2A

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Automotive FUJI POWER MOSFET

Super J MOS® S2 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

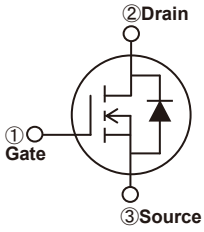
Automotive switching applications

TO-247



①Gate ②Drain ③Source

Equivalent circuit schematic



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

Parameter	Symbol	Characteristics	Unit	Remarks
Drain-Source Voltage	V_{DS}	600	V	
	V_{DSX}	600	V	V_{GS}=-30V
Continuous Drain Current	I_D	±22.8	A	T_C=25°C Note*1
		±14.4	A	T_C=100°C Note*1
Pulsed Drain Current	I_{DP}	±68.2	A	Note *1
Gate-Source Voltage	V_{GS}	±30	V	
Non-Repetitive Maximum Avalanche Current	I_{AS}	3.5	A	Note *2
Non-Repetitive Maximum Avalanche Energy	E_{AS}	748	mJ	Note *3
Maximum Drain-Source dV/dt	dV_{DS}/dt	50	kV/μs	V_{DS}≤ 600V
Peak Diode Recovery dV/dt	dV/dt	15	kV/μs	Note *4
Peak Diode Recovery -di/dt	-di/dt	100	A/μs	Note *5
Maximum Power Dissipation	P_D	2.5	W	T_a=25°C
		140		T_C=25°C
Operating and Storage Temperature range	T_{ch}	150	°C	
	T_{stg}	-55 to +150	°C	

Note *1 : Limited by maximum channel temperature.
Note *2 : T_{ch} ≤ 150°C, See Fig.1 and Fig.2
Note *3 : Starting T_{ch}=25°C, I_{AS}=2.1A, L=311mH, V_{DD}=25V, R_G=50Ω, See Fig.1 and Fig.2
E_{AS} limited by maximum channel temperature and avalanche current.
Note *4 : I_{SD} ≤ -I_D,-di/dt=100A/μs, V_{DS} peak ≤ 600V, T_{ch} ≤ 150°C.
Note *5 : I_{SD} ≤ -I_D, dV/dt=15kV/μs, V_{DS} peak ≤ 600V, T_{ch} ≤ 150°C.

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JULY 2022

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

• Static Ratings

Parameter	Symbol	Conditions		min.	typ.	max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA		600	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS} I_D=1.22mA		3.5	4.0	4.5	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=600V V_{GS}=0V	T_{ch}=25°C	-	-	2	μA
		V_{DS}=480V V_{GS}=0V	T_{ch}=125°C	-	-	250	
Gate-Source Leakage Current	I_{GSS}	V_{DS}=0V V_{GS}= ± 30V		-	10	100	nA
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=10V I_D=11.4A		-	0.110	0.125	Ω
Gate resistance	R_G	f=1MHz, open drain		-	8.3	-	Ω

• Dynamic Ratings

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Forward Transconductance	g_{fs}	V_{DS}=25V I_D=11.4A	7.5	15	-	S
Input Capacitance	C_{iss}	V_{DS}=400V V_{GS}=0V f=250kHz	-	1240	-	pF
Output Capacitance	C_{oss}		-	42	-	
Reverse Transfer Capacitance	C_{rss}		-	6.3	-	
Effective output capacitance, energy related (Note *6)	$C_{o(er)}$	V_{GS}=0V V_{DS}=0…400V	-	102	-	
Effective output capacitance, time related (Note *7)	$C_{o(tr)}$	V_{GS}=0V V_{DS}=0…400V I_D=constant	-	391	-	
Turn-On Time	$t_{d(on)}$	V_{DD}=400V, V_{GS}=10V I_D=11.4A, R_G=15Ω See Fig.3 and Fig.4	-	21	-	ns
	t_r		-	78	-	
Turn-Off Time	$t_{d(off)}$		-	101	-	
	t_f		-	24	-	
Total Gate Charge	Q_G	V_{DD}=400V, I_D=22.8A V_{GS}=10V See Fig.5	-	53	-	nC
Gate-Source Charge	Q_{GS}		-	20	-	
Gate-Drain Charge	Q_{GD}		-	20	-	
Drain-Source crossover Charge	Q_{SW}		-	13	-	

Note *6 : $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 400V.
Note *7 : $C_{o(tr)}$ is a fixed capacitance that gives the same charging times as C_{oss} while V_{DS} is rising from 0 to 400V.

• Reverse Diode Ratings

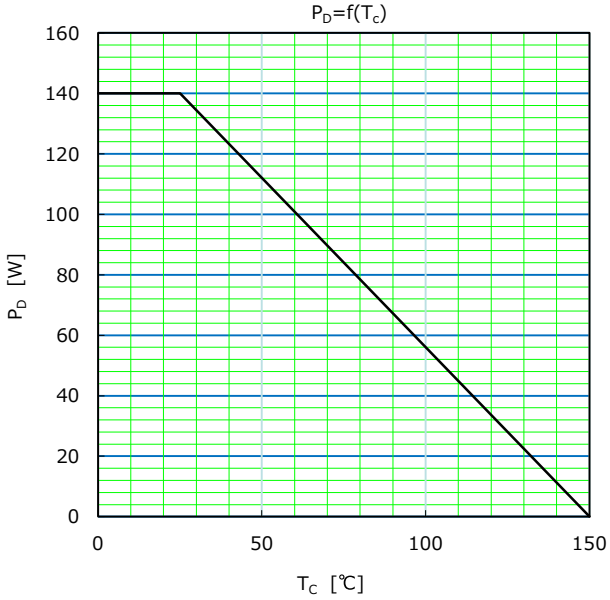
Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Diode Forward On-Voltage	V_{SD}	I_{SD}=22.8A, V_{GS}=0V T_{ch}=25°C	-	0.90	1.35	V
Reverse Recovery Time	t_{rr}	V_{DD}=400V, I_{SD}=22.8A -di/dt=100A/μs T_{ch}=25°C See Fig.6 and Fig.7	-	310	-	ns
Reverse Recovery Charge	Q_{rr}		-	4.4	-	μC
Peak Reverse Recovery Current	I_{rp}		-	27	-	A

Thermal Characteristics

Parameter	Symbol	min.	typ.	max.	Unit
Channel to Case	$R_{th(ch-c)}$	-	-	0.888	°C/W
Channel to Ambient	$R_{th(ch-a)}$	-	-	50	°C/W

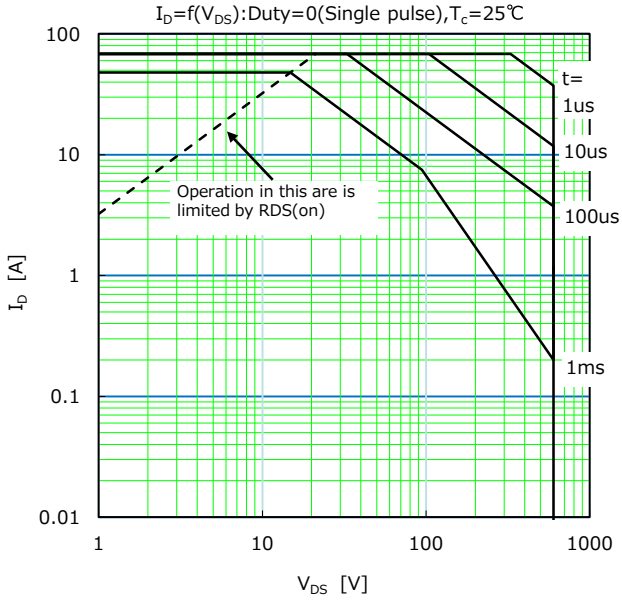
Allowable Power Dissipation

$P_D=f(T_c)$



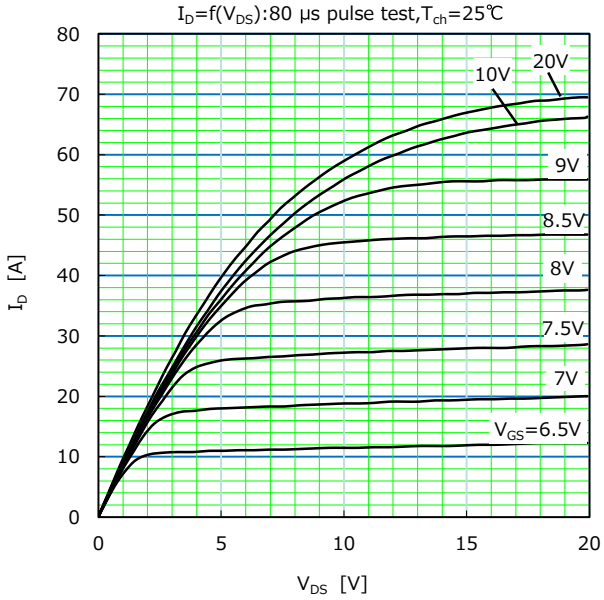
Safe Operating Area

$I_D=f(V_{DS})$:Duty=0(Single pulse),T_c=25℃



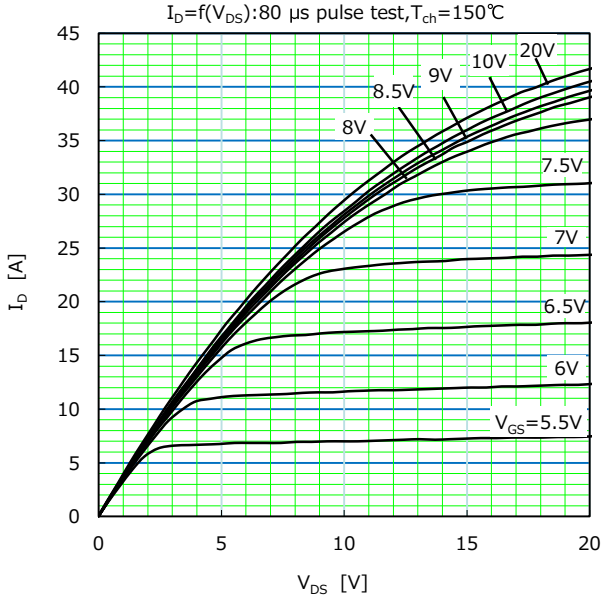
Typical Output Characteristics

$I_D=f(V_{DS})$:80 μs pulse test,T_{ch}=25℃



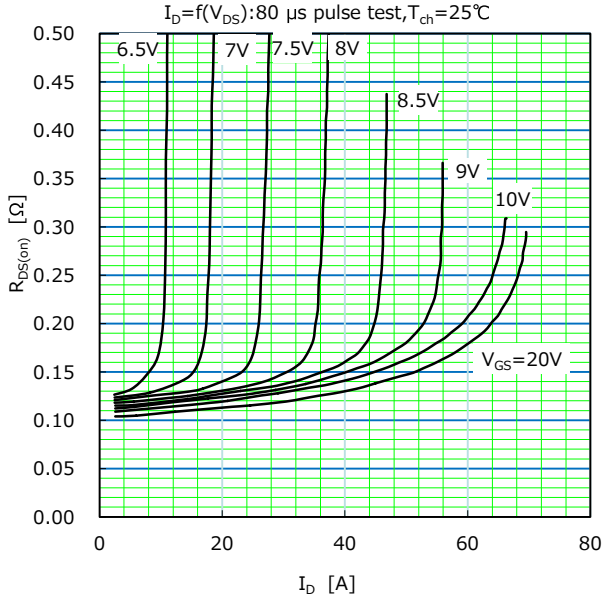
Typical Output Characteristics

$I_D=f(V_{DS})$:80 μs pulse test,T_{ch}=150℃



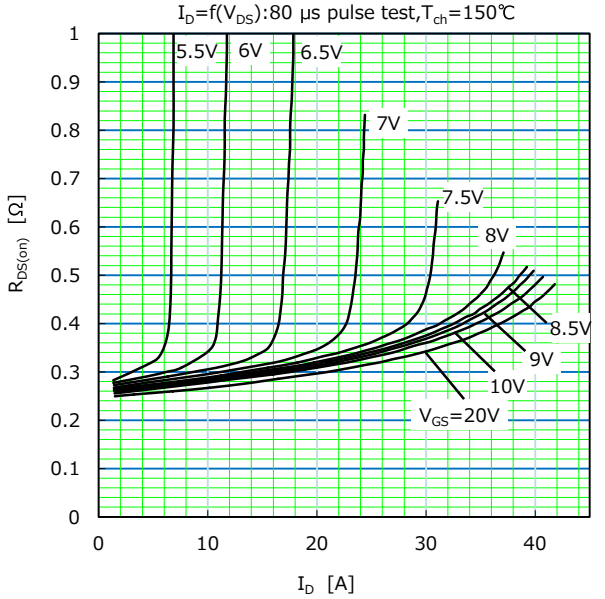
Typical Output Characteristics

$I_D=f(V_{DS})$:80 μs pulse test,T_{ch}=25℃

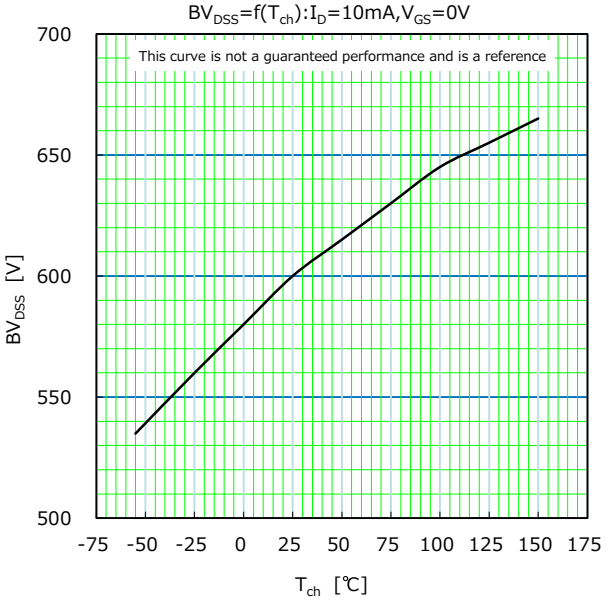


Typical Output Characteristics

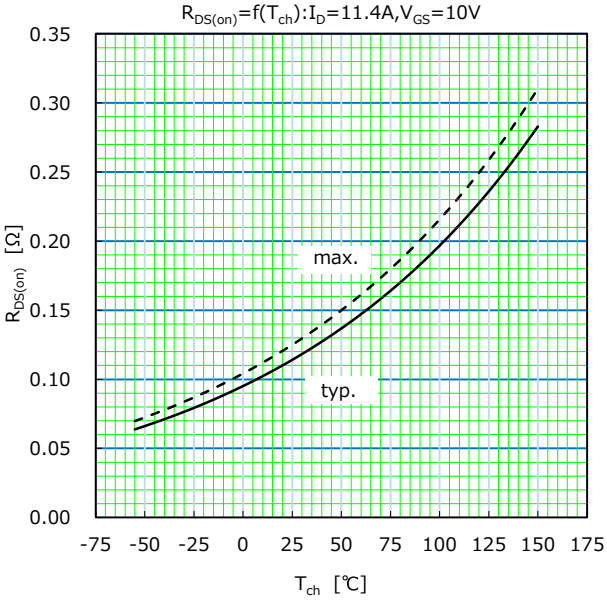
$I_D=f(V_{DS})$:80 μs pulse test,T_{ch}=150℃



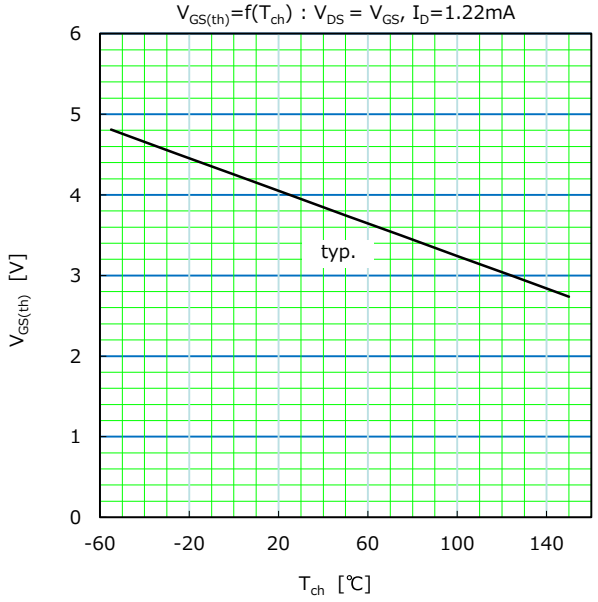
Drain-Source Breakdown Voltage
$BV_{DSS}=f(T_{ch}):I_D=10mA,V_{GS}=0V$



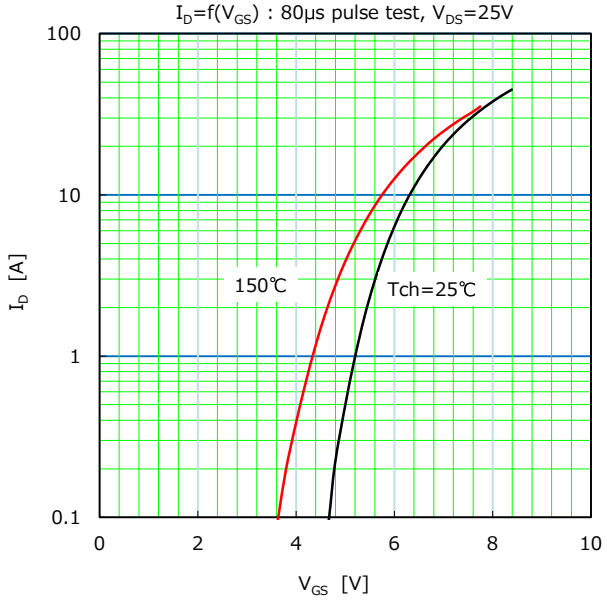
Drain-Source On-state Resistance
$R_{DS(on)}=f(T_{ch}):I_D=11.4A,V_{GS}=10V$



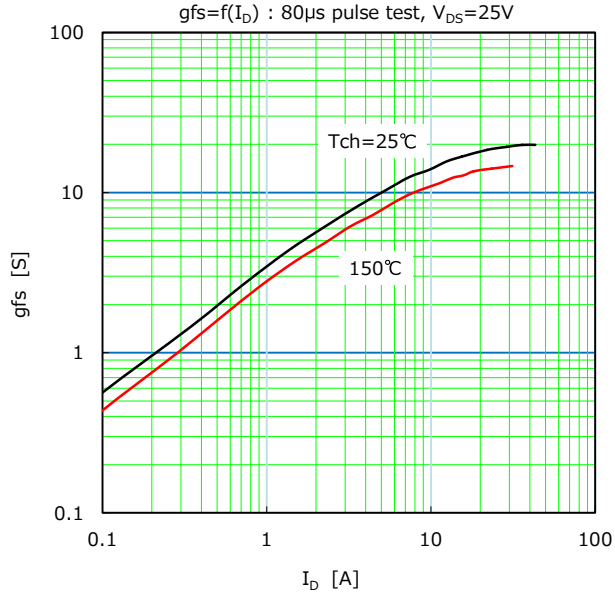
Gate Threshold Voltage vs. T_{ch}
$V_{GS(th)}=f(T_{ch})$: $V_{DS}=V_{GS}$, $I_D=1.22mA$



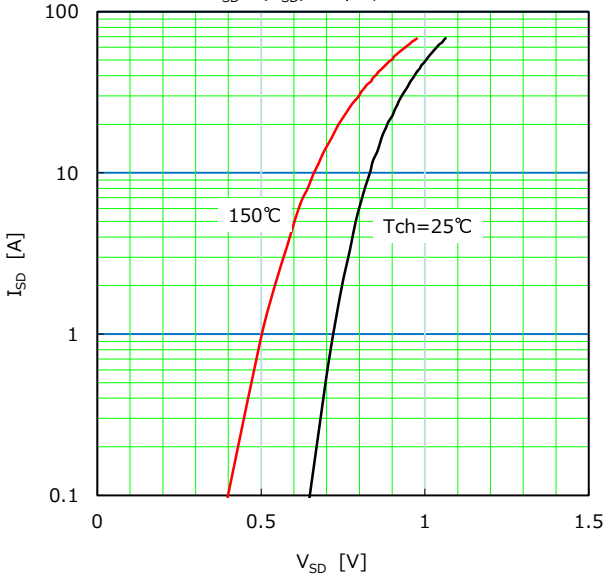
Typical Transfer Characteristic
$I_D=f(V_{GS})$: 80μs pulse test, $V_{DS}=25V$



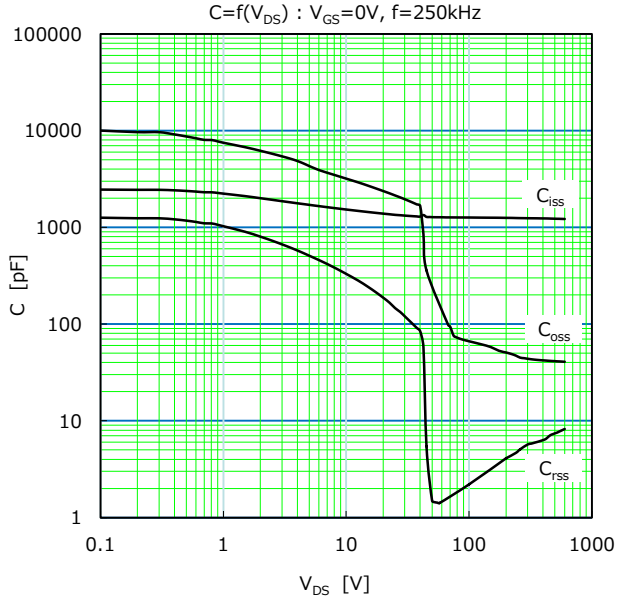
Typical Transconductance
$gfs=f(I_D)$: 80μs pulse test, $V_{DS}=25V$



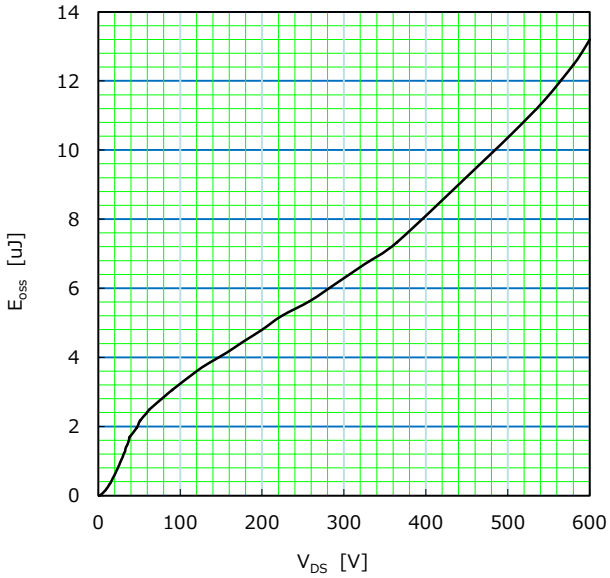
Typical Forward Characteristics of Reverse Diode
$I_{SD}=f(V_{SD})$:80 μs pulse test



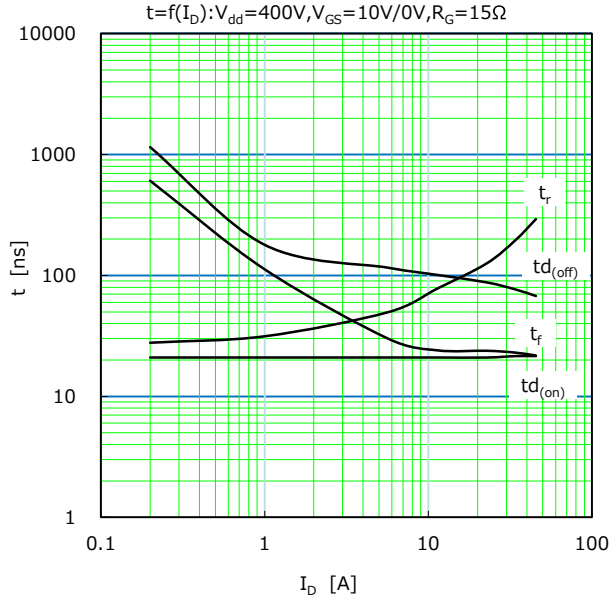
Typical Capacitance
C=f(V_{DS}) : V_{GS}=0V, f=250kHz



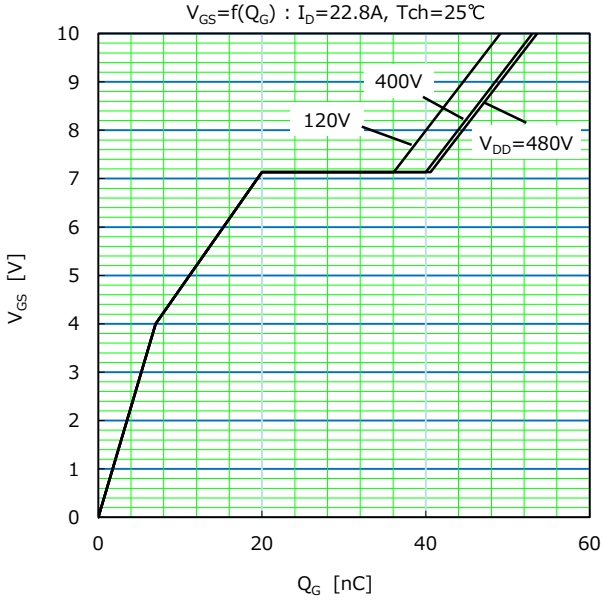
Typical C_{oss} stored energy



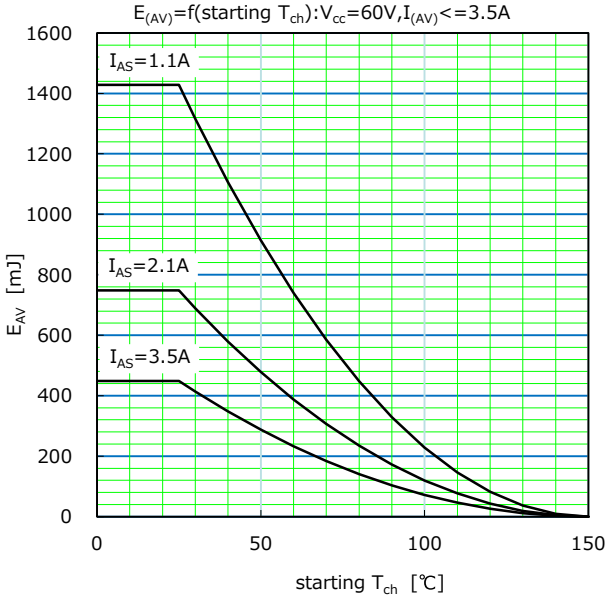
Typical Switching Characteristics vs. I_D T_{ch}=25℃
t=f(I_D):V_{dd}=400V,V_{GS}=10V/0V,R_G=15Ω



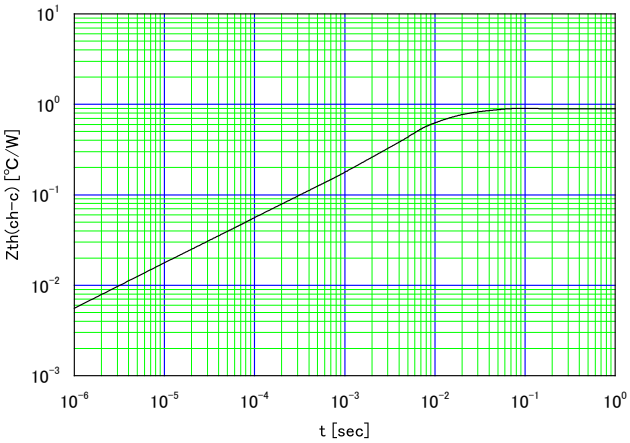
Typical Gate Charge Characteristics
V_{GS}=f(Q_G) : I_D=22.8A, Tch=25℃



Maximum Avalanche Energy vs. startingT_{ch}
$E_{(AV)}$=f(starting T_{ch}):V_{cc}=60V,$I_{(AV)}$<=3.5A



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



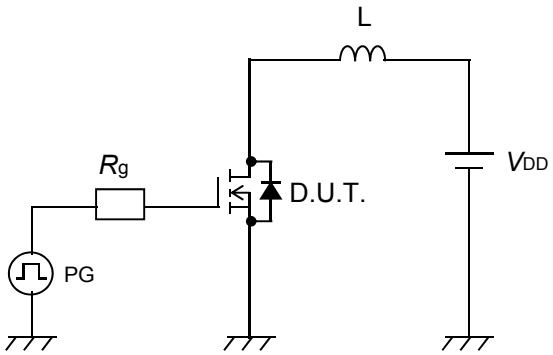


Fig.1 Avalanche Test circuit

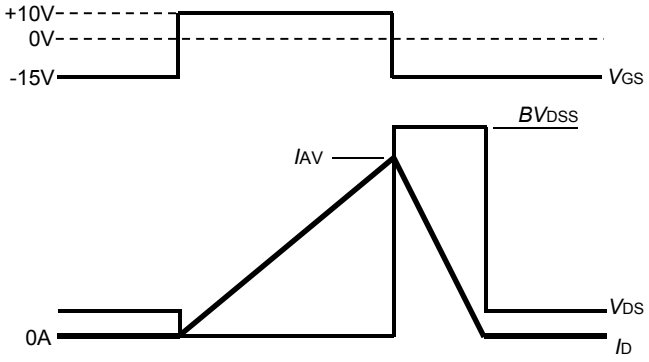


Fig.2 Operating waveforms of Avalanche Test

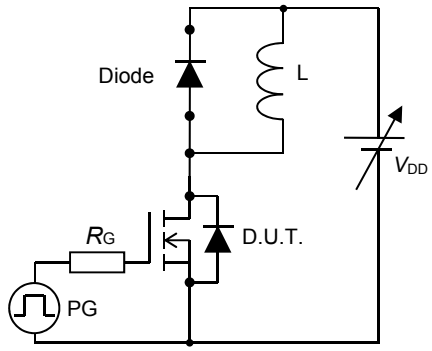


Fig.3 Switching Test circuit

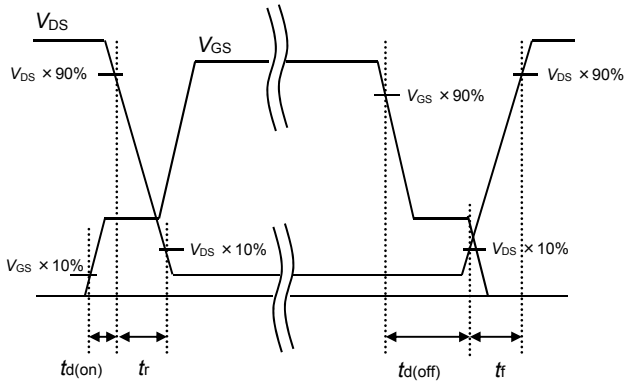


Fig.4 Operating waveform of Switching Test

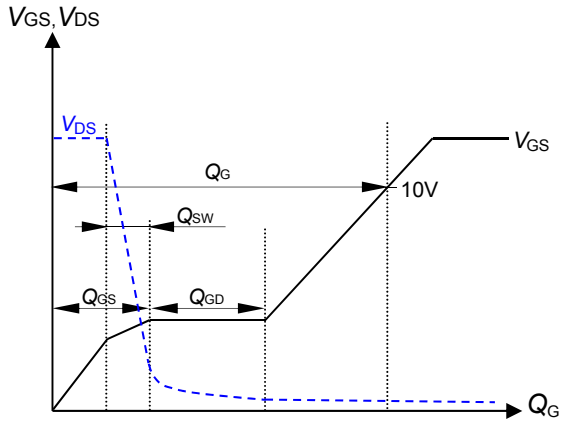


Fig.5 Operating waveform of Gate charge Test

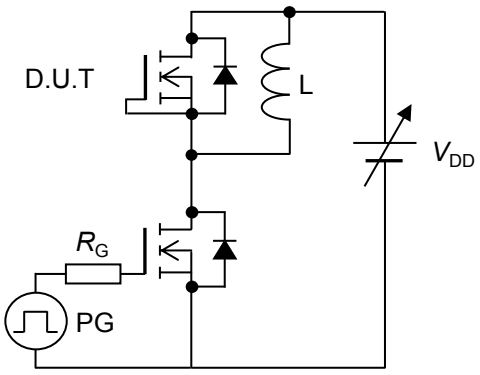


Fig.6 Reverse recovery Test circuit

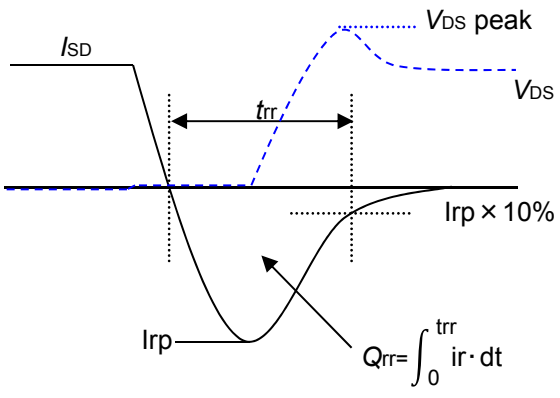
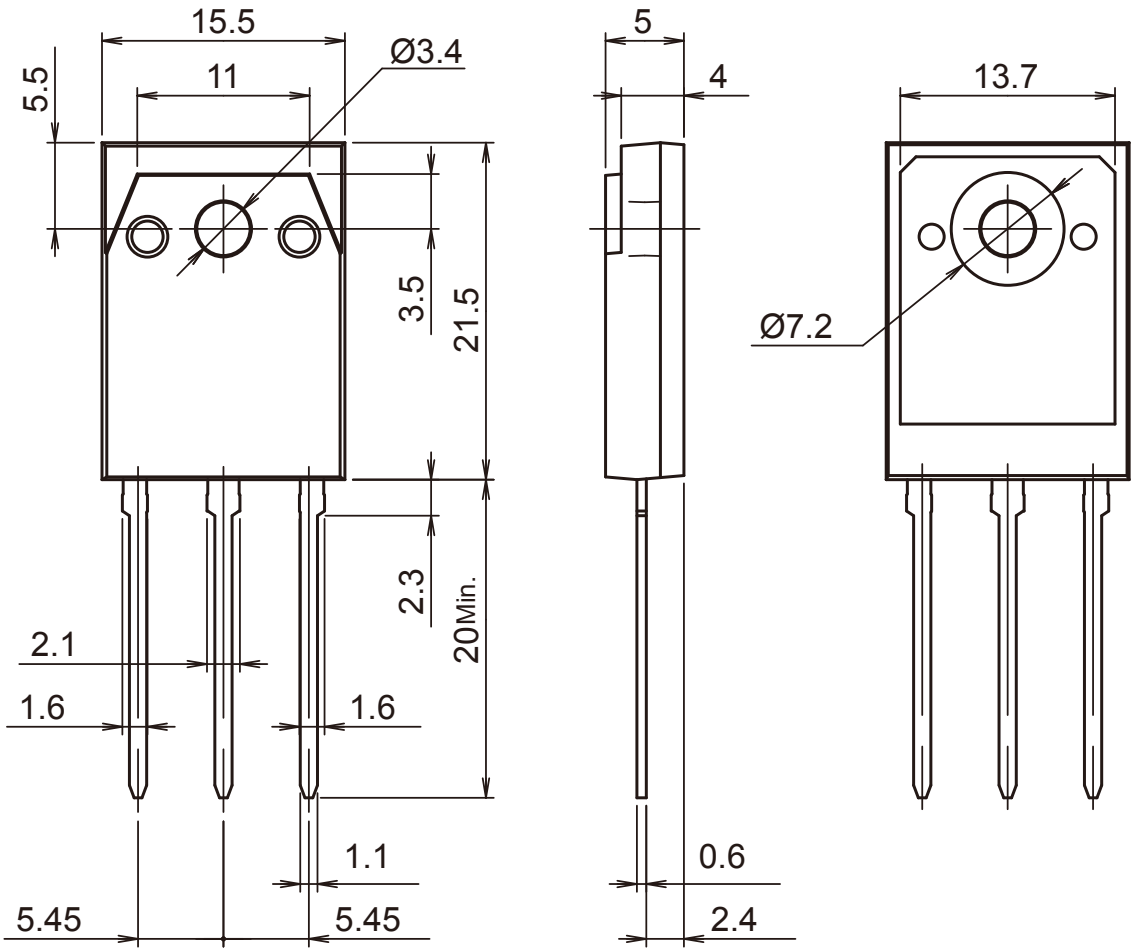


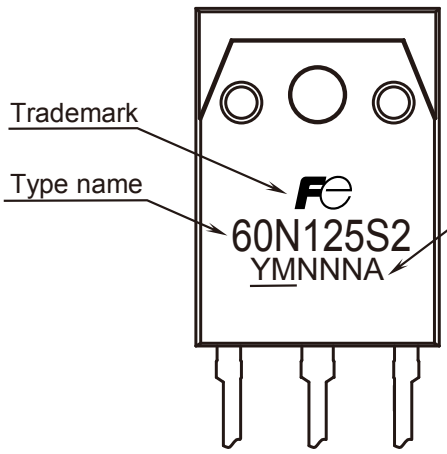
Fig.7 Operating waveform of Reverse recovery Test

Outview: TO-247 (Type: A) Package



DIMENSIONS ARE IN MILLIMETERS.

Marking



Date code & Lot No.

Y: Last digit of year
M: Month code 1～9 and O, N, D
NNN: Lot. serial number
A: For Automotive
Under bar of date code: means lead-free mark

* The font (font type,size) and the trademark size might be acutually different.

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   The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Data sheet, be sure to obtain the latest specifications.

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   • Traffic-signal control equipment • Gas leakage detectors with an auto-shut-off feature
   • Emergency equipment for responding to disasters and anti-burglary devices • Safety devices • Medical equipment

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