FMP20N60S1

FUJI POWER MOSFET

Super J-MOS series

N-Channel enhancement mode power MOSFET

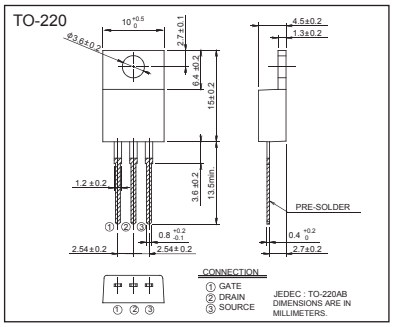
Features

Low on-state resistance
Low switching loss
easy to use (more controllabe switching dV/dt by R_g)

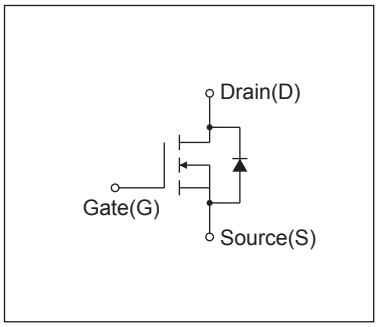
Applications

UPS
Server
Telecom
Power conditioner system
Power supply

Outline Drawings [mm]



Equivalent circuit schematic



Maximum Ratings and Characteristics

● **Absolute Maximum Ratings at T_c=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	±20	A	Tc=25°C Note*1
		±12.6	A	Tc=100°C Note*1
Pulsed Drain Current	I_{DP}	±60	A	
Gate-Source Voltage	V_{GS}	±30	V	
Repetitive and Non-Repetitive Maximum Avalanche Current	I_{AR}	6.6	A	Note *2
Non-Repetitive Maximum Avalanche Energy	E_{AS}	472.2	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	2.02	W	T_a=25°C
		150		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}=2A, L=216mH, V_{DD}=60V, R_G=50Ω, See Fig.1 and Fig.2
E_{AS} limited by maximum channel temperature and avalanche current.
Note *4 : I_F≤-I_D, -di/dt=100A/μs, V_{DD}≤400V, T_{ch}≤150°C.
Note *5 : I_F≤-I_D, dV/dt=15kV/μs, V_{DD}≤400V, T_{ch}≤150°C.

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

Static Ratings

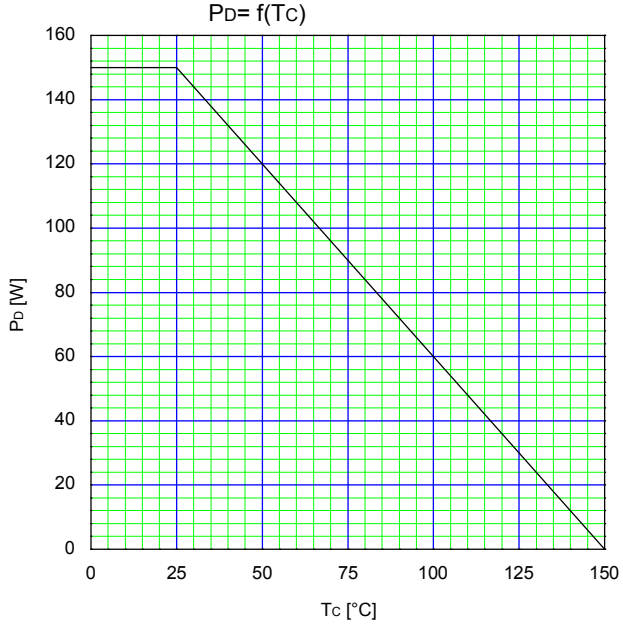
Description	Symbol	Conditions		min.	typ.	max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=250μA V_{GS}=0V		600	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	I_D=250μA V_{DS}=V_{GS}		2.5	3	3.5	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=600V V_{GS}=0V	T_{ch}=25°C	-	-	25	μA
		V_{DS}=480V V_{GS}=0V	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=10A V_{GS}=10V		-	0.161	0.19	Ω
Gate resistance	R_G	f=1MHz, open drain		-	3.7	-	Ω
Forward Transconductance	g_{fs}	I_D=10A V_{DS}=25V		8.5	17.5	-	S
Input Capacitance	C_{iss}	V_{DS}=10V V_{GS}=0V f=1MHz		-	1470	-	pF
Output Capacitance	C_{oss}			-	3120	-	
Reverse Transfer Capacitance	C_{rss}			-	280	-	
Effective output capacitance, energy related (Note *6)	$C_{o(er)}$	V_{GS}=0V V_{DS}=0…480V		-	90	-	
Effective output capacitance, time related (Note *7)	$C_{o(tr)}$	V_{GS}=0V V_{DS}=0…480V ID=constant		-	305	-	
Turn-On Time	$t_{d(on)}$	V_{DD}=400V, V_{GS}=10V I_D=10A, R_G=27Ω See Fig.3 and Fig.4		-	22	-	ns
	t_r			-	40	-	
Turn-Off Time	$t_{d(off)}$			-	162	-	
	t_f			-	22	-	
Total Gate Charge	Q_G	V_{DD}=480V, I_D=20A V_{GS}=10V See Fig.5		-	48	-	nC
Gate-Source Charge	Q_{GS}			-	12.5	-	
Gate-Drain Charge	Q_{GD}			-	15	-	
Drain-Source crossover Charge	Q_{SW}			-	8	-	
Avalanche Capability	I_{AV}	L=6.02mH, T_{ch}=25°C See Fig.1 and Fig.2		6.6	-	-	A
Diode Forward On-Voltage	V_{SD}	I_F=20A, V_{GS}=0V T_{ch}=25°C		-	0.9	1.35	V
Reverse Recovery Time	t_{rr}	I_F=20A, V_{GS}=0V V_{DD}=400V -di/dt=100A/μs T_{ch}=25°C See Fig.6			370	-	ns
Reverse Recovery Charge	Q_{rr}			-	6.2	-	μC
Peak Reverse Recovery Current	I_{rp}			-	32	-	A

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 80% BV_{DSS}.
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 80% BV_{DSS}.

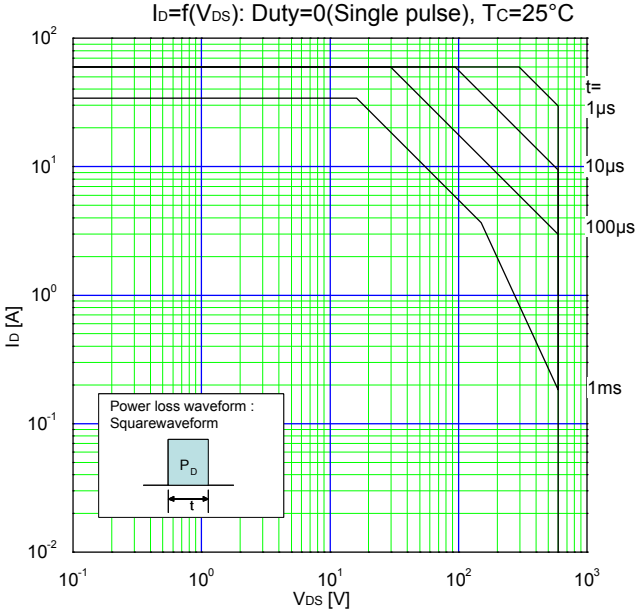
● Thermal Characteristics

Description	Symbol	min.	typ.	max.	Unit
Channel to Case	$R_{th(ch-c)}$			0.83	°C/W
Channel to Ambient	$R_{th(ch-a)}$			62	°C/W

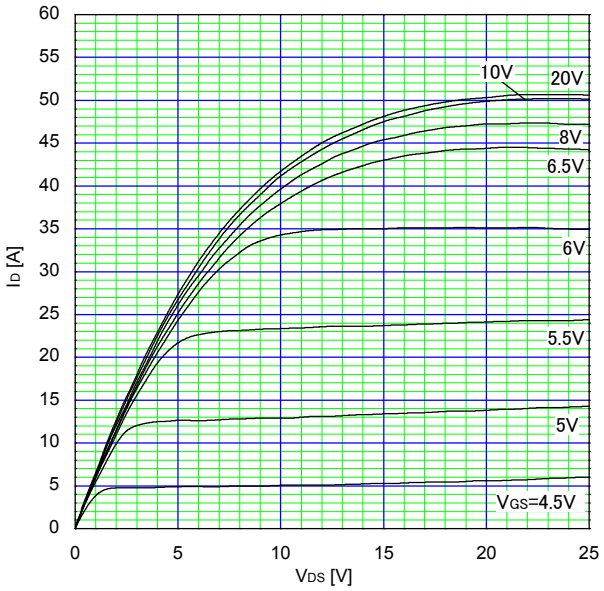
Allowable Power Dissipation
P_D= f(T_C)



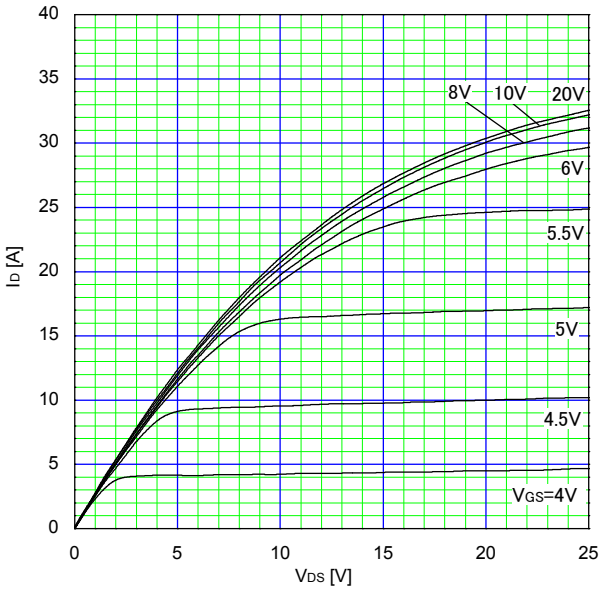
Safe Operating Area
I_D=f(V_{DS}): Duty=0(Single pulse), T_C=25°C



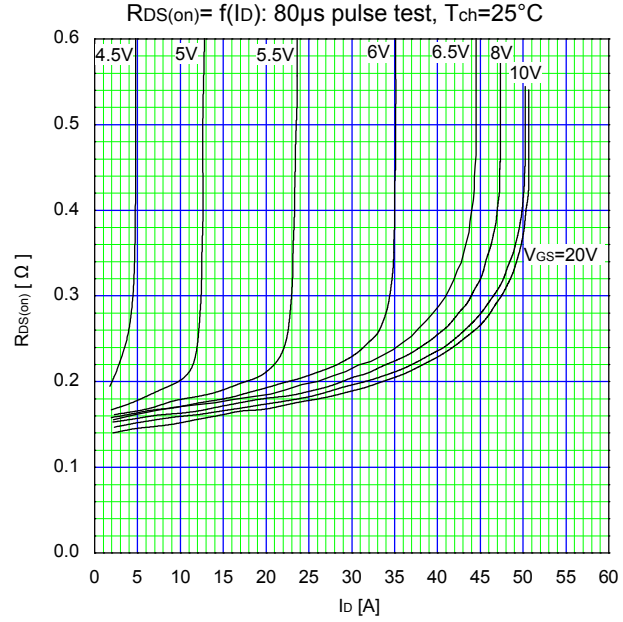
Typical Output Characteristics
I_D=f(V_{DS}): 80µs pulse test, T_{ch}=25°C



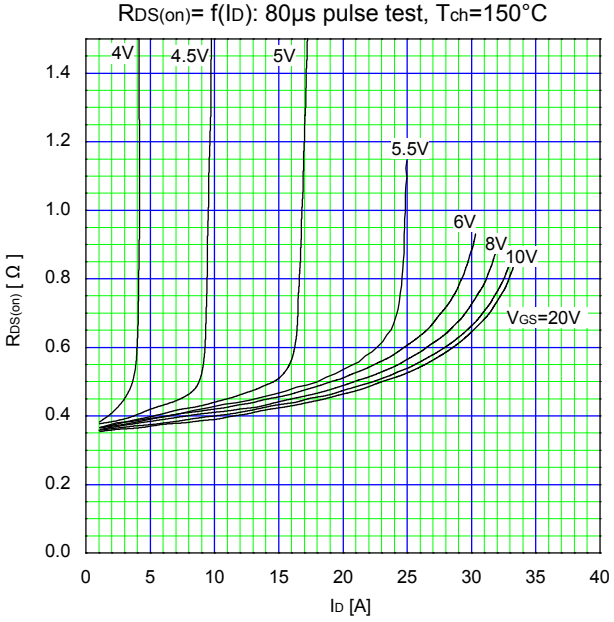
Typical Output Characteristics
I_D=f(V_{DS}): 80µs pulse test, T_{ch}=150°C



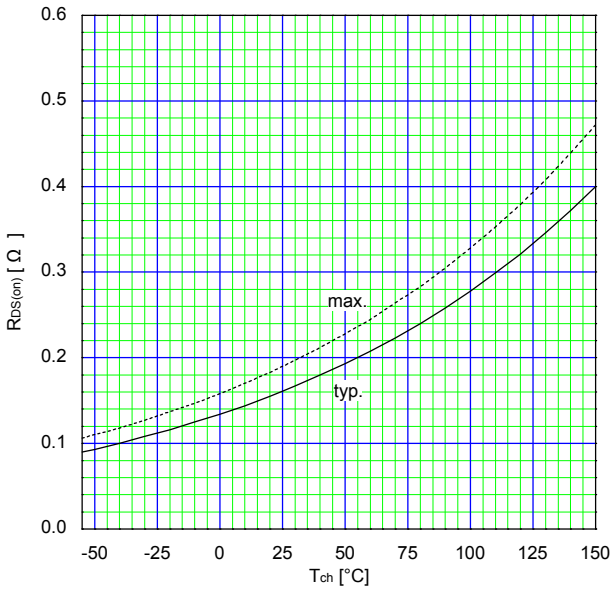
Typical Drain-Source on-state Resistance
$R_{DS(on)}$= f(I_D): 80µs pulse test, T_{ch}=25°C



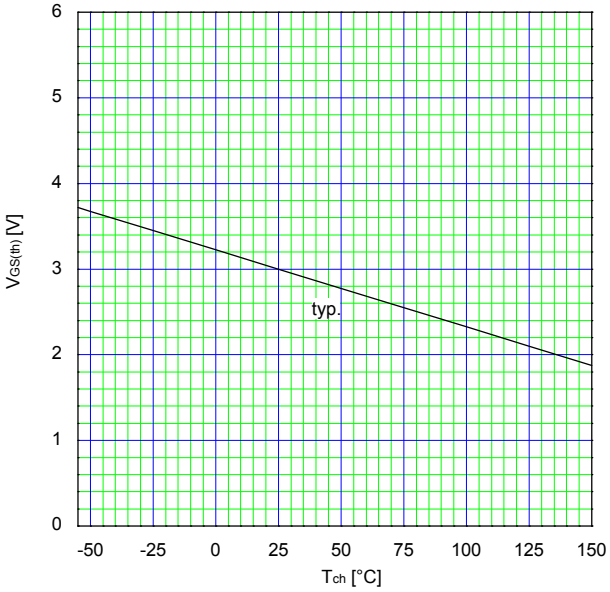
Typical Drain-Source on-state Resistance
$R_{DS(on)}$= f(I_D): 80µs pulse test, T_{ch}=150°C



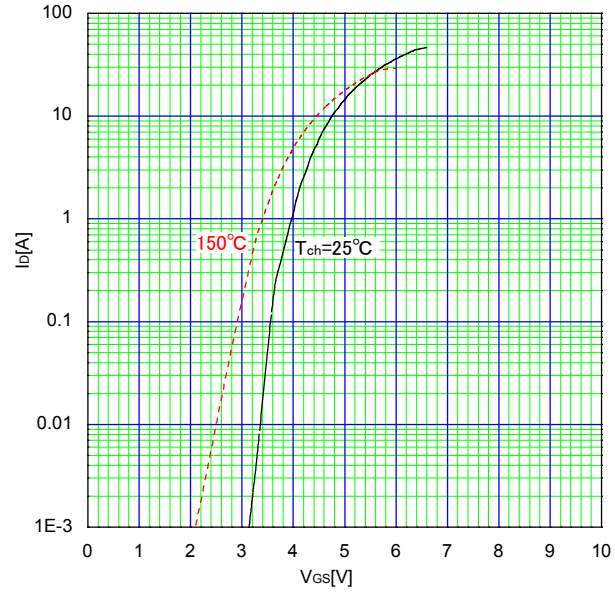
Drain-Source On-state Resistance
$R_{DS(on)}$= f(T_{ch}): I_D=10A, V_{GS}=10V



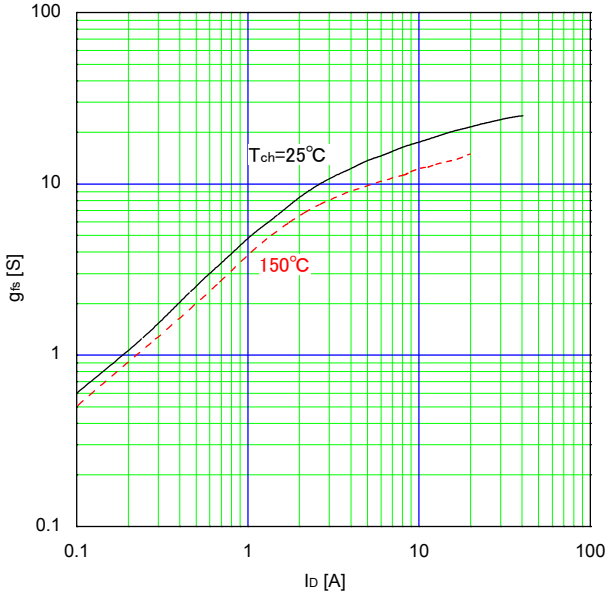
Gate Threshold Voltage vs. Tch
$V_{GS(th)}$= f(T_{ch}): V_{DS}= V_{GS}, I_D= 250μA



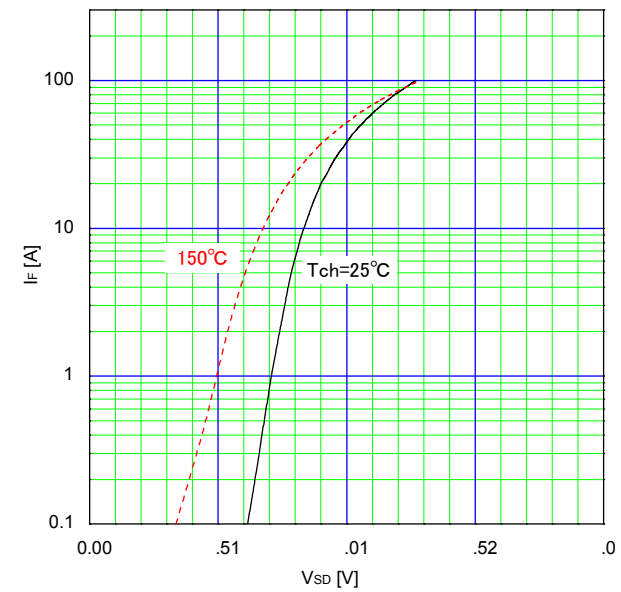
Typical Transfer Characteristic
I_D= f(V_{GS}): 80μs pulse test, V_{DS}=25V



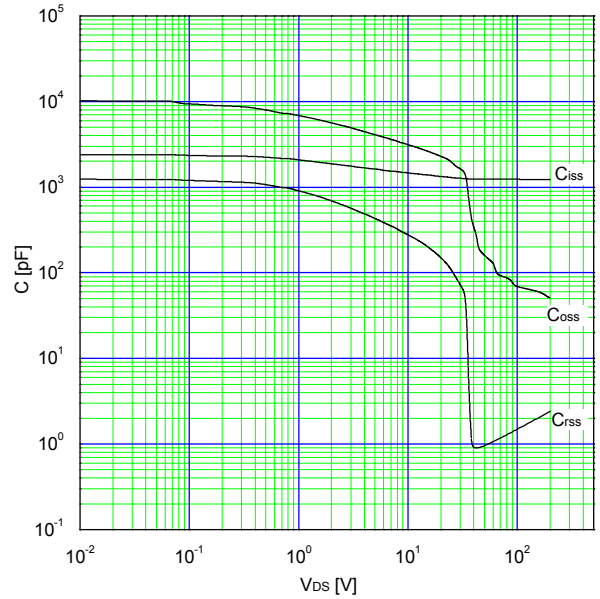
Typical Transconductance
g_{fs}= f(I_D):80μs pulse test, V_{DS}=25V



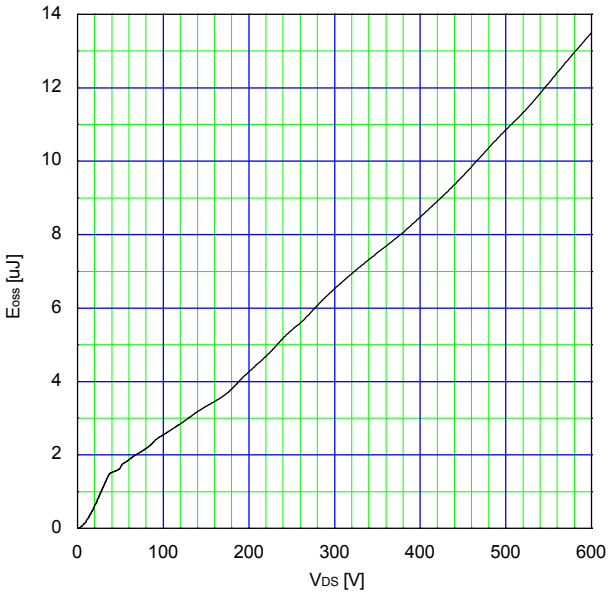
Typical Forward Characteristics of Reverse Diode
I_F= f(V_{SD}): 80μs pulse test



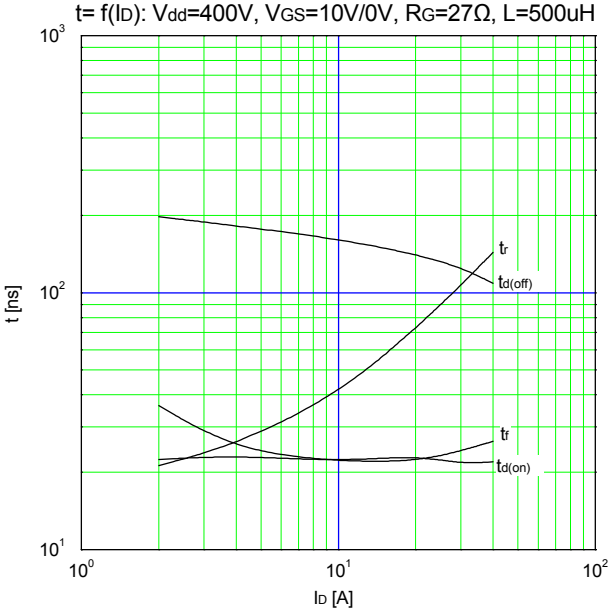
Typical Capacitance
C= f(V_{DS}): V_{GS}=0V, f=1MHz



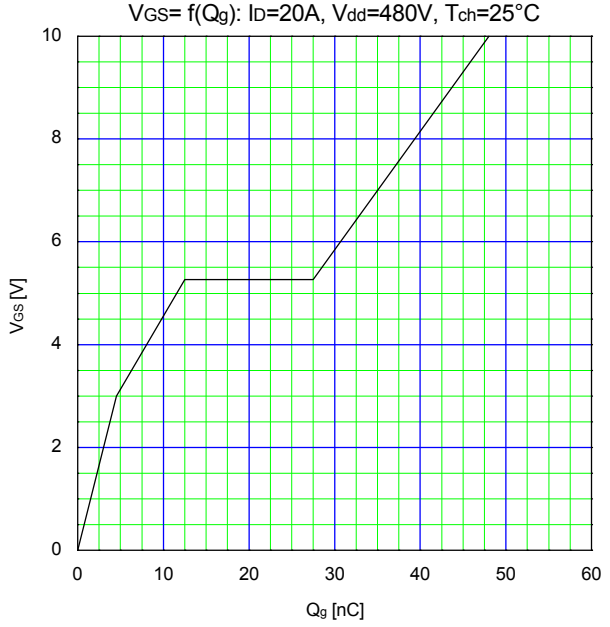
Typical Coss stored energy



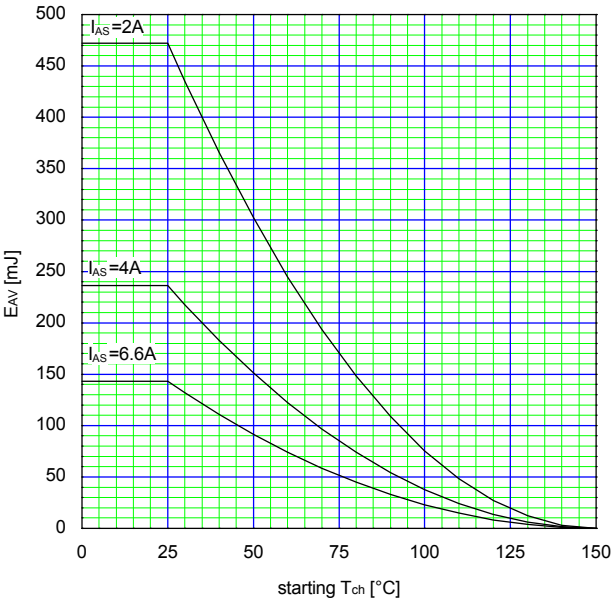
Typical Switching Characteristics vs. ID Tch=25
t= f(ID): Vdd=400V, VGS=10V/0V, RG=27Ω, L=500uH



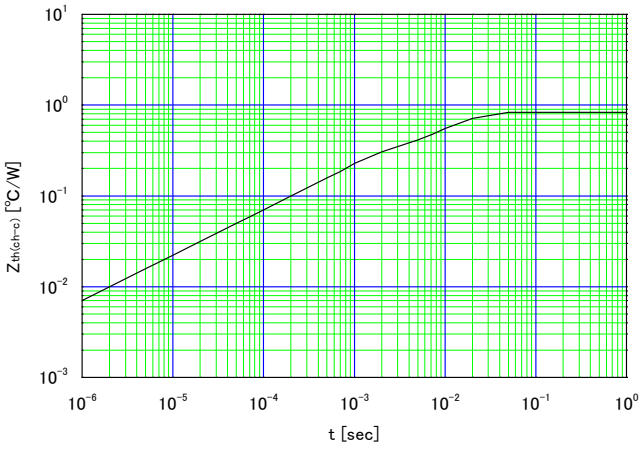
Typical Gate Charge Characteristics
VGS= f(Qg): ID=20A, Vdd=480V, Tch=25°C



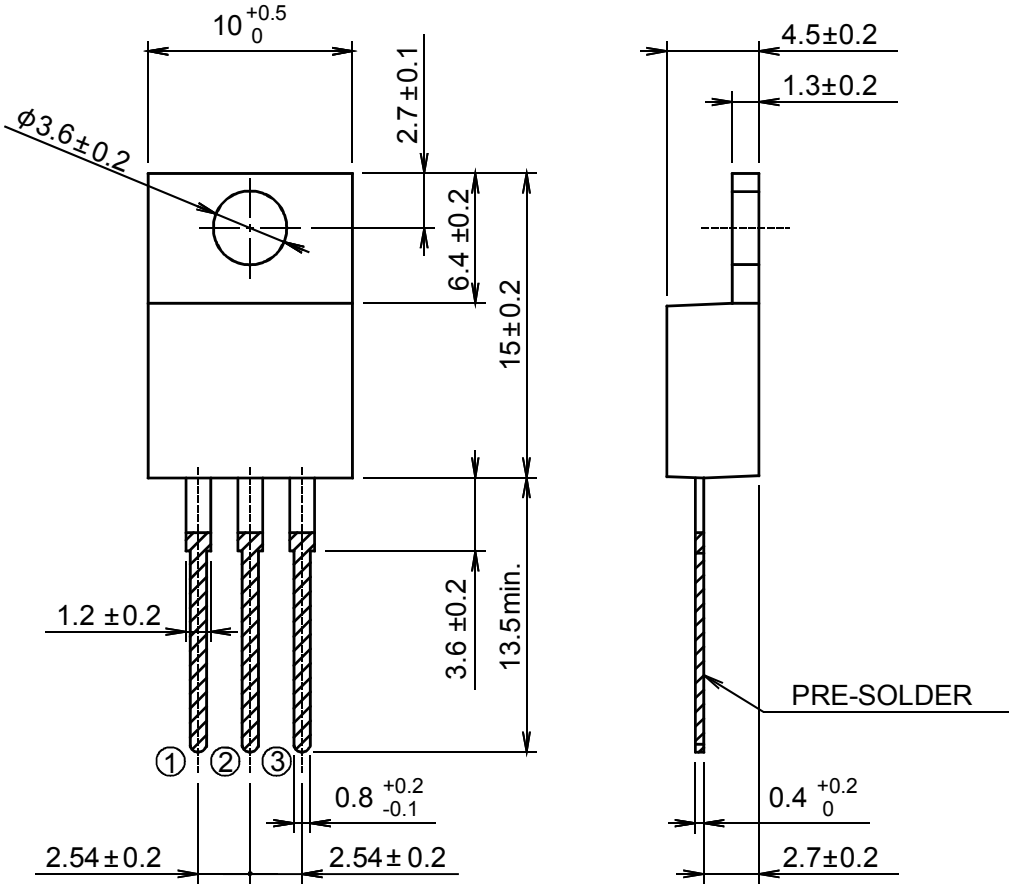
Maximum Avalanche Energy vs. startingTch
E(AV)= f(starting Tch): VCC=60V, I(AV)<=6.6A

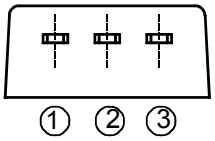


Transient Thermal Impedance
Zth(ch-c)= f(t): D=0



■ Outview: TO-220 Package



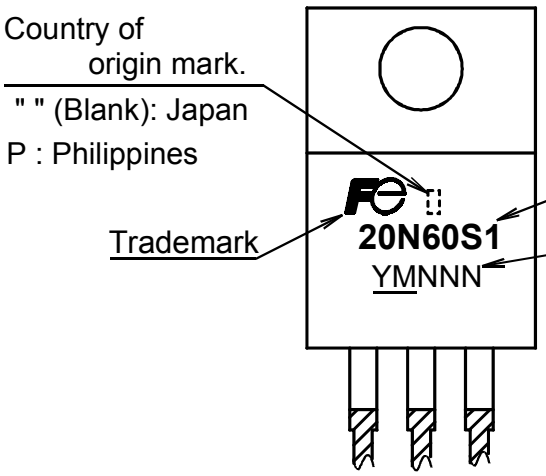


CONNECTION

① GATE
② DRAIN
③ SOURCE

JEDEC : TO-220AB
DIMENSIONS ARE IN MILLIMETERS.

■ Marking



Type name

Date code & Lot No.

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

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

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- Measurement equipment
- Machine tools
- Audiovisual equipment
- Electrical home appliances
- Personal equipment
- Industrial robots etc.

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- Gas leakage detectors with an auto-shut-off feature
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- Safety devices
- Medical equipment

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