FMW20N60S1HF

FUJI POWER MOSFET

Super J-MOS series

N-Channel enhancement mode power MOSFET

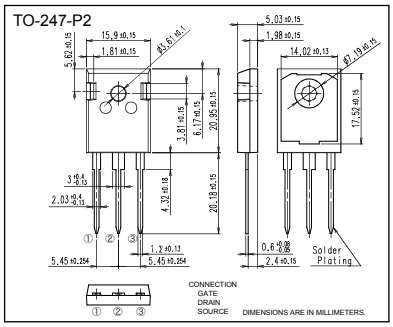
Features

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

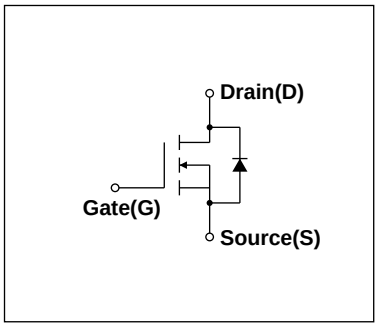
Applications

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	2.5	W	T_a=25°C
		140		Tc=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

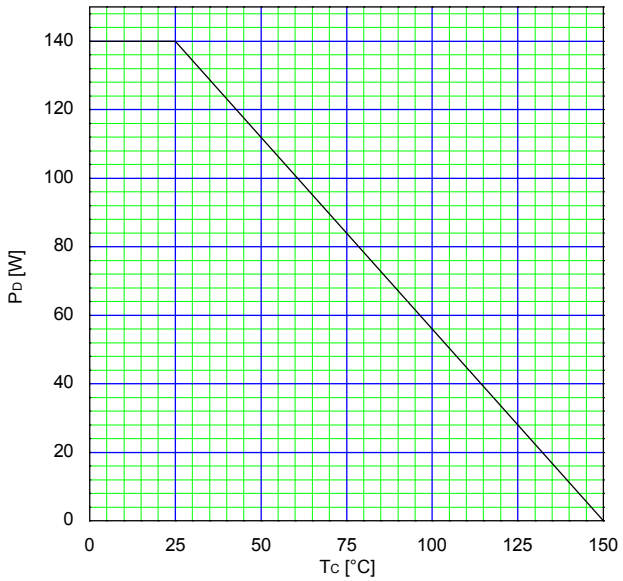
Description	Symbol	Conditions		min.	typ.	max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=250μA V_{GS}=0V		600	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	I_D=250μA V_{DS}=V_{GS}		2.5	3	3.5	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=600V V_{GS}=0V	T_{ch}=25°C	-	-	25	μA
		V_{DS}=480V V_{GS}=0V	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}.

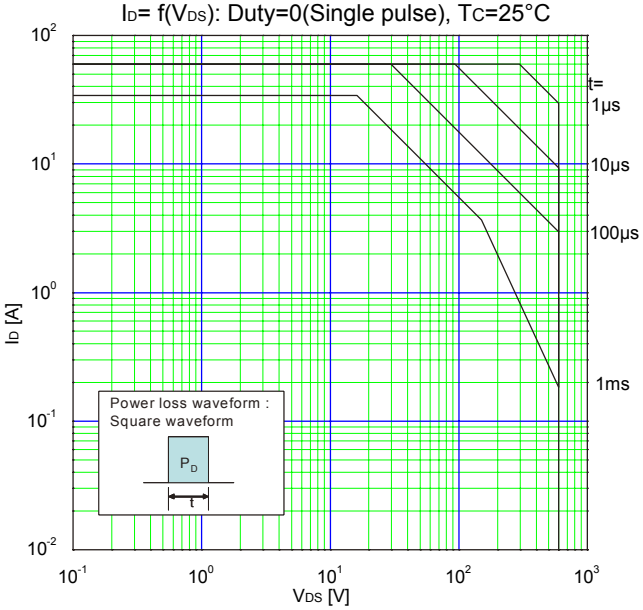
● Thermal Characteristics

Description	Symbol	min.	typ.	max.	Unit
Channel to Case	$R_{th(ch-c)}$			0.89	°C/W
Channel to Ambient	$R_{th(ch-a)}$			50	°C/W

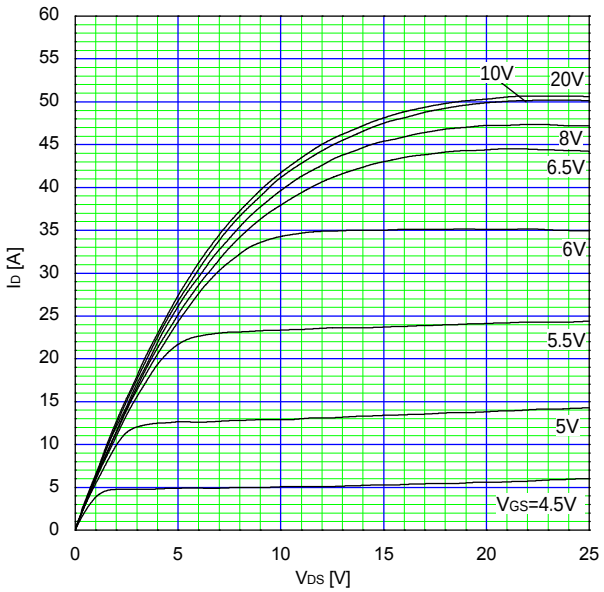
Allowable Power Dissipation
P_D= f(T_C)



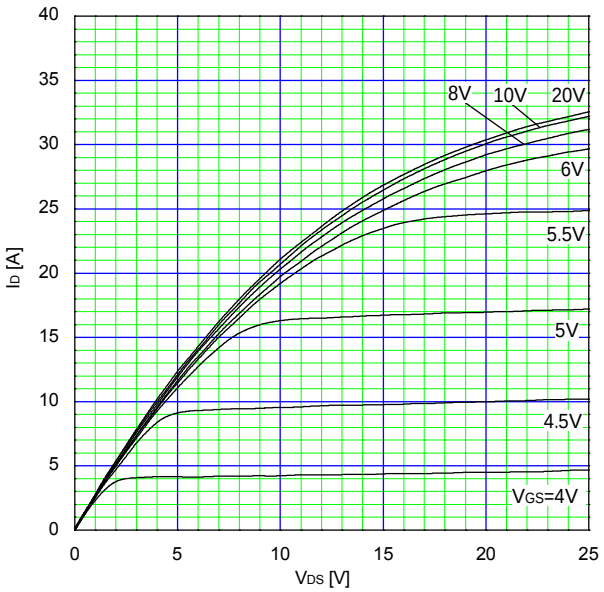
Safe Operating Area
I_D= f(V_{DS}): Duty=0(Single pulse), T_C=25°C



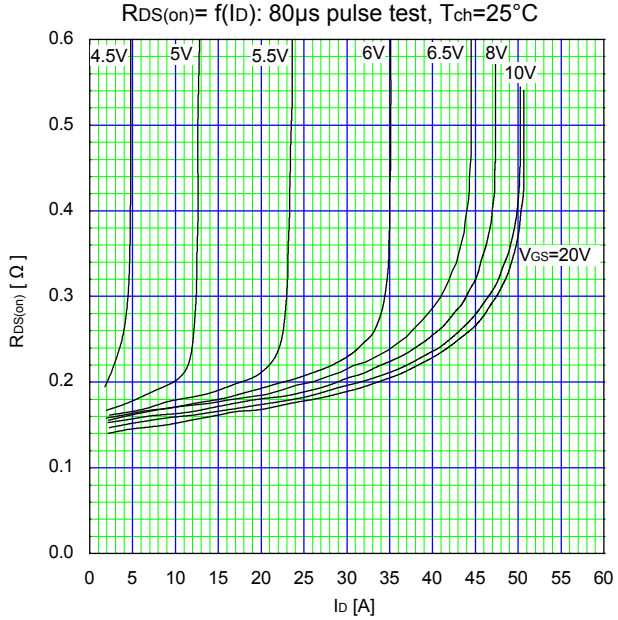
Typical Output Characteristics
I_D= f(V_{DS}): 80µs pulse test, T_{ch}=25°C



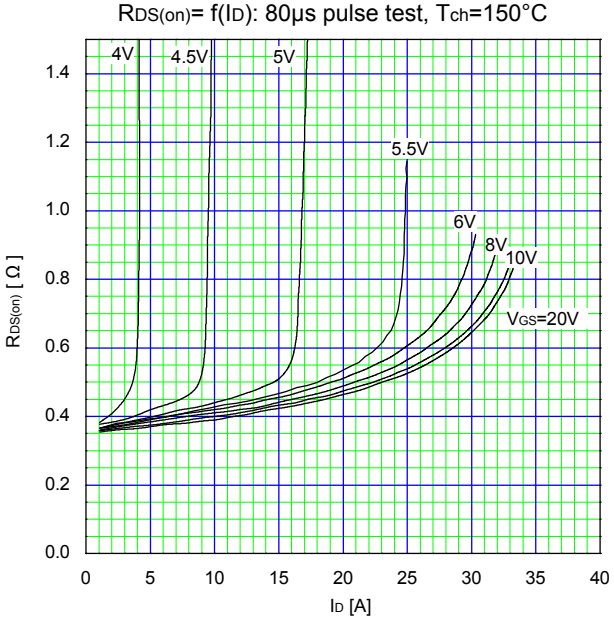
Typical Output Characteristics
I_D= f(V_{DS}): 80µs pulse test, T_{ch}=150°C



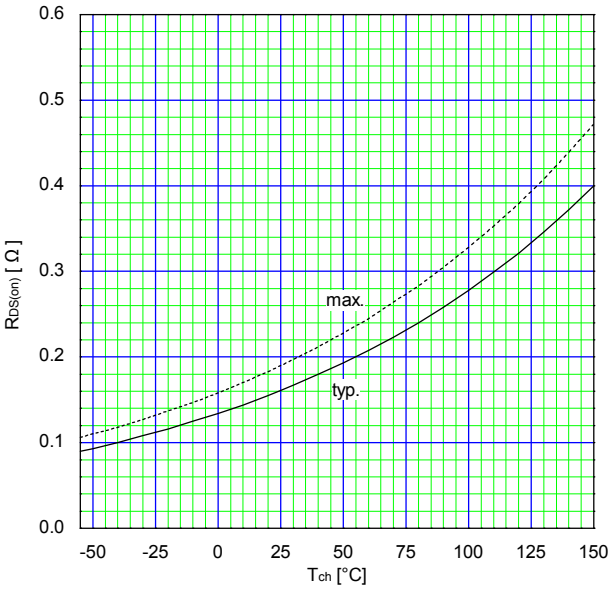
Typical Drain-Source on-state Resistance
$R_{DS(on)}$= f(I_D): 80µs pulse test, T_{ch}=25°C



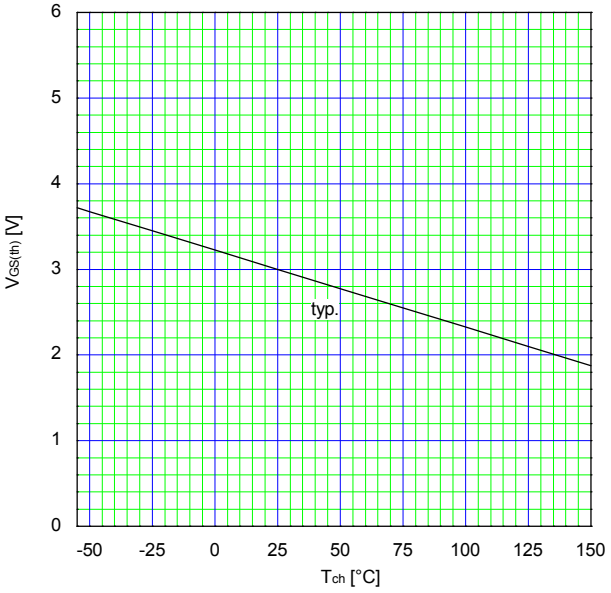
Typical Drain-Source on-state Resistance
$R_{DS(on)}$= f(I_D): 80µs pulse test, T_{ch}=150°C



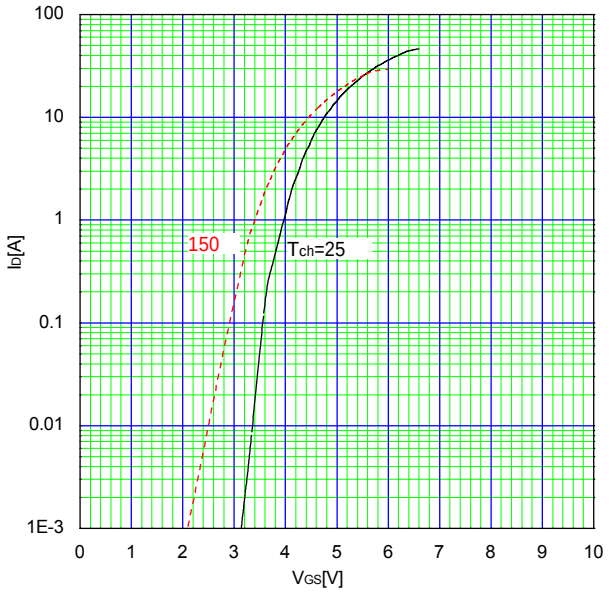
Drain-Source On-state Resistance
$R_{DS(on)}$= f(T_{ch}): I_D=10A, V_{GS}=10V



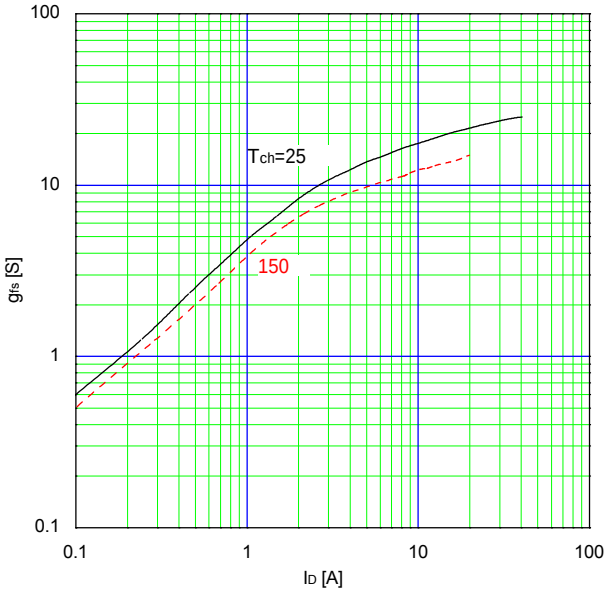
Gate Threshold Voltage vs. Tch
$V_{GS(th)}$= f(T_{ch}): V_{DS}=V_{GS}, I_D=250μA



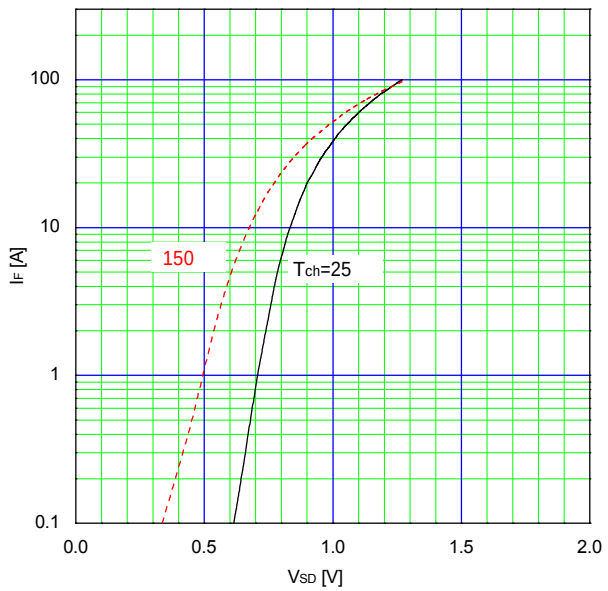
Typical Transfer Characteristic
I_D= f(V_{GS}): 80μs pulse test, V_{DS}=25V



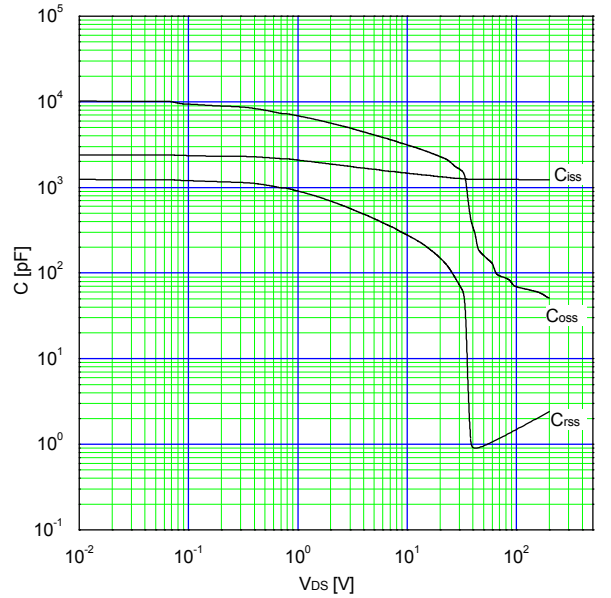
Typical Transconductance
g_{fs}= f(I_D): 80μs pulse test, V_{DS}=25V



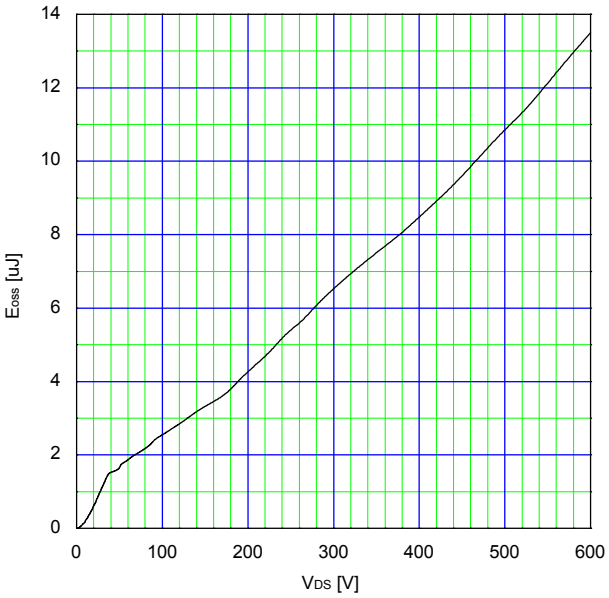
Typical Forward Characteristics of Reverse Diode
I_F= f(V_{SD}): 80μs pulse test



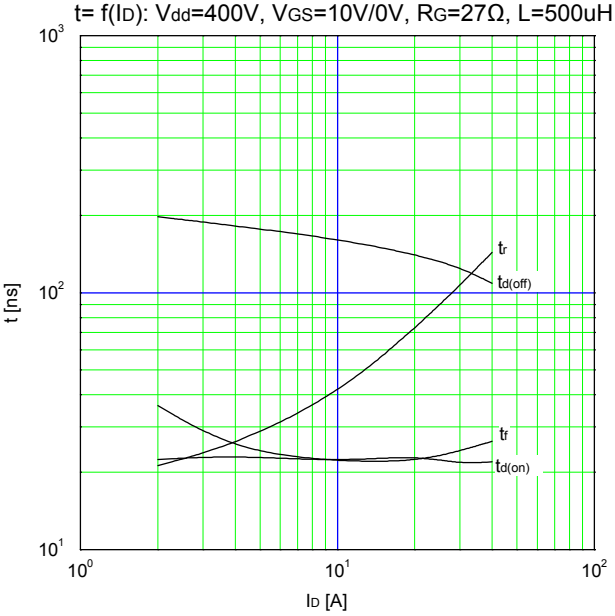
Typical Capacitance
C= f(V_{DS}): V_{GS}=0V, f=1MHz



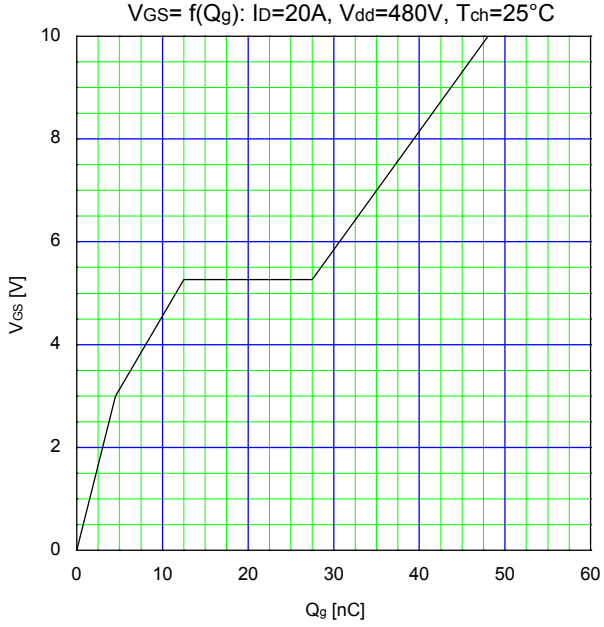
Typical Coss stored energy



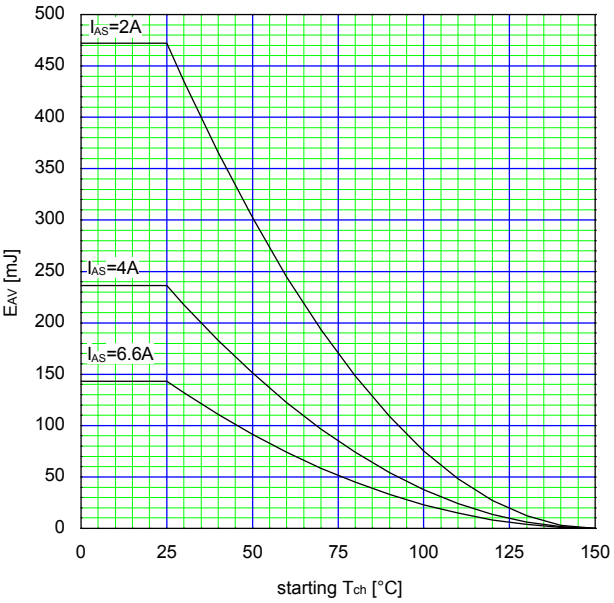
Typical Switching Characteristics vs. ID Tch=25°C
t= f(ID): Vdd=400V, VGS=10V/0V, RG=27Ω, L=500uH



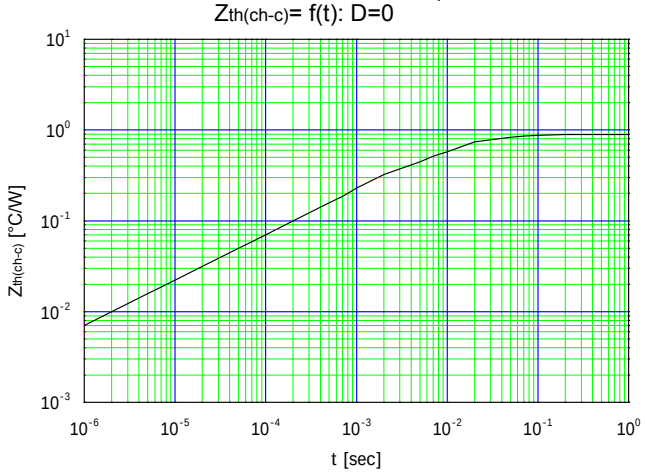
Typical Gate Charge Characteristics
VGS= f(Qg): ID=20A, Vdd=480V, Tch=25°C



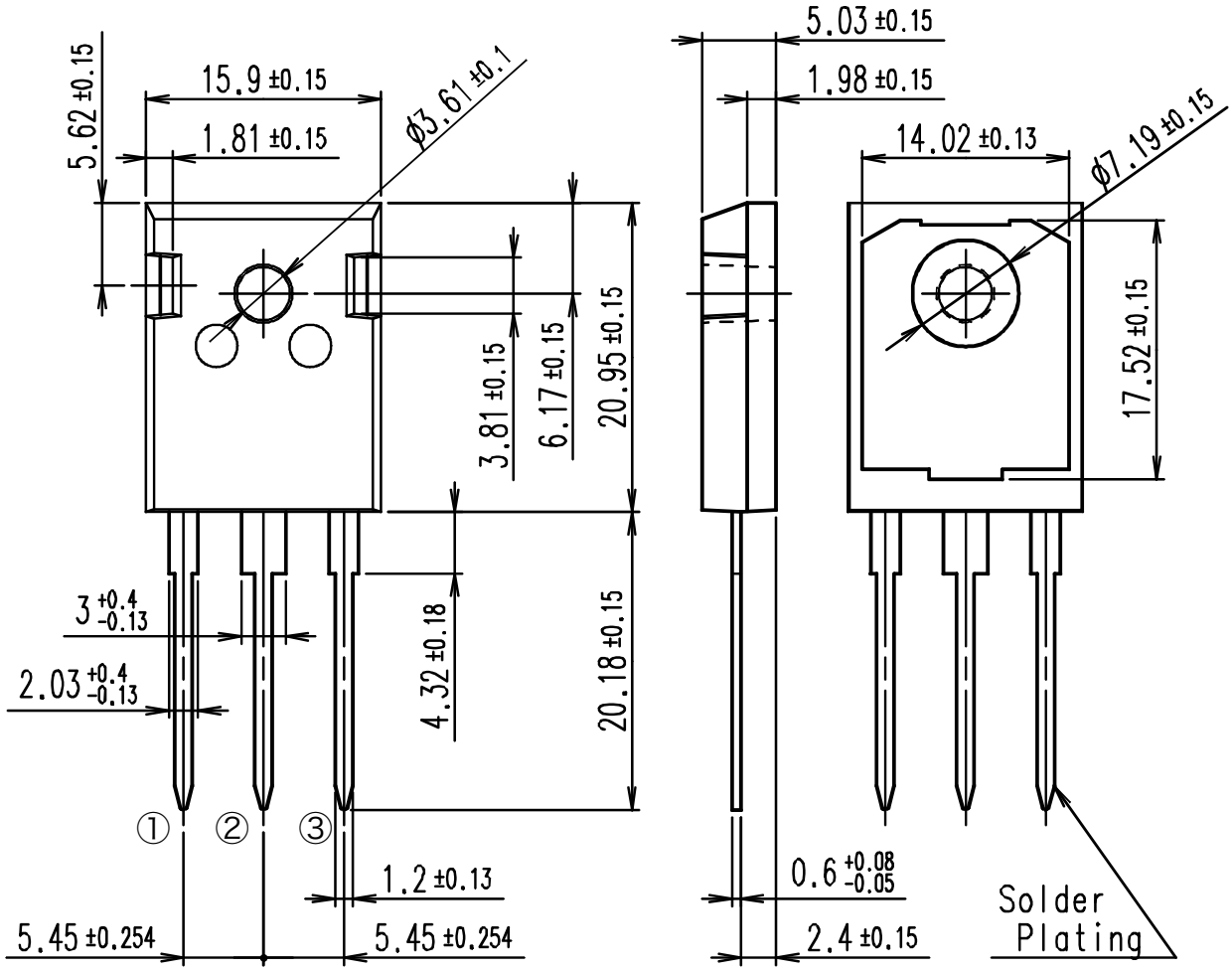
Maximum Avalanche Energy vs. startingTch
E(AV)= f(starting Tch): VCC=60V, I(AV)<=6.6A

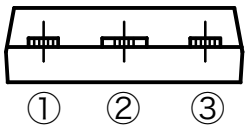


Transient Thermal Impedance
Zth(ch-c)= f(t): D=0



■ Outview: TO-247-P2 Package

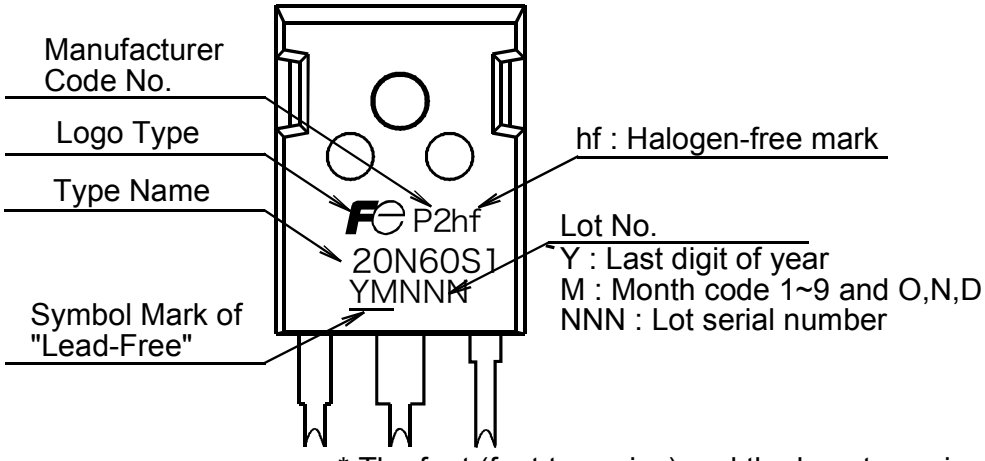




CONNECTION
GATE
DRAIN
SOURCE

DIMENSIONS ARE IN MILLIMETERS.

■ Marking



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

WARNING

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of February 2012.
The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sur to obtain the latest specifications.

2. All applications described in this Catalog exemplify the use of Fuji's products for your reference only. No right or license, either express or implied, under any patent, copyright, 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 the equipment from causing a physical injury, fire, or other problem if any of the products become faulty. It is recommended to make your design failsafe, flame retardant, and free of malfunction.

4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
- Computers
- OA equipment
- Communications equipment (terminal devices)
- Measurement equipment
- Machine tools
- Audiovisual equipment
- Electrical home appliances
- Personal equipment
- Industrial robots etc.

5. If you need to use a product in this Catalog for equipment requiring 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 the equipment becomes faulty.
- Transportation equipment (mounted on cars and ships)
- Trunk communications equipment
- 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

6. Do not use products in this Catalog for the equipment requiring strict reliability such as the following and equivalents to strategic equipment (without limitation).
- Space equipment
- Aeronautic equipment
- Nuclear control equipment
- Submarine repeater equipment

8. If you have any question about any portion in this Catalog, 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.