Fuji Electric

Innovating Energy Technology

FGW15N120HD

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Discrete IGBT

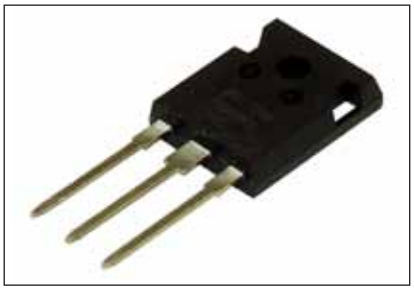
Discrete IGBT (High-Speed V series)
1200V / 15A

Features

Low power loss
Low switching surge and noise
High reliability, high ruggedness (RBSOA, SCSOA etc.)

Applications

Uninterruptible power supply
Power coditionner
Power factor correction circuit



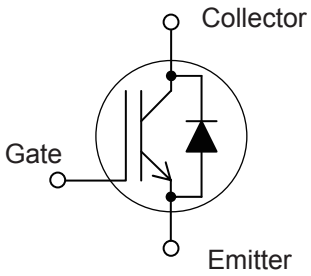
Maximum Ratings and Characteristics

● **Absolute Maximum Ratings (at T_c=25°C unless otherwise specified)**

Items	Symbols	Characteristics	Units	Remarks
Collector-Emitter Voltage	V_{CES}	1200	V	
Gate-Emitter Voltage	V_{GES}	±20	V	
DC Collector Current	$I_{C@25}$	31	A	T_C=25°C,T_j=150°C
	$I_{C@100}$	15	A	T_C=100°C,T_j=150°C
Pulsed Collector Current	I_{CP}	45	A	Note *1
Turn-Off Safe Operating Area	-	45	A	V_{CE}≤1200V,T_j≤175°C
Diode Forward Current	$I_{F@25}$	22	A	
	$I_{F@100}$	12	A	
Diode Pulsed Current	I_{FP}	45	A	Note *1
Short Circuit Withstand Time	t_{SC}	5	μs	V_{CC}≤600V,V_{GE}=12V T_j≤150°C
IGBT Max. Power Dissipation	P_{D_IGBT}	155	W	T_C=25°C
FWD Max. Power Dissipation	P_{D_FWD}	75		T_C=25°C
Operating Junction Temperature	T_j	-40 ~ +175	°C	
Storage Temperature	T_{stg}	-55 ~ +175	°C	

Note *1 : Pulse width limited by Tjmax.

Equivalent circuit



● **Electrical characteristics (at T_j= 25°C unless otherwise specified)**

Items	Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	I_C = 50μA, V_{GE} = 0V		1200	-	-	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V	T_j=25°C	-	-	250	μA
			T_j=175°C	-	-	2	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V		-	-	200	nA
Gate-Emitter Threshold Voltage	$V_{GE\ (th)}$	V_{CE} = +20V, I_C = 15mA		4.0	5.0	6.0	V
Collector-Emitter Saturation Voltage	$V_{CE\ (sat)}$	V_{GE} = +15V, I_C = 15A	T_j=25°C	-	1.8	2.34	V
			T_j=175°C	-	2.3	-	
Input Capacitance	C_{ies}	V_{CE}=25V		-	1365	-	pF
Output Capacitance	C_{oes}	V_{GE}=0V		-	50	-	
Reverse Transfer Capacitance	C_{res}	f=1MHz		-	45	-	
Gate Charge	Q_G	V_{CC} = 600V I_C = 15A V_{GE} = 15V		-	140	-	nC
Turn-On Delay Time	$t_{d(on)}$	T_j = 25°C		-	20	-	ns
Rise Time	t_r	V_{CC} = 600V		-	15	-	
Turn-Off Delay Time	$t_{d(off)}$	I_C = 15A		-	180	-	
Fall Time	t_f	V_{GE} = 15V		-	35	-	
Turn-On Energy	E_{on}	R_G = 10Ω		-	0.6	-	mJ
Turn-Off Energy	E_{off}	L = 500μH Energy loss include “tail” and FWD reverse recovery.		-	0.8	-	
Turn-On Delay Time	$t_{d(on)}$	T_j = 175°C		-	25	-	ns
Rise Time	t_r	V_{CC} = 600V		-	17	-	
Turn-Off Delay Time	$t_{d(off)}$	I_C = 15A		-	220	-	
Fall Time	t_f	V_{GE} = 15V		-	60	-	
Turn-On Energy	E_{on}	R_G = 10Ω		-	1.2	-	mJ
Turn-Off Energy	E_{off}	L = 500μH Energy loss include “tail” and FWD reverse recovery.		-	1.2	-	

● FWD Characteristics

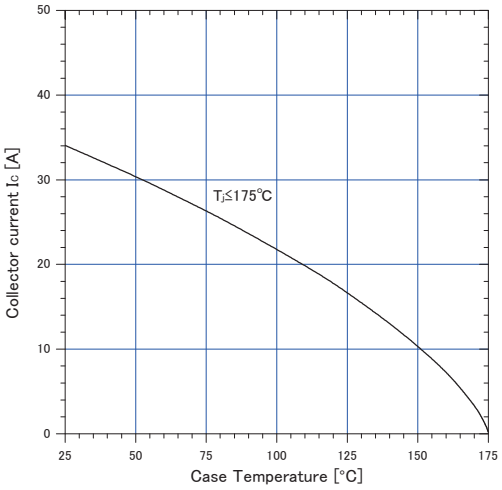
Description	Symbol	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Unit
Forward Voltage Drop	V_F	I_F=12A	T_j=25°C	-	2.2	2.8	V
			T_j=175°C	-	1.8	-	V
Diode Reverse Recovery Time	t_{rr1}	V_{CC}=30V,I_F = 1.2A -di/dt=200A/μs		-	33	-	ns
Diode Reverse Recovery Time	t_{rr2}	V_{CC}=600V I_F=12A -di$_F$/dt=200A/μs T_j=25°C			0.30	-	μs
Diode Reverse Recovery Charge	Q_{rr}			-	0.60	-	μC
Diode Reverse Recovery Time	t_{rr2}	V_{CC}=600V I_F=12A -di$_F$/dt=200A/μs T_j=175°C		-	0.55	-	μs
Diode Reverse Recovery Charge	Q_{rr}			-	3.0	-	μC

● Thermal resistance characteristics

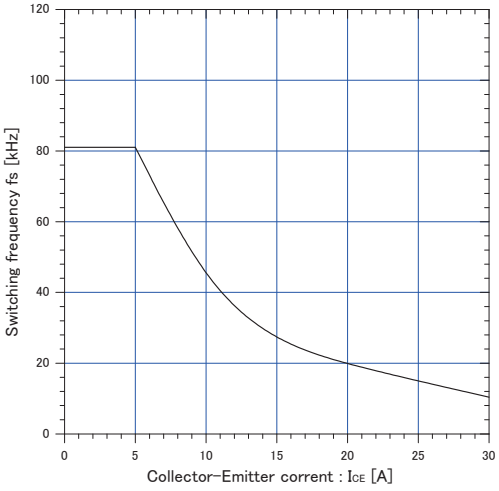
Items	Symbols	Conditions	Characteristics min.	Characteristics typ.	Characteristics max.	Units
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	-	50	°C/W
Thermal Resistance, IGBT Junction to Case	$R_{th(j-c)\_IGBT}$	-	-	-	0.962	
Thermal Resistance, FWD Junction to Case	$R_{th(j-c)\_FWD}$	-	-	-	1.923	

■ Characteristics (Representative)

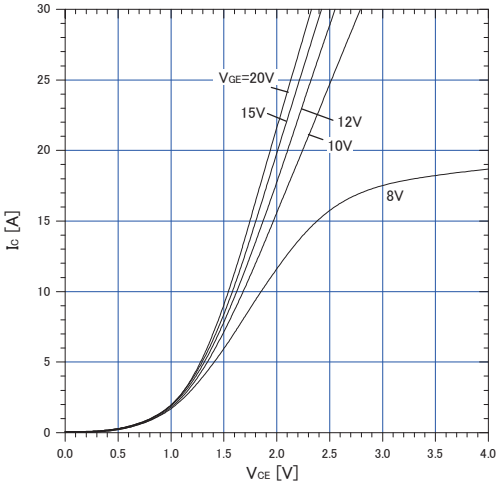
Graph.1
DC Collector Current vs T_C
V_{GE}≥+15V, T_j≤175°C



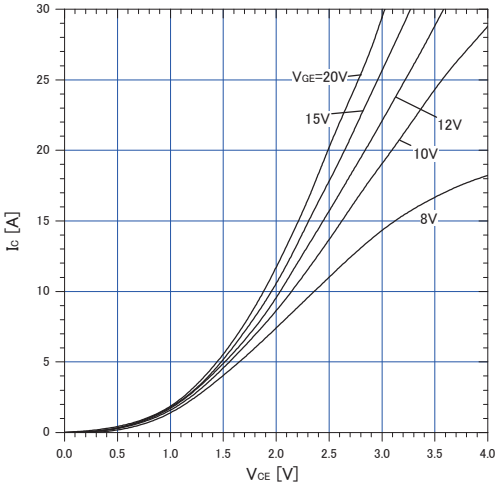
Graph.2
Collector Current vs. switching frequency
V_{GE}=+15V, T_C≤175°C, V_{CC}=600V, D=0.5,
R_G=10Ω, T_C=100°C



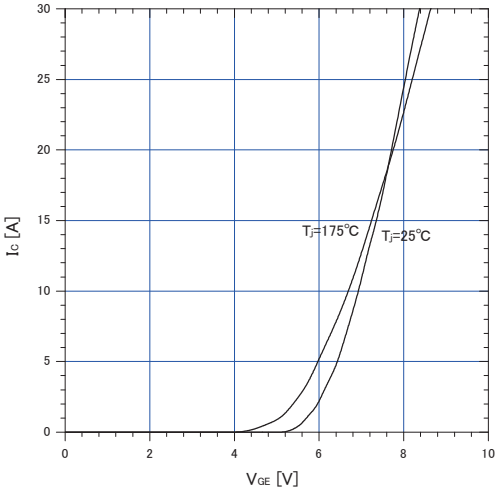
Graph.3
Typical Output Characteristics (V_{CE}-I_C)
T_j=25°C



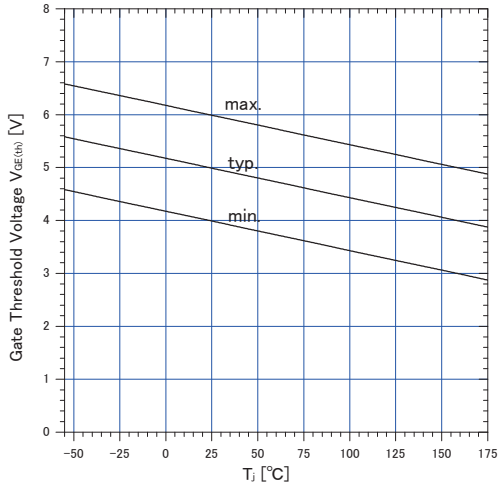
Graph.4
Typical Output Characteristics (V_{CE}-I_C)
T_j=175°C



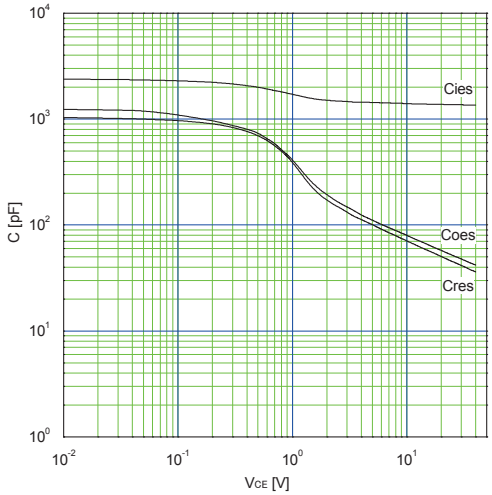
Graph.5
Typical Transfer Characteristics
V_{GE}=+15V



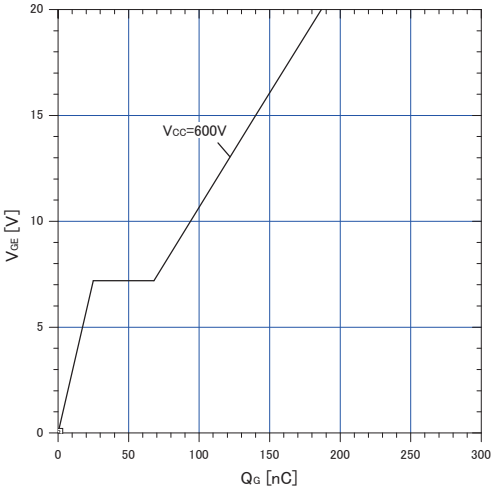
Graph.6
Gate Threshold Voltage vs. T_j
I_C=15mA, V_{CE}=20V



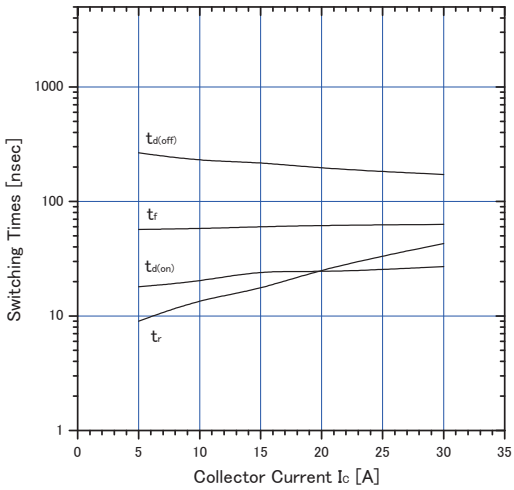
Graph.7
Typical Capacitance
V_{GE}=0V,f=1MHz,T_j=25°C



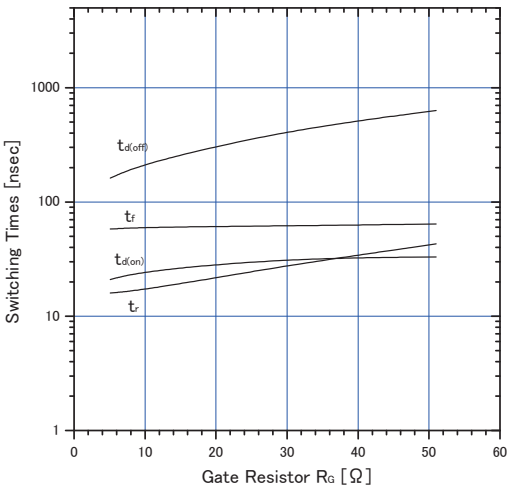
Graph.8
Typical Gate Charge
V_{CC}=600V,I_C=15A,T_j=25°C



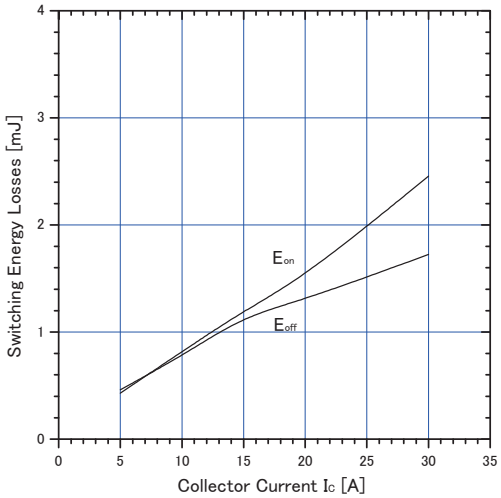
Graph.9
Typical switching time vs. I_C
T_j=175°C,V_{CC}=600V,L=500µH
V_{GE}=15V,R_G=10Ω



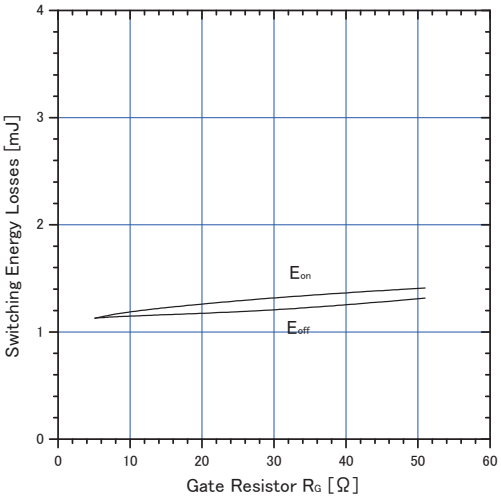
Graph.10
Typical switching time vs. R_G
T_j=175°C,V_{CC}=600V,I_C=15A,L=500µH
V_{GE}=15V



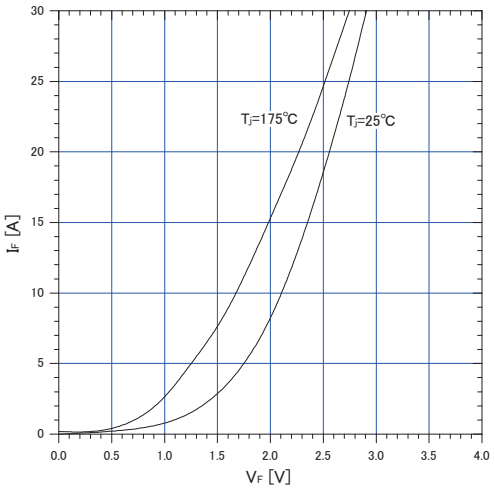
Graph.11
Typical switching losses vs. I_C
T_j=175°C,V_{CC}=600V,L=500µH
V_{GE}=15V,R_G=10Ω



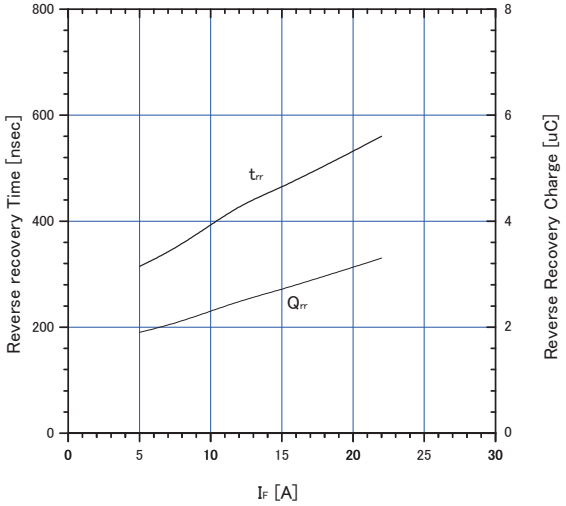
Graph.12
Typical switching losses vs. R_G
T_j=175°C,V_{CC}=600V,I_C=15A,L=500µH
V_{GE}=15V



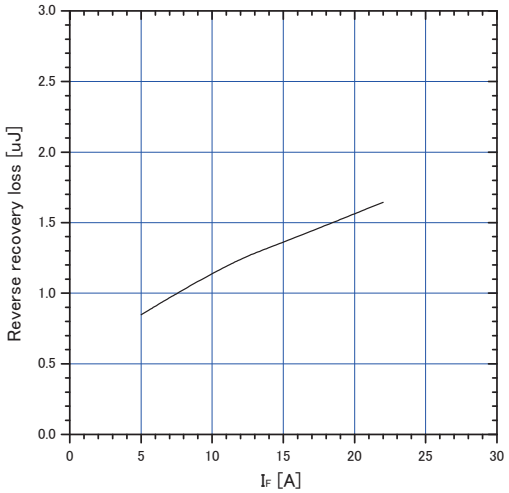
Graph.13
FWD Forward voltage drop (V_F-I_F)



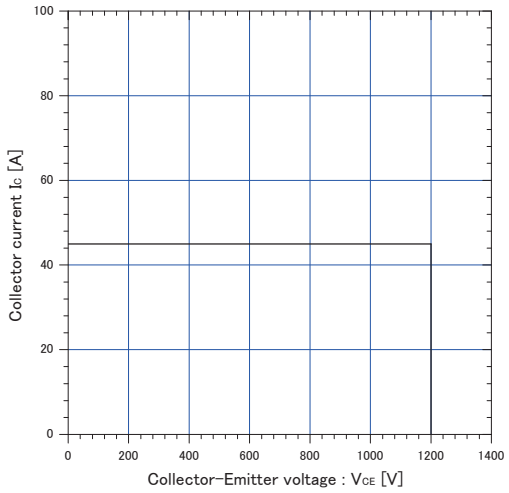
Graph.14
Typical reverse recovery characteristics vs. I_F
T_j=175°C, V_{CC}=600V, L=500µH
V_{GE}=15V, R_G=10Ω



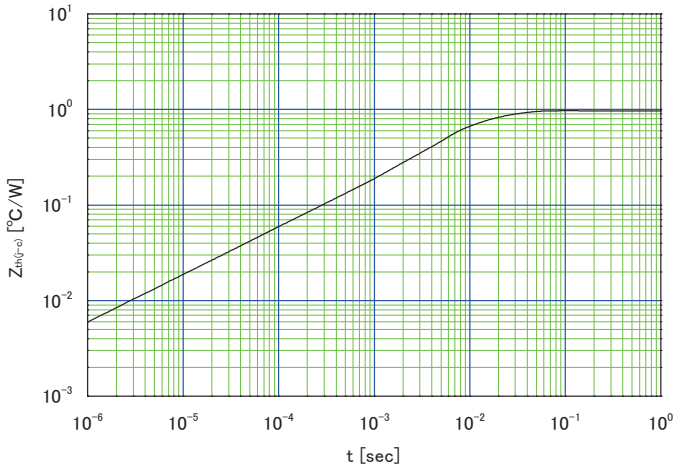
Graph.15
Typical reverse recovery loss vs. I_F
T_j=175°C, V_{CC}=600V, L=500µH
V_{GE}=15V, R_G=10Ω



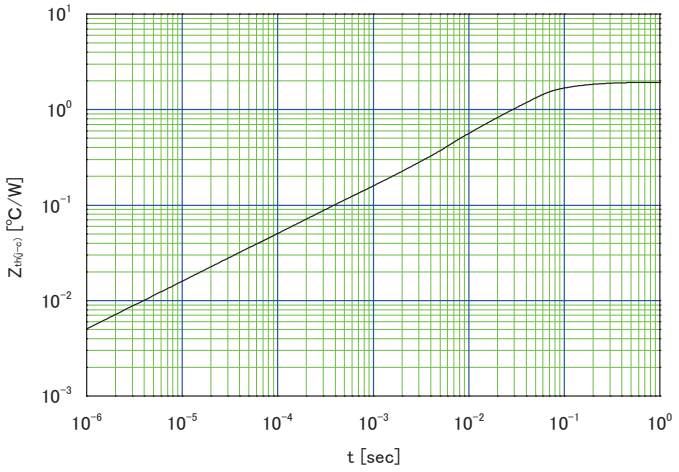
Graph.16
Reverse biased Safe Operating Area
T_j≤175°C, V_{GE}=+15V/0V, R_G=10Ω



Graph.17
Transient thermal resistance of IGBT

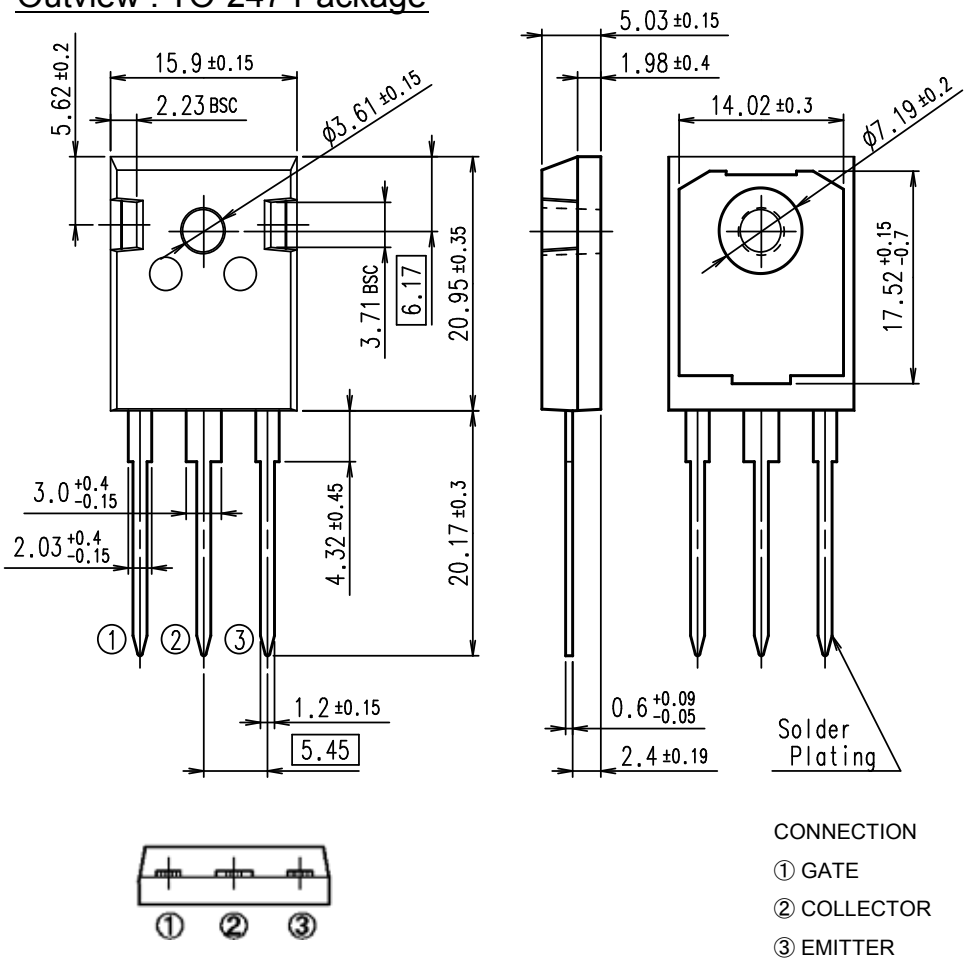


Graph.18
Transient thermal resistance of FWD



■ Outline Drawings, mm

Outview : TO-247 Package



CONNECTION
① GATE
② COLLECTOR
③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

WARNING

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of May 2011.
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.

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4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
- Computers
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- 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.
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- 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

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- Space equipment
- Aeronautic equipment
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- Submarine repeater equipment

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富士電機 Innovating Energy Technology

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IGBT Modules

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