FGW75N60HD

Discrete IGBT

Discrete IGBT (High-Speed V series)

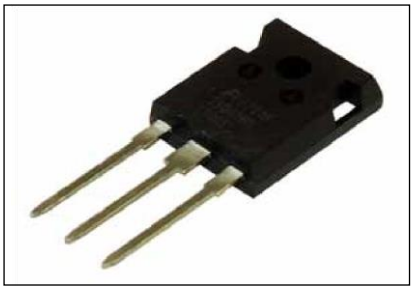
٦٠٠V / ٧٥A

■ Features

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

■ Applications

- Uninterruptible power supply
- Power coditionner



■ Equivalent circuit

Items	Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	I_C = 250μA, V_{GE} = 0V		٦٠٠	-	-	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 600V, V_{GE} = 0V	T_j=25°C	-	-	٢٥٠	μA
			T_j=175°C	-	-	١٠	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V		-	-	٢٠٠	nA
Gate-Emitter Threshold Voltage	$V_{GE\ (th)}$	V_{CE} = +20V, I_C = 75mA		٤,٠	٥,٠	٦,٠	V
Collector-Emitter Saturation Voltage	$V_{CE\ (sat)}$	V_{GE} = +15V, I_C = 75A	T_j=25°C	-	١,٥٠	١,٩٥	V
			T_j=175°C	-	١,٨٠	-	
Input Capacitance	C_{ies}	V_{CE}=25V V_{GE}=0V f=1MHz		-	٦١٥٠	-	pF
Output Capacitance	C_{oes}			-	٣٠٠	-	
Reverse Transfer Capacitance	C_{res}			-	٢٤٠	-	
Gate Charge	Q_G	V_{CC} = 400V I_C = 75A V_{GE} = 15V		-	٤٦٠	-	nC
Turn-On Delay Time	$t_{d(on)}$	T_j = 25°C V_{CC} = 400V I_C = 75A V_{GE} = 15V R_G = 10Ω		-	٤٥	-	ns
Rise Time	t_r			-	١٣٠	-	
Turn-Off Delay Time	$t_{d(off)}$			-	٤٥٠	-	
Fall Time	t_f			-	١٠٥	-	
Turn-On Energy	E_{on}			-	٣,٠	-	mJ

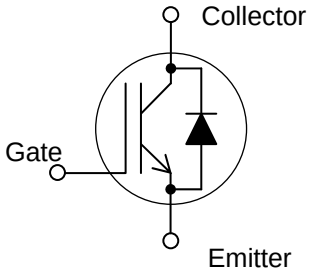
Turn-Off Energy	E_{off}	L = 500μH Energy loss include "tail" and FWD reverse recovery.	-	٤,٢	-	
Turn-On Delay Time	$t_{d(on)}$	T_j = 175°C	-	٤٥	-	ns
Rise Time	t_r	V_{CC} = 400V	-	١٣٠	-	
Turn-Off Delay Time	$t_{d(off)}$	I_C = 75A	-	٤٩٠	-	
Fall Time	t_f	V_{GE} = 15V	-	١٢٠	-	
Turn-On Energy	E_{on}	R_G = 10Ω	-	٤,٣	-	mJ
Turn-Off Energy	E_{off}	L = 500μH Energy loss include "tail" and FWD reverse recovery.	-	٤,٨	-	

● **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}	٦٠٠	V	
Gate-Emitter voltage	V_{GES}	±20	V	
DC Collector Current	$I_{C@25}$	١٠٠	A	T_C=25°C, T_j=150°C Note *1
	$I_{C@100}$	٧٥	A	T_C=100°C, T_j=150°C
Pulsed Collector Current	I_{CP}	٢٢٥	A	Note *2
Turn-Off Safe Operating Area	-	٢٢٥	A	V_{CE}≦600V, T_j≦175°C
Diode Forward Current	$I_{F@25}$	٦٠	A	Note *1
	$I_{F@100}$	٣٥	A	
Diode Pulsed Current	I_{FP}	٢٢٥	A	Note *1
Short Circuit Withstand Time	t_{SC}	٥	μs	V_{CC}≦300V, V_{GE}=12V T_j≦175°C
IGBT Max. Power Dissipation	P_{D_IGBT}	٥٠٠	W	T_C=25°C
FWD Max. Power Dissipation	P_{D_FWD}	١٩٠		T_C=25°C
Operating Junction Temperature	T_j	-٤٠~+١٧٥	°C	
Storage Temperature	T_{stg}	-٥٥~+١٧٥	°C	



Note *1 : Current value limited by bonding wire. Note *2 : Pulse width limited by Tjmax.

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

FWD Characteristics

Description	Symbol	Conditions		Characteristics min.	typ.	max.	Unit
Forward Voltage Drop	V_F	I_F=35A	T_j=25°C	-	٢,٠	٢,٦	V
			T_j=175°C	-	١,٤	-	V
Diode Reverse Recovery Time	t_{rr1}	V_{CC}=30V,I_F = 3.5A - di/dt=200A/μs		-	٢٦	٣٦	ns

Diode Reverse Recovery Time	t_{rr2}	V_{cc}=400V I_F=35A -di_F/dt=200A/μs T_j=25°C		٠,٠٥	-	μs
Diode Reverse Recovery Charge	Q_{rr}		-	٠,١٢	-	μC
Diode Reverse Recovery Time	t_{rr2}	V_{cc}=400V I_F=35A -di_F/dt=200A/μs T_j=175°C	-	٠,١٩	-	μs
Diode Reverse Recovery Charge	Q_{rr}		-	١,١٠	-	μC

Thermal resistance characteristics

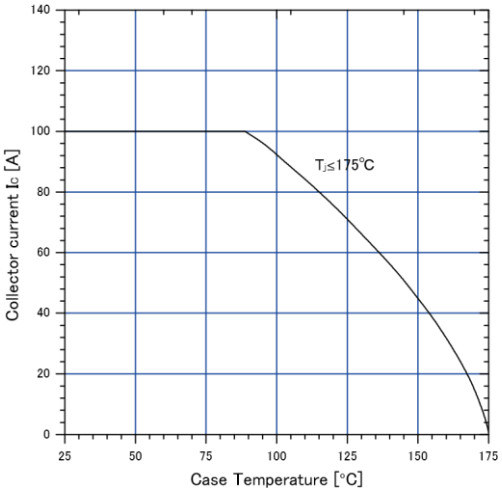
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	-	٥٠	°C/W
Thermal Resistance, IGBT Junction to Case	$R_{th(j-c)\_IGBT}$	-	-	-	٠,٢٩٨	
Thermal Resistance, FWD Junction to Case	$R_{th(j-c)\_FWD}$	-	-	-	٠,٧٨١	

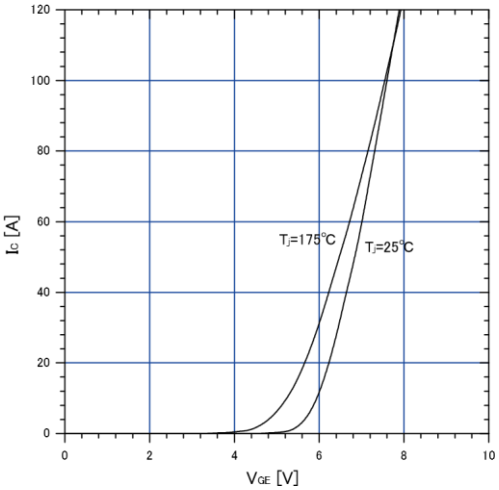
■ Characteristics (Representative)

Graph.1

DC Collector Current vs T_c

V_{GE}≥+15V, T_j≤175ºC



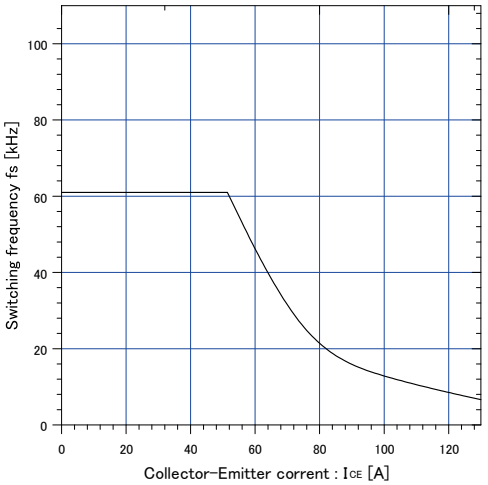


Graph.2

Collector Current vs. switching frequency

V_{GE}=+15V, T_c≤175ºC, V_{cc}=400V, D=0.5,

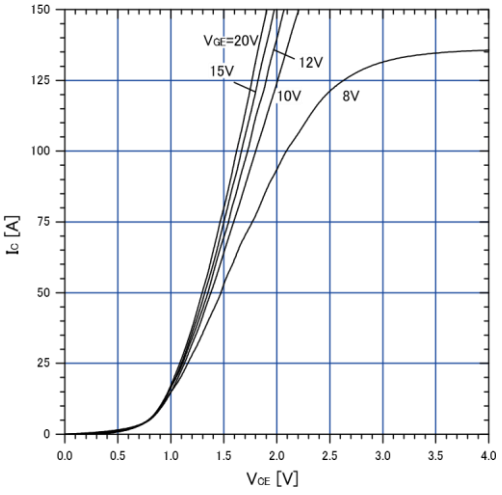
R_G=10Ω, T_c=100ºC



Graph.3

Typical Output Characteristics (V_{CE}-I_c)

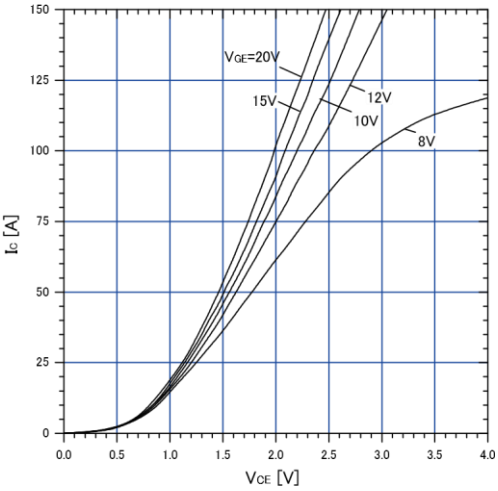
T_j=25ºC



Graph.4

Typical Output Characteristics (V_{CE}-I_c)

T_j=175ºC



Graph.5

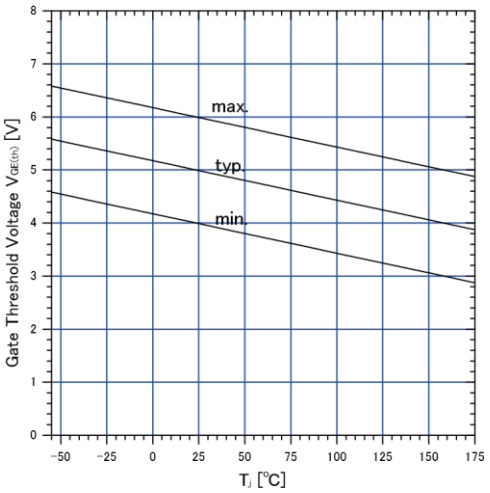
Typical Transfer Characteristics

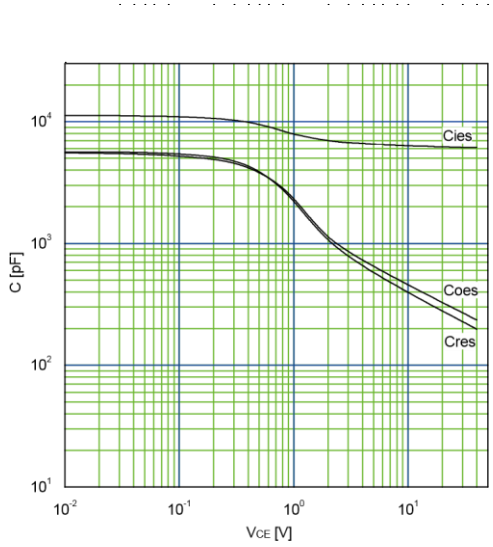
V_{GE}=+15V

Graph.6

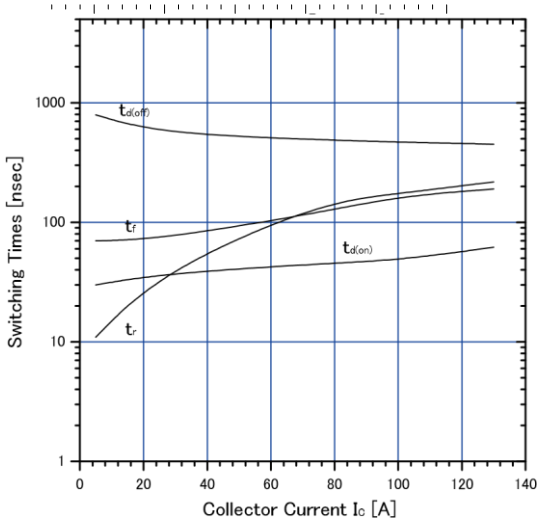
Gate Threshold Voltage vs. T_j

I_C=75mA, V_{CE}=20V





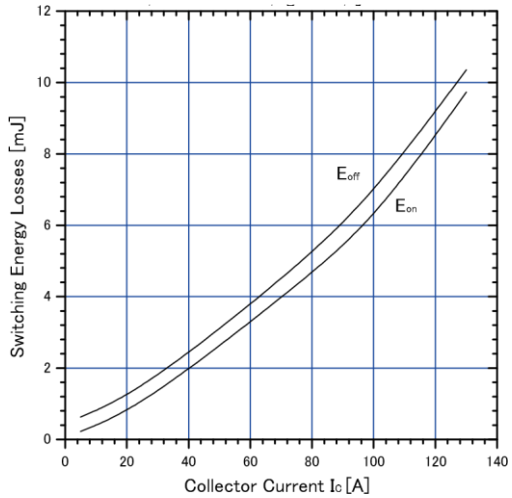
Graph.7
Typical Capacitance
V_{GE}=0V, f=1MHz, T_j=25ºC

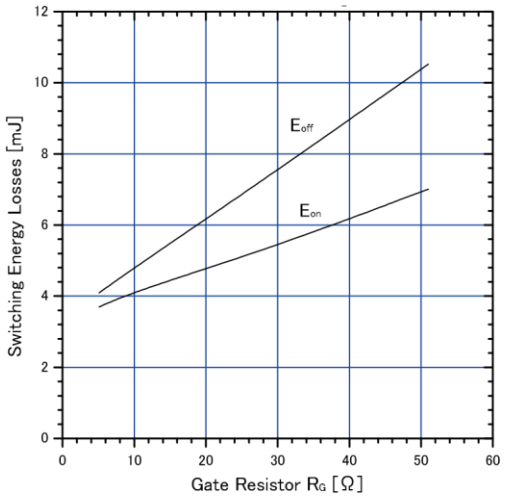


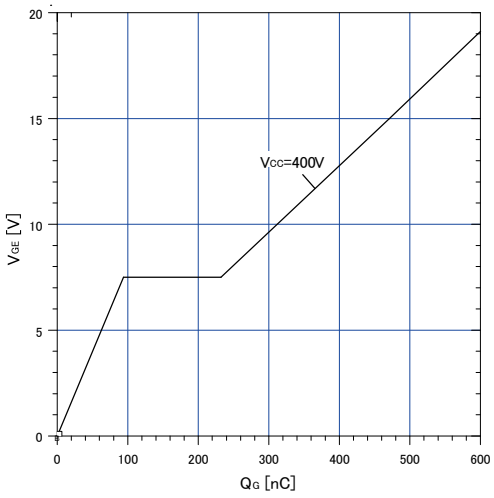
Graph.8
Typical Gate Charge
V_{CC}=400V, I_C=75A, T_j=25ºC

Graph.9
Typical switching time vs. I_C
T_j=175ºC, V_{CC}=400V, L=500µH
V_{GE}=15V, R_G=10Ω

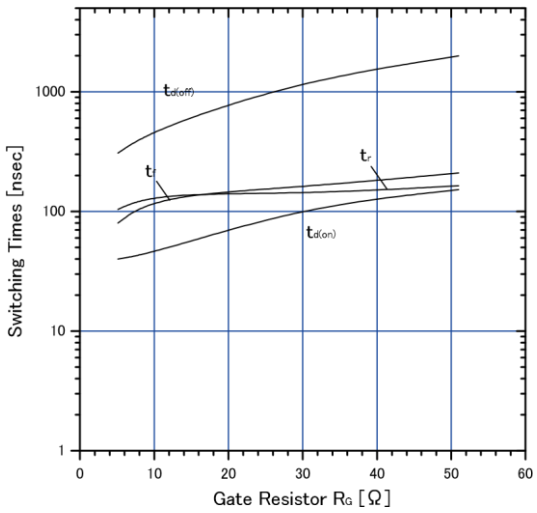
Graph.11
Typical switching losses vs. I_C
T_j=175ºC, V_{CC}=400V, L=500µH
V_{GE}=15V, R_G=10Ω



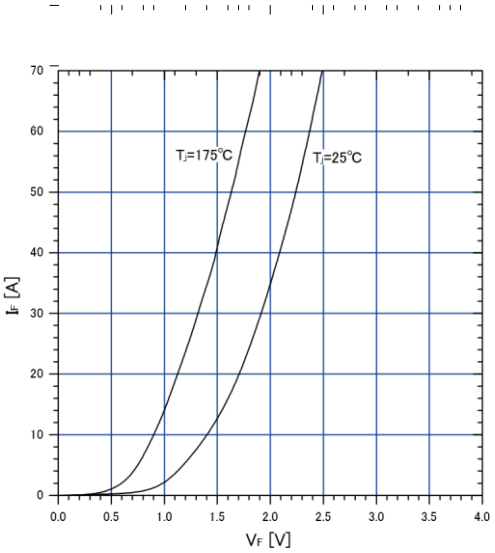




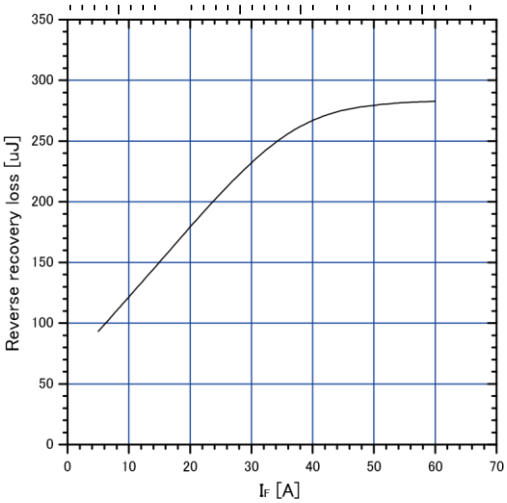
Graph.10
Typical switching time vs. R_G
T_j=175ºC, V_{cc}=400V, I_c=75A, L=500µH
V_{GE}=15V



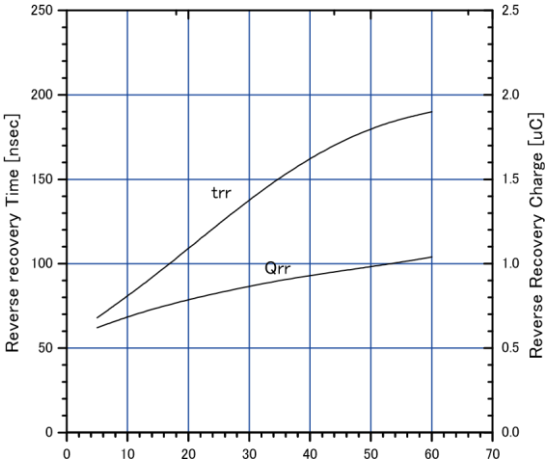
Graph.12
Typical switching losses vs. R_G
T_j=175ºC, V_{cc}=400V, I_c=75A, L=500µH
V_{GE}=15V
Graph.13
FWD Forward voltage drop (V_F-I_F)
Graph.14
Typical reverse recovery characteristics vs. I_F



Graph.15
Typical reverse recovery loss vs. I_F
T_j=175ºC, V_{cc}=400V, L=500µH
V_{GE}=15V, R_G=10Ω



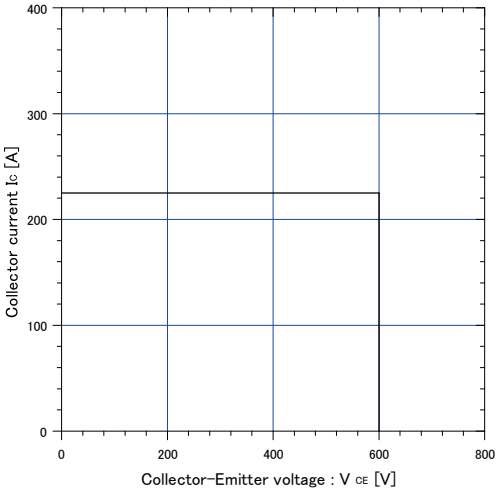
T_j=175ºC, V_{cc}=400V, L=500µH
V_{GE}=15V, R_G=10Ω



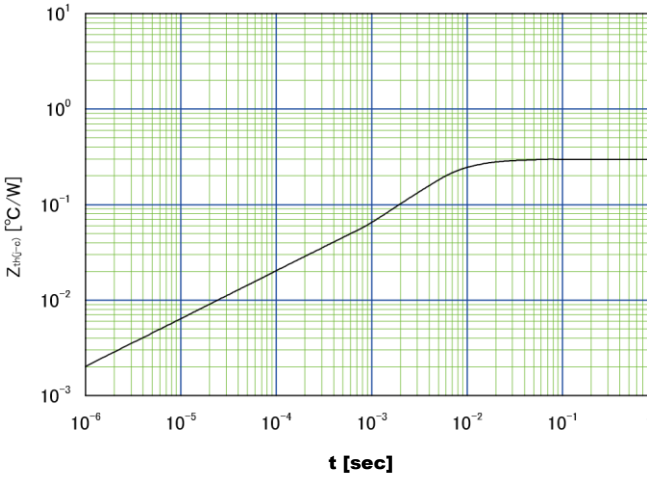
I_F [A]

Graph.16
Reverse biased Safe Operating Area

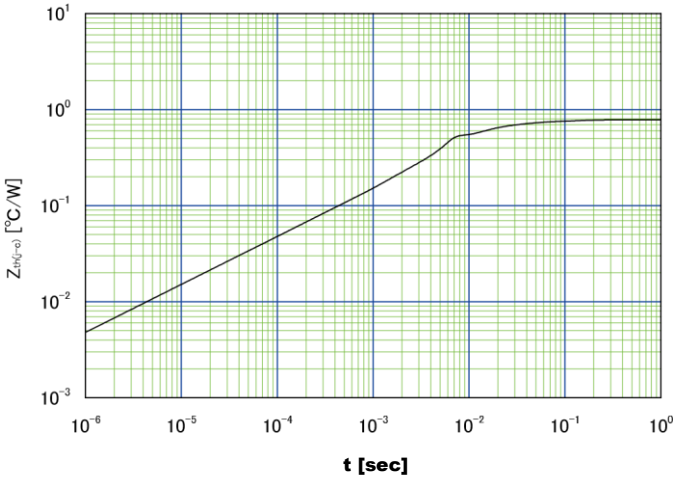
$T_j \leq 175°C$, V_{GE}=+15V/0V, R_G=10Ω



Graph.17 Transient thermal resistance of IGBT

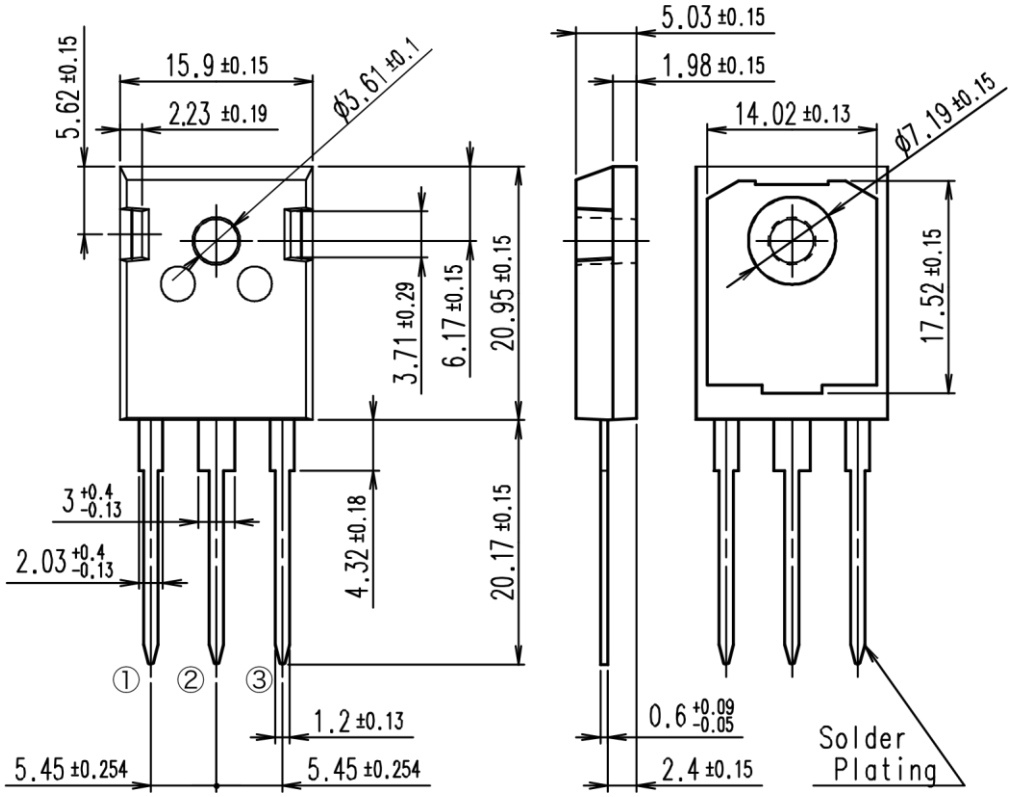


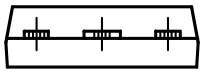
Graph.18 Transient thermal resistance of FWD



Outline Drawings, mm

Outview : TO-247 Package





① ② ③

CONNECTION

① GATE

② COLLECTOR

③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

WARNING

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• Industrial robots etc.

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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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• Submarine repeater equipment

٧.

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