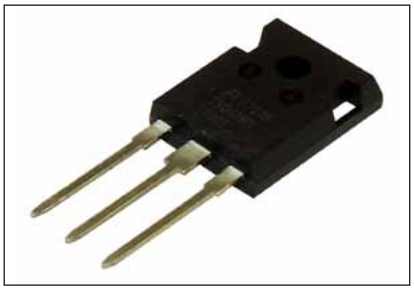
FGW60N65WE

Discrete IGBT (High-Speed W series)
650V / 60A

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

Applications
Uninterruptible power supply
PV Power coditionner
Inverter welding machine



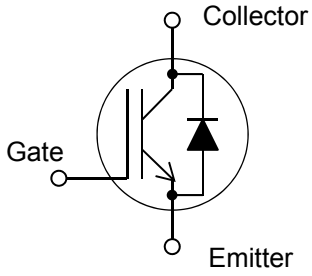
Maximum Ratings and Characteristics

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

Items	Symbols	Characteristics	Unit	Remarks
Collector-Emitter Voltage	V_{CES}	650	V	
Gate-Emitter Voltage	V_{GES}	±20	V	
Transient Gate-Emitter Voltage		±30		T_p<1μs
DC Collector Current	$I_{C@25}$	83	A	T_C=25°C
	$I_{C@100}$	60	A	T_C=100°C
Pulsed Collector Current	I_{CP}	240	A	Note *1
Turn-Off Safe Operating Area	-	240	A	V_{CE}≤650V T_j≤175°C
Diode Forward Current	$I_{F@25}$	88	A	
	$I_{F@100}$	60	A	
Diode Pulsed Current	I_{FP}	240	A	Note *1
IGBT Max. Power Dissipation	P_{D_IGBT}	405	W	T_C=25°C
FWD Max. Power Dissipation	P_{D_FWD}	220	W	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 T_{jmax}.

Equivalent circuit



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

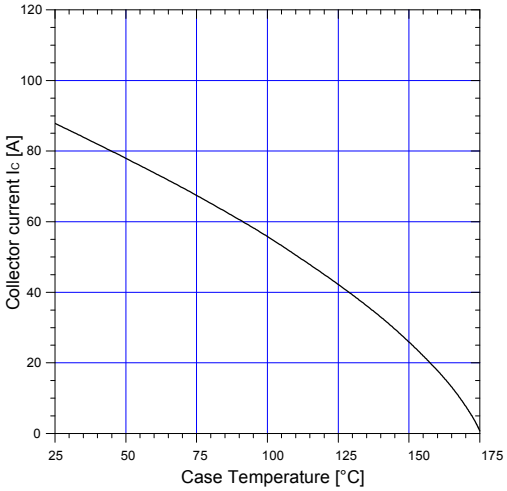
Description	Symbol	Conditions		min.	typ.	max.	Unit
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 650V, V_{GE} = 0V	T_j=25°C	-	-	250	μA
			T_j=175°C	-	-	2	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V		-	-	200	nA
Gate-Emitter Threshold Voltage	$V_{GE\ (th)}$	V_{CE} = 20V, I_C = 60mA		3.0	4.0	5.0	V
Collector-Emitter Saturation Voltage	$V_{CE\ (sat)}$	V_{GE} = 15V, I_C = 60A	T_j=25°C	-	1.80	2.20	V
			T_j=125°C	-	2.05	-	
			T_j=175°C	-	2.10	-	
Input Capacitance	C_{ies}	V_{CE}=25V		-	4300	-	pF
Output Capacitance	C_{oes}	V_{GE}=0V		-	125	-	
Reverse Transfer Capacitance	C_{res}	f=1MHz		-	95	-	
Gate Charge	Q_G	V_{CC} = 520V I_C = 60A V_{GE} = 15V		-	250	-	nC
Turn-On Delay Time	$t_{d(on)}$	T_j = 25°C, V_{CC} = 400V I_C = 30A, V_{GE} = 15V R_G = 10Ω, L = 500μH Energy loss include “tail” and FWD reverse recovery.		-	29	-	ns
Rise Time	t_r			-	45	-	
Turn-Off Delay Time	$t_{d(off)}$			-	260	-	
Fall Time	t_f			-	78	-	
Turn-On Energy	E_{on}			-	0.60	-	mJ
Turn-Off Energy	E_{off}			-	0.67	-	
Turn-On Delay Time	$t_{d(on)}$	T_j = 150°C, V_{CC} = 400V I_C = 30A, V_{GE} = 15V R_G = 10Ω, L = 500μH Energy loss include “tail” and FWD reverse recovery.		-	29	-	ns
Rise Time	t_r			-	45	-	
Turn-Off Delay Time	$t_{d(off)}$			-	295	-	
Fall Time	t_f			-	68	-	
Turn-On Energy	E_{on}			-	1.05	-	mJ
Turn-Off Energy	E_{off}			-	0.73	-	
Forward Voltage Drop	V_F	I_F=60A	T_j=25°C	-	2.5	3.2	V
			T_j=125°C	-	1.9	-	V
			T_j=175°C	-	1.7	-	V
Diode Reverse Recovery Time	t_{rr}	V_{CC}=400V, I_F=30A		-	120	-	ns
Diode Reverse Recovery Charge	Q_{rr}	-di_F/dt=500A/μs, T_j=25°C		-	0.33	-	μC
Diode Reverse Recovery Time	t_{rr}	V_{CC}=400V, I_F=30A		-	170	-	ns
Diode Reverse Recovery Charge	Q_{rr}	-di_F/dt=500A/μs, T_j=150°C		-	1.30	-	μC

● Thermal Resistance

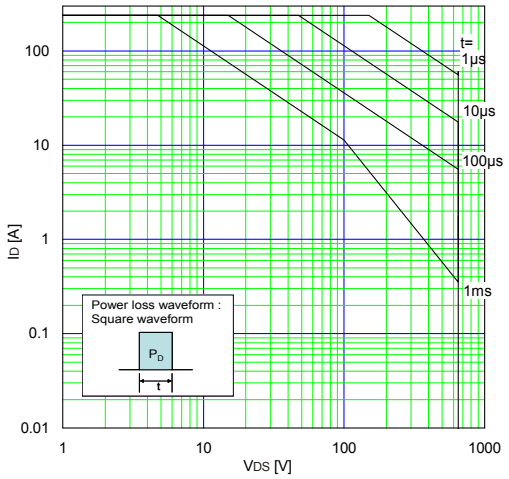
Description	Symbol	min.	typ.	max.	Unit
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	50	°C/W
Thermal Resistance, IGBT Junction to Case	$R_{th(j-c)\_IGBT}$	-	-	0.366	°C/W
Thermal Resistance, FWD Junction to Case	$R_{th(j-c)\_FWD}$	-	-	0.676	°C/W

Characteristics (Representative)

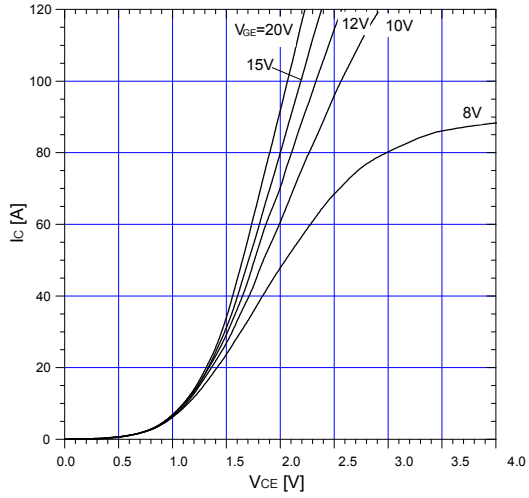
Graph.1
DC Collector Current vs Tc
V_{GE}≥+15V, Tj≤175°C



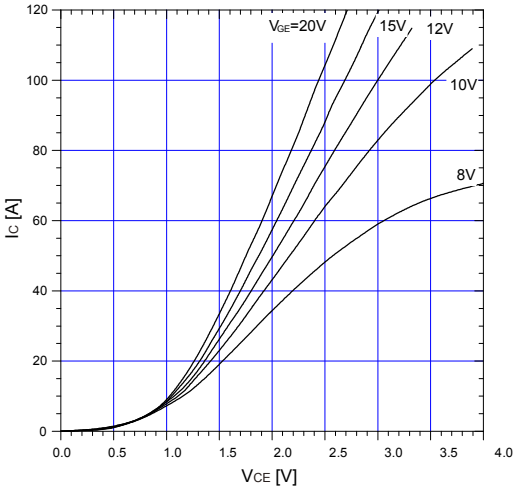
Graph.2
FBSOA
Duty=0(Single pulse), Tc=25°C



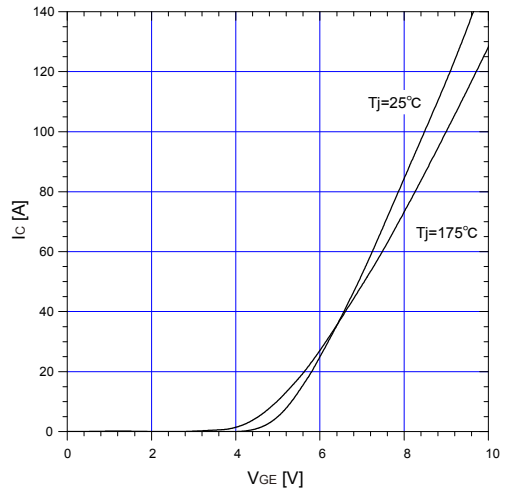
Graph.3
Typical Output Characteristics (V_{CE}-I_C)
Tj=25°C



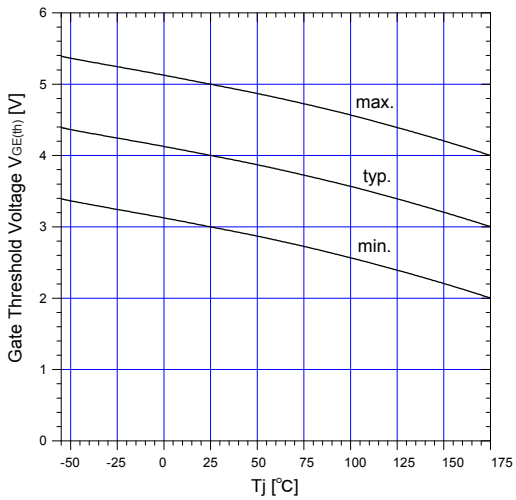
Graph.4
Typical Output Characteristics (V_{CE}-I_C)
Tj=175°C



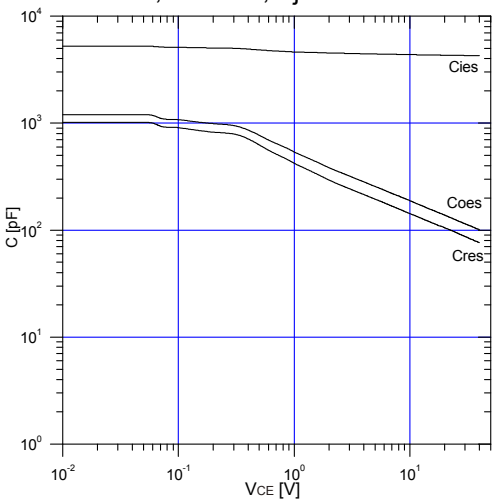
Graph.5
Typical Transfer Characteristics
V_{CE}=10V



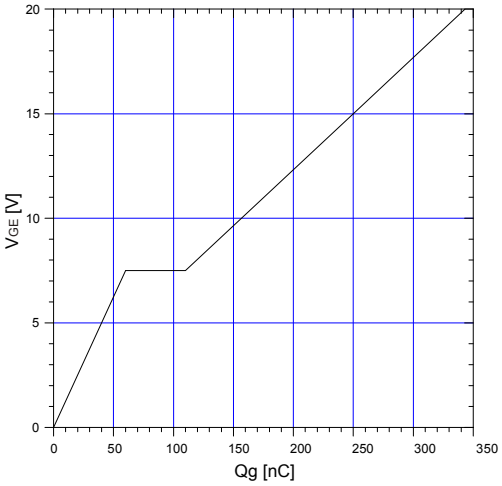
Graph.6
Gate Threshold Voltage vs. Tj
I_C=60mA, V_{CE}=20V



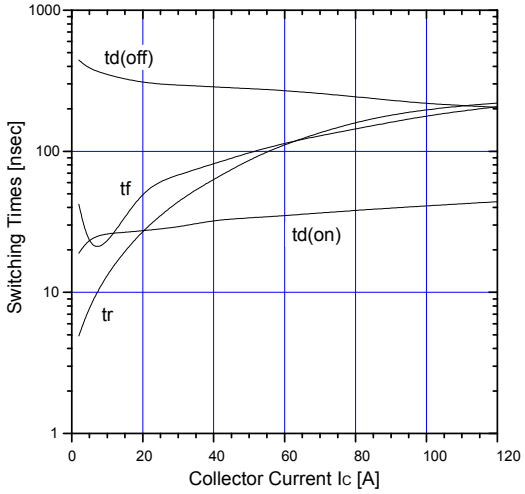
Graph.7
Typical Capacitance
V_{GE}=0V, f=1MHz, Tj=25°C



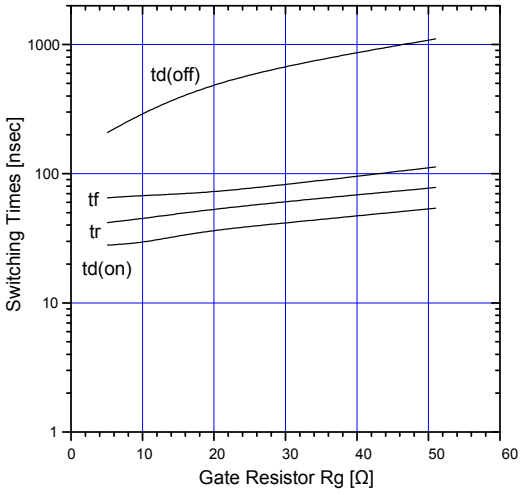
Graph.8
Typical Gate Charge
Vcc=520V, I_C=60A, Tj=25°C



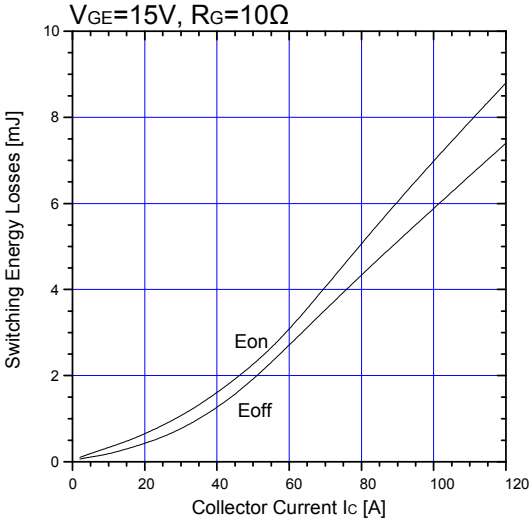
Graph.9
Typical switching time vs. Ic
Tj=150°C, Vcc=400V, L=500µH
V_{GE}=15V, R_G=10Ω



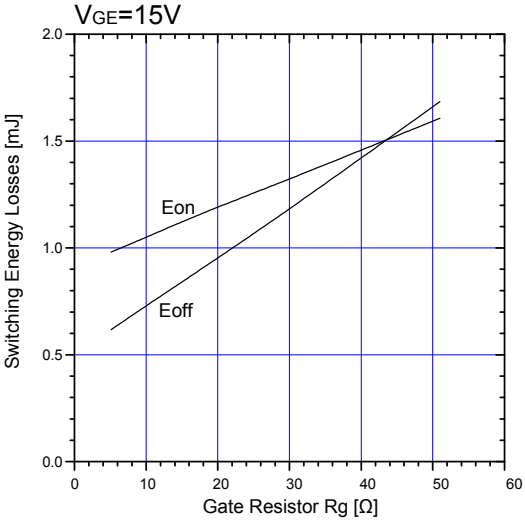
Graph.10
Typical switching time vs. Rg
Tj=150°C, Vcc=400V, I_C=30A, L=500µH
V_{GE}=15V



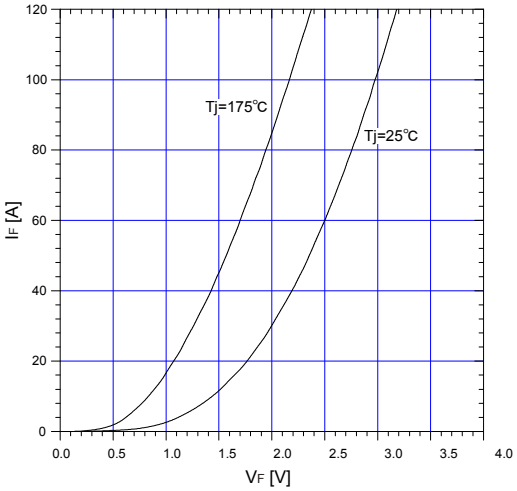
Graph.11
Typical switching losses vs. Ic
Tj=150°C, Vcc=400V, L=500µH
V_{GE}=15V, R_G=10Ω



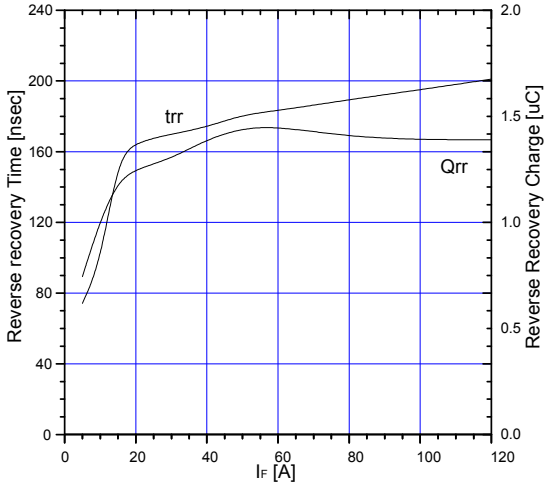
Graph.12
Typical switching losses vs. Rg
Tj=150°C, Vcc=400V, I_C=30A, L=500µH
V_{GE}=15V



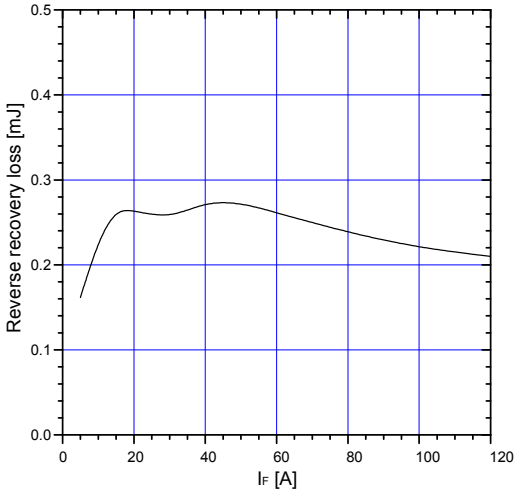
Graph.13
FWD Forward voltage drop (V_F-I_F)



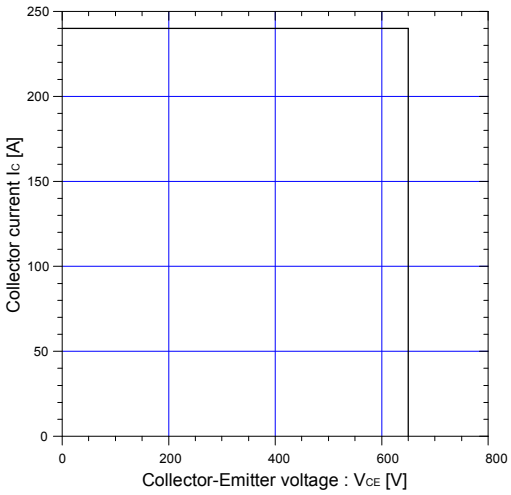
Graph.14
Typical reverse recovery characteristics vs. I_F
Tj=15°C, Vcc=400V, L=500μH
V_{GE}=15V, R_G=10Ω



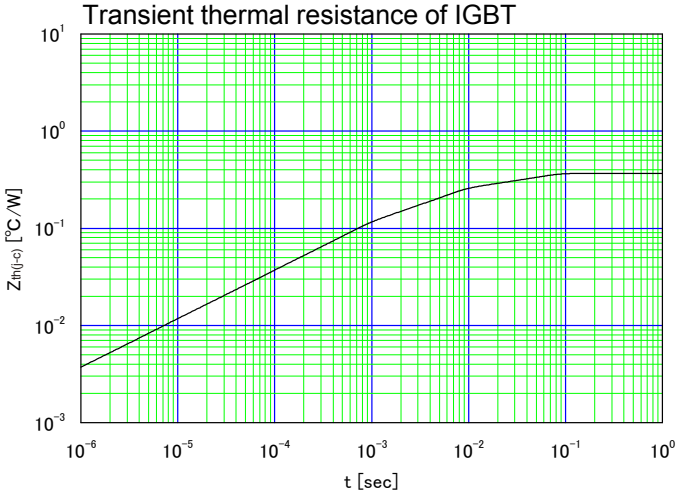
Graph.15
Typical reverse recovery loss vs. I_F
Tj=150°C, Vcc=400V, L=500μH
V_{GE}=15V, R_G=10Ω



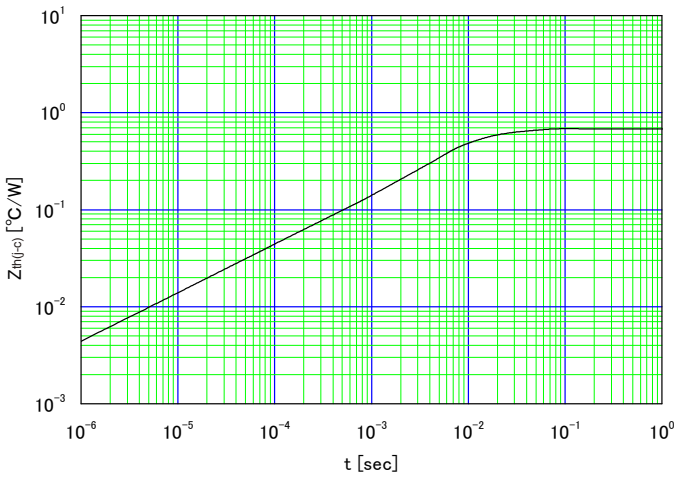
Graph.16
Reverse biased Safe Operating Area
Tj≤175C, V_{GE}=+15V/0V, R_G=10Ω



Graph.17
Transient thermal resistance of IGBT

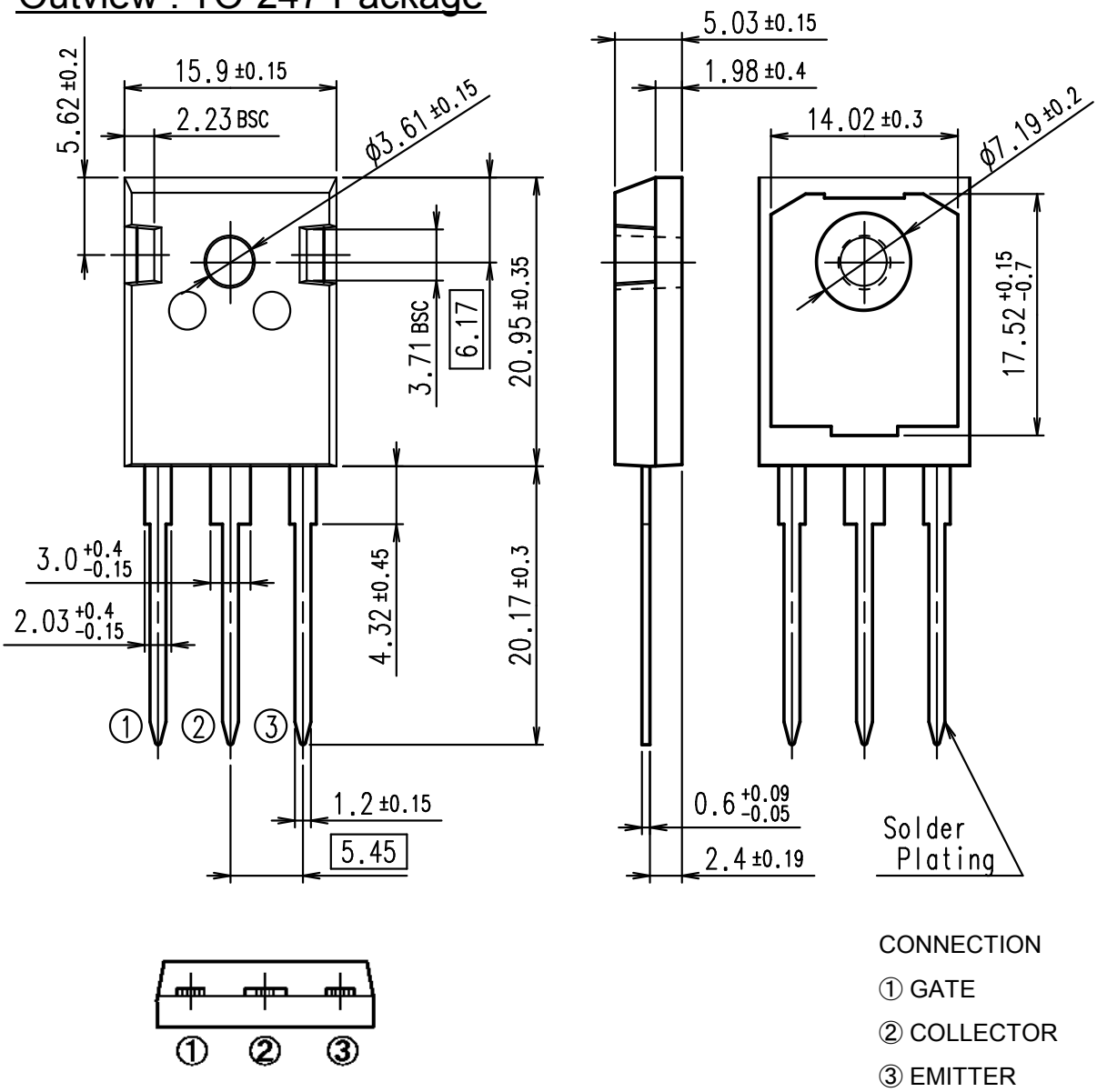


Graph.18
Transient thermal resistance of FWD



Outline Drawings, mm

Outview : TO-247 Package



CONNECTION

① GATE

② COLLECTOR

③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

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- Audiovisual equipment
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