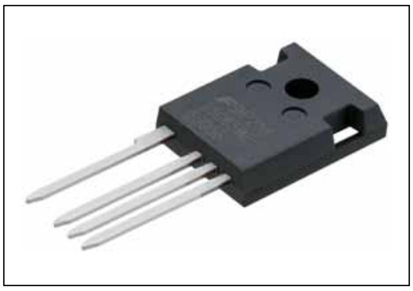
FGZ50N65WE

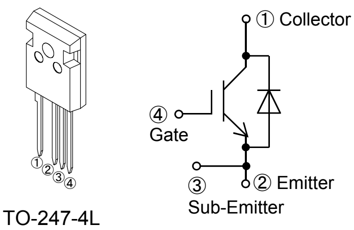
Discrete IGBT (High-Speed W series)
650V / 50A

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

Applications
Uninterruptible power supply
PV Power conditioner
Inverter welding machine



Equivalent circuit



TO-247-4L

Maximum Ratings and Characteristics

● Absolute Maximum Ratings at T_{vj}=25°C (unless otherwise specified)

Items	Symbol	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	$I_{C@25}$	70	A	T_C=25°C
	$I_{C@100}$	50	A	T_C=100°C
Pulsed Collector Current	I_{CP}	200	A	Note *1
Turn-Off Safe Operating Area	-	200	A	V_{CE}≤650V, T_{vj}≤175°C
Diode Forward Current	$I_{F@25}$	73	A	
	$I_{F@100}$	50	A	
Diode Pulsed Current	I_{FP}	200	A	Note *1
IGBT Max. Power Dissipation	P_{D_IGBT}	330	W	T_C=25°C
FWD Max. Power Dissipation	P_{D_FWD}	170	W	T_C=25°C
Operating Junction Temperature	T_{vj}	-40 ~ +175	°C	
Storage Temperature	T_{stg}	-55 ~ +175	°C	

Note *1 : Pulse width limited by *T*vjmax.

● Electrical characteristics at T_{vj}= 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_{vj}=25°C	-	-	250	uA
			T_{vj}=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 = 50mA		3.0	4.0	5.0	V
Collector-Emitter Saturation Voltage	$V_{CE\ (sat)}$	V_{GE} = 15V, I_C = 50A	T_{vj}=25°C	-	1.80	2.20	V
			T_{vj}=125°C	-	2.05	-	
			T_{vj}=175°C	-	2.10	-	
Input Capacitance	C_{ies}	V_{CE}=25V		-	3650	-	pF
Output Capacitance	C_{oes}	V_{GE}=0V		-	105	-	
Reverse Transfer Capacitance	C_{res}	*f*=1MHz		-	80	-	
Gate Charge	Q_G	V_{CC} = 520V I_C = 50A V_{GE} = 15V		-	215	-	nC
Turn-On Delay Time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 400V I_C = 25A, V_{GE} = 15V $R_{G(on)}$ = 10Ω, $R_{G(off)}$ = 20Ω Energy loss include “tail” and FWD reverse recovery.		-	26	-	ns
Rise Time	t_r			-	12	-	
Turn-Off Delay Time	$t_{d(off)}$			-	350	-	
Fall Time	t_f			-	23	-	
Turn-On Energy	E_{on}			-	0.12	-	mJ
Turn-Off Energy	E_{off}			-	0.40	-	
Turn-On Delay Time	$t_{d(on)}$	T_{vj} = 150°C, V_{CC} = 400V I_C = 25A, V_{GE} = 15V $R_{G(on)}$ = 10Ω, $R_{G(off)}$ = 20Ω Energy loss include “tail” and FWD reverse recovery.		-	26	-	ns
Rise Time	t_r			-	14	-	
Turn-Off Delay Time	$t_{d(off)}$			-	390	-	
Fall Time	t_f			-	16	-	
Turn-On Energy	E_{on}			-	0.30	-	mJ
Turn-Off Energy	E_{off}			-	0.52	-	
Forward Voltage Drop	V_F	I_F=50A	T_{vj}=25°C	-	2.5	3.2	V
			T_{vj}=125°C	-	1.9	-	V
			T_{vj}=175°C	-	1.7	-	V
Diode Reverse Recovery Time	t_{rr}	V_{CC}=400V, I_F = 25A		-	115	-	ns
Diode Reverse Recovery Charge	Q_{rr}	-di_F/d*t*=500A/μs, T_{vj}=25°C		-	0.35	-	μC
Diode Reverse Recovery Time	t_{rr}	V_{CC}=400V, I_F=25A		-	140	-	ns
Diode Reverse Recovery Charge	Q_{rr}	-di_F/d*t*=500A/μs, T_{vj}=150°C		-	1.10	-	μC

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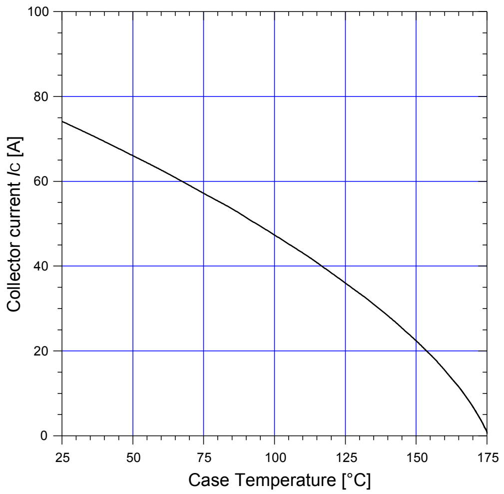
MARCH 2017

● Thermal Resistance

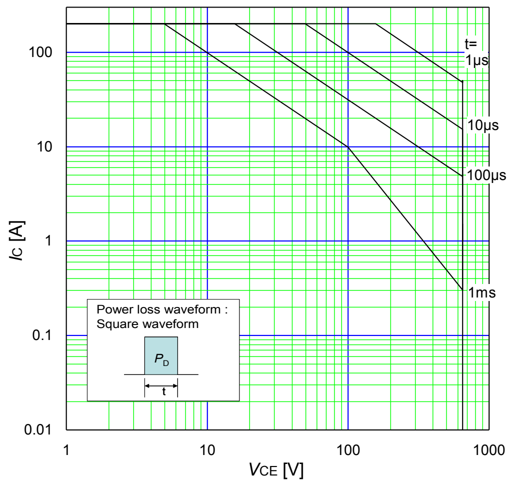
Description	Symbol	min.	typ.	max.	Unit
Thermal Resistance, Junction-Ambient	$R_{th(j\text{-}a)}$	-	-	50	°C/W
Thermal Resistance, IGBT Junction to Case	$R_{th(j\text{-}c)\_IGBT}$	-	-	0.448	°C/W
Thermal Resistance, FWD Junction to Case	$R_{th(j\text{-}c)\_FWD}$	-	-	0.862	°C/W

Characteristics (Representative)

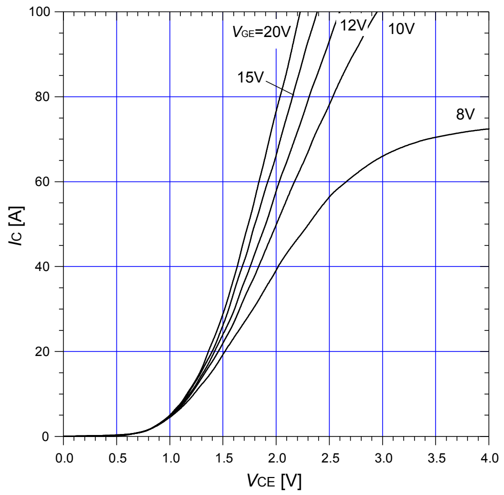
Graph.1
DC Collector Current vs Tc
V_{GE}≥+15V, T_{vj}≤175°C



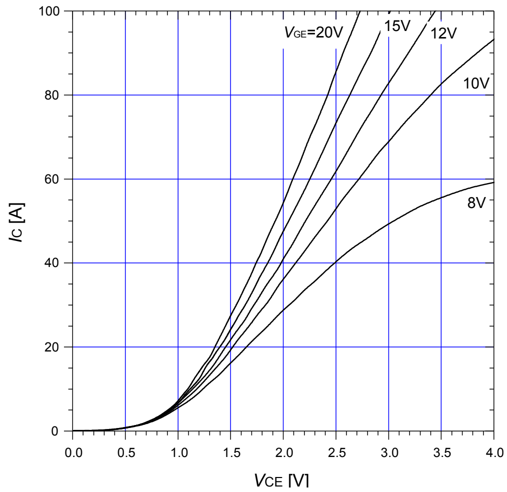
Graph.2
SOA
Duty=0(Single pulse), T_c=25°C



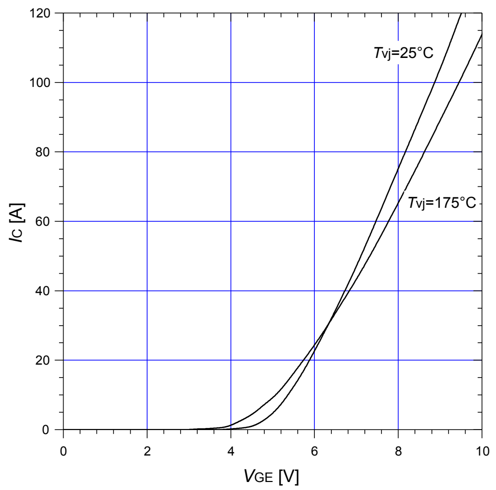
Graph.3
Typical Output Characteristics (V_{CE}-I_C)
T_{vj}=25°C



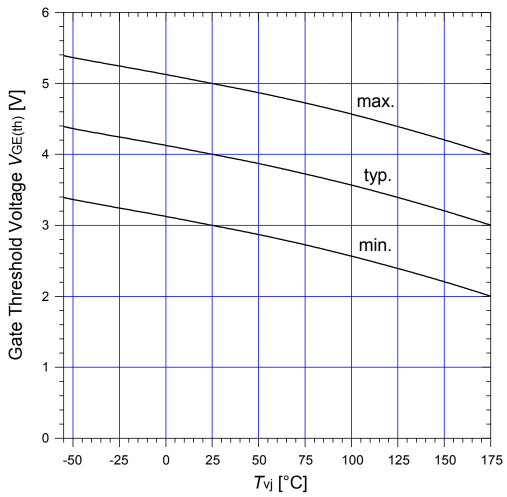
Graph.4
Typical Output Characteristics (V_{CE}-I_C)
T_{vj}=175°C



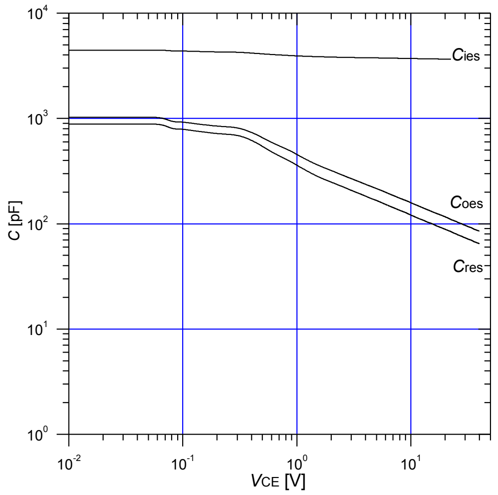
Graph.5
Typical Transfer Characteristics
V_{CE}=10V



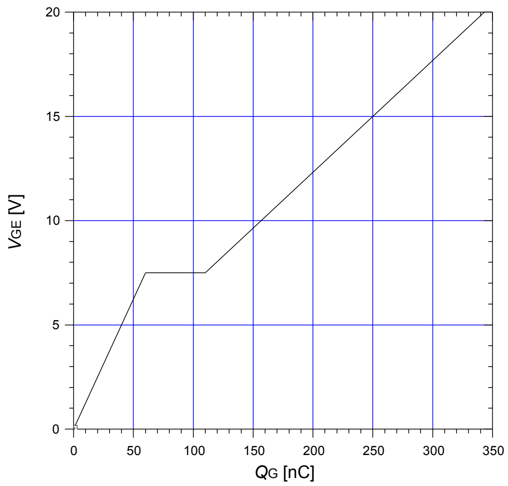
Graph.6
Gate Threshold Voltage vs. T_{vj}
I_C=50mA, V_{CE}=20V



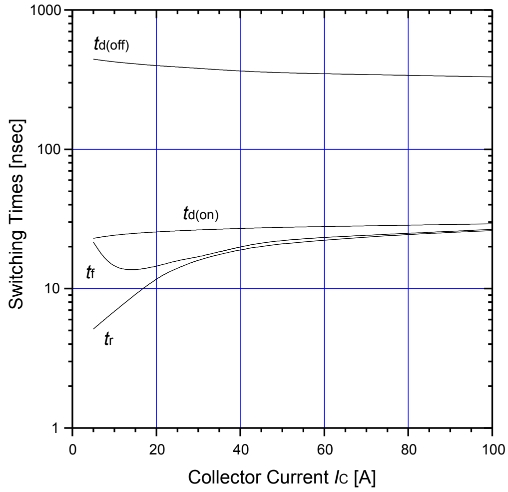
Graph.7
Typical Capacitance
V_{GE}=0V, f=1MHz, T_{vj}=25°C



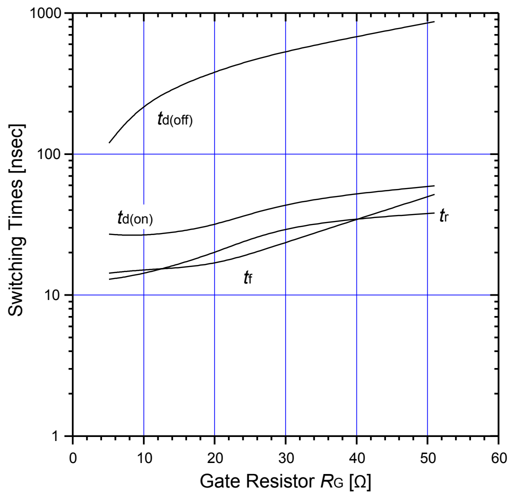
Graph.8
Typical Gate Charge
V_{CC}=520V, I_C=50A, T_{vj}=25°C



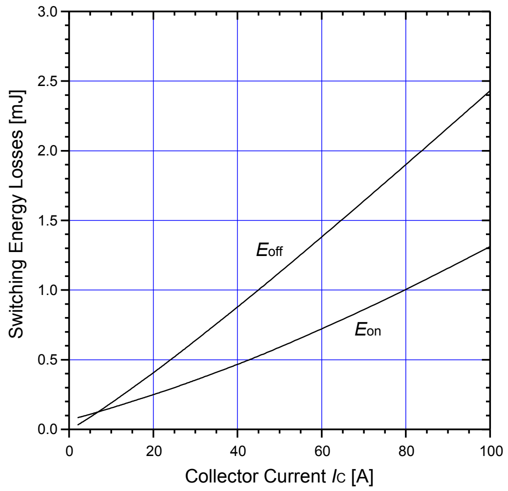
Graph.9
Typical switching time vs. I_C
T_{vj}=150°C, V_{CC}=400V
V_{GE}=15V, R_G=+10/-20Ω



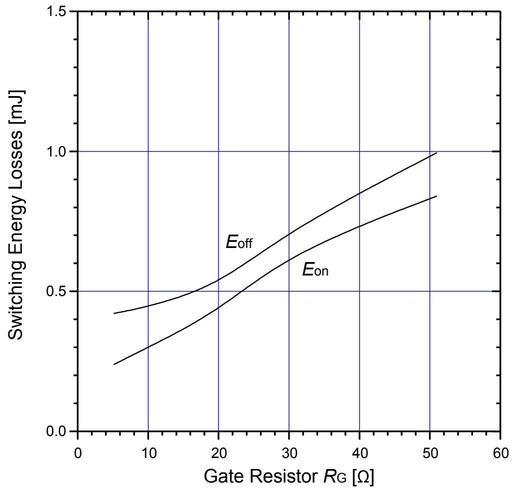
Graph.10
Typical switching time vs. R_G
T_{vj}=150°C, V_{CC}=400V, I_C=25A
V_{GE}=15V



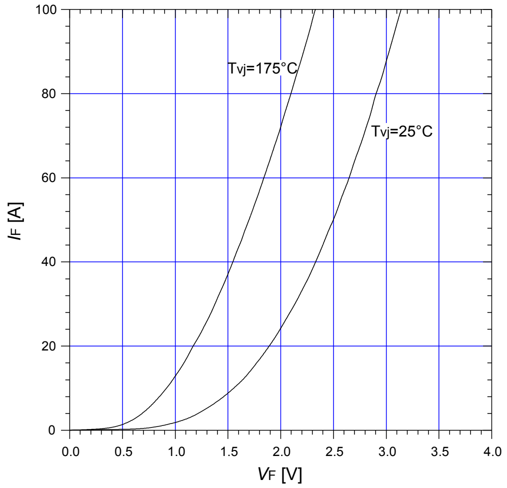
Graph.11
Typical switching losses vs. I_C
T_{vj}=150°C, V_{CC}=400V
V_{GE}=15V, R_G=+10/-20Ω



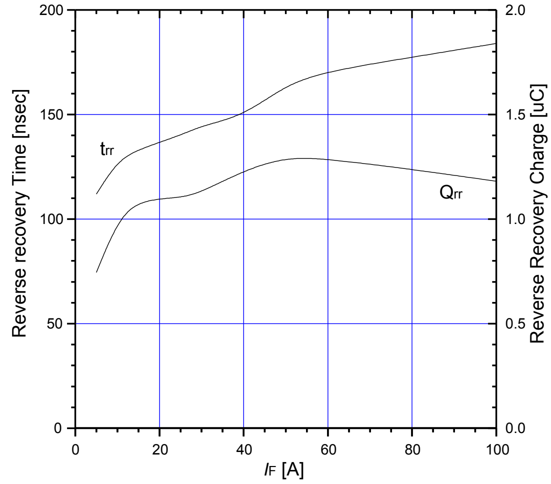
Graph.12
Typical switching losses vs. R_G
T_{vj}=150°C, V_{CC}=400V, I_C=25A
V_{GE}=15V



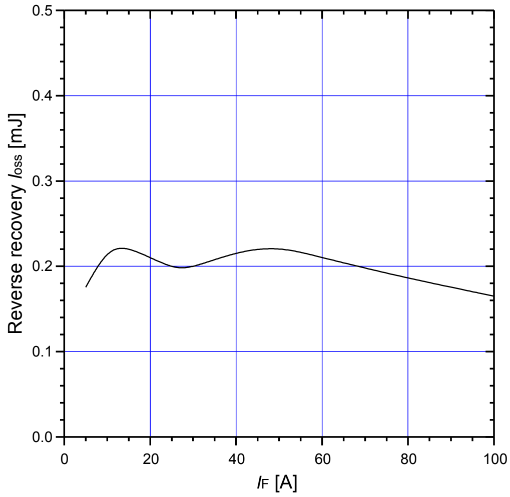
Graph.13
FWD Forward voltage drop (V_F-I_F)



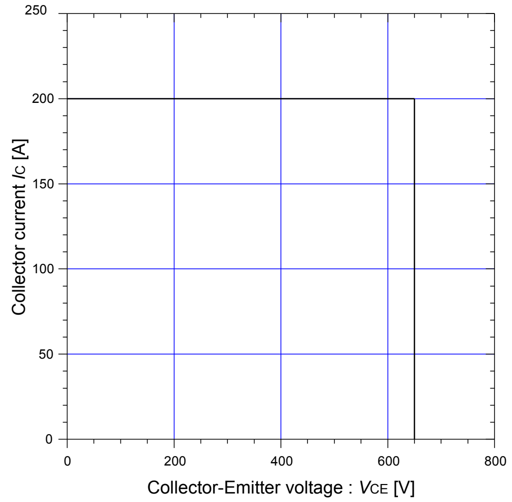
Graph.14
Typical reverse recovery characteristics vs. I_F
T_{vj}=150°C, V_{CC}=400V, L=500µH
V_{GE}=15V, R_G=10Ω



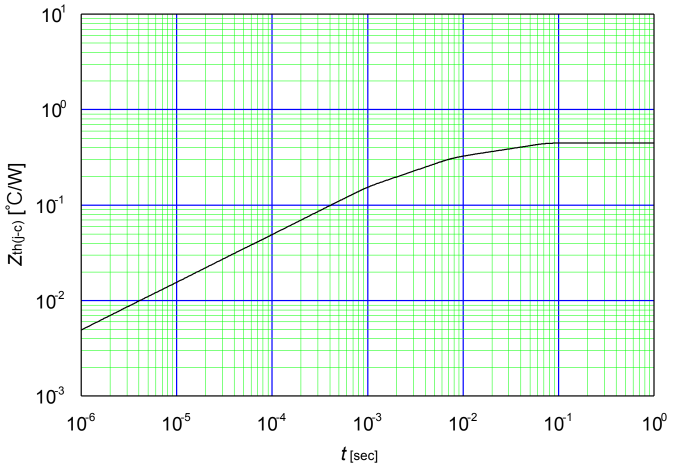
Graph.15
Typical reverse recovery loss vs. I_F
T_{vj}=150°C, V_{CC}=400V, L=500µH
V_{GE}=15V, R_G=10Ω



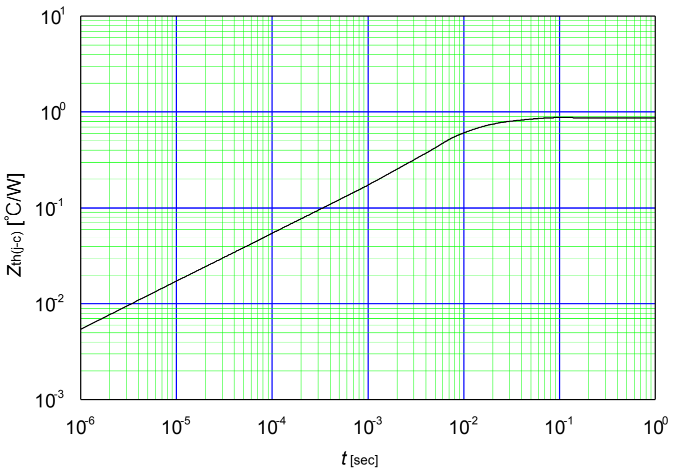
Graph.16
Reverse biased Safe Operating Area
T_{vj}≤175°C, V_{GE}=+15V/0V, R_G=10Ω



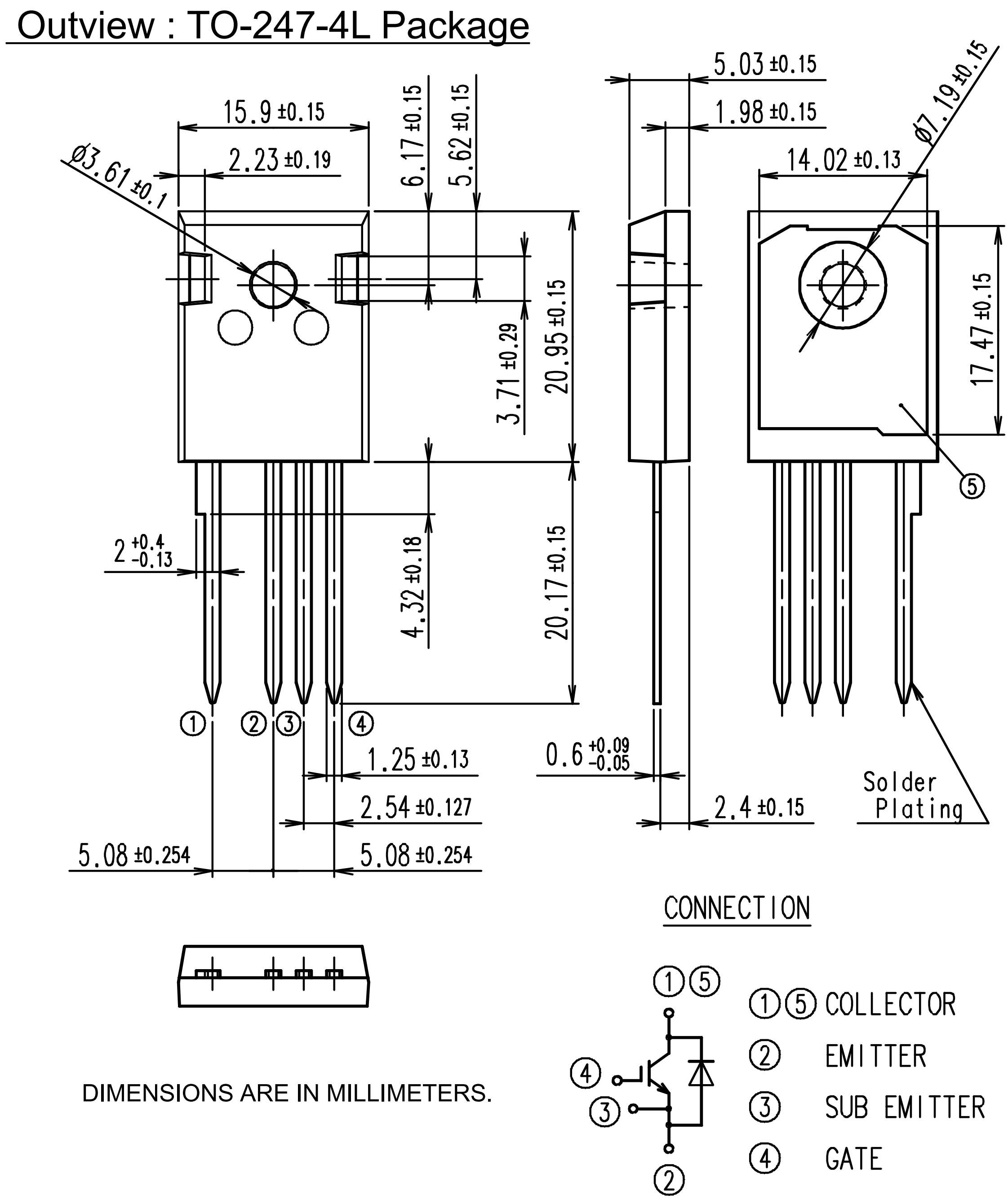
Graph.17
Transient thermal resistance of IGBT



Graph.18
Transient thermal resistance of FWD



Outline Drawings, mm



DIMENSIONS ARE IN MILLIMETERS.

WARNING

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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
   - OA equipment
   - Communications equipment (terminal devices)
   - Measurement equipment
   - Machine tools
   - Audiovisual equipment
   - Electrical home appliances
   - Personal equipment
   - Industrial robots etc.

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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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   - Aeronautic equipment
   - Nuclear control equipment
   - Submarine repeater equipment

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