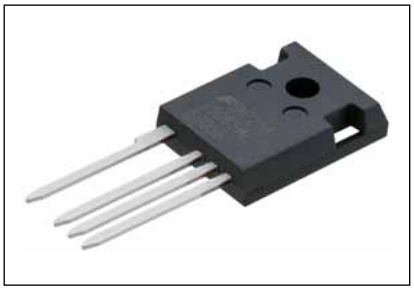
FGZ50N65WD

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



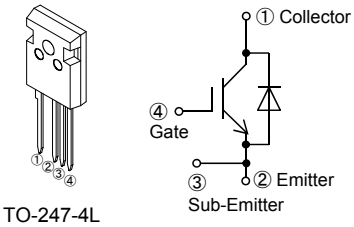
Maximum Ratings and Characteristics

● **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=25ºC
	$I_{C@100}$	50	A	T_C=100ºC
Pulsed Collector Current	I_{CP}	200	A	Note *1
Turn-Off Safe Operating Area	-	200	A	V_{CE}≤650V, T_{vj}≤175ºC
Diode Forward Current	$I_{F@25}$	38	A	
	$I_{F@100}$	25	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}	95	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 Tvjmax.

Equivalent circuit



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● **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 V_{GE}=0V f=1MHz		-	3650	-	pF
Output Capacitance	C_{oes}			-	105	-	
Reverse Transfer Capacitance	C_{res}			-	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			-	26	-	
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	$t_{d(off)}$			-	380	-	
Fall Time	t_f			-	15	-	
Turn-On Energy	E_{on}			-	0.22	-	mJ
Turn-Off Energy	E_{off}			-	0.52	-	
Forward Voltage Drop	V_F	I_F=25A	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		-	70	-	ns
Diode Reverse Recovery Charge	Q_{rr}	-di_F/dt=500A/μs, T_{vj}=25°C		-	0.32	-	μC
Diode Reverse Recovery Time	t_{rr}	V_{CC}=400V, I_F=25A		-	95	-	ns
Diode Reverse Recovery Charge	Q_{rr}	-di_F/dt=500A/μs, T_{vj}=150°C		-	0.88	-	μC

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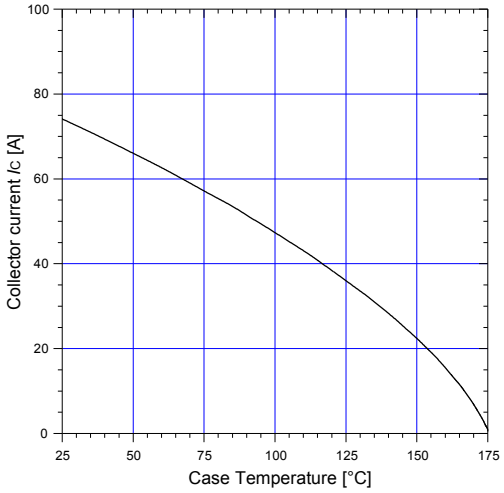
MARCH 2017

● Thermal Resistance

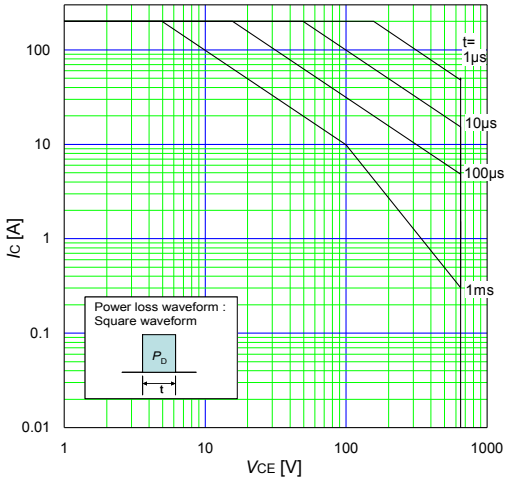
Description	Symbol	min.	typ.	max.	Unit
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	50	°C/W
Thermal Resistance, IGBT Junction to Case	$R_{th(j-c)\_IGBT}$	-	-	0.448	°C/W
Thermal Resistance, FWD Junction to Case	$R_{th(j-c)\_FWD}$	-	-	1.563	°C/W

Characteristics (Representative)

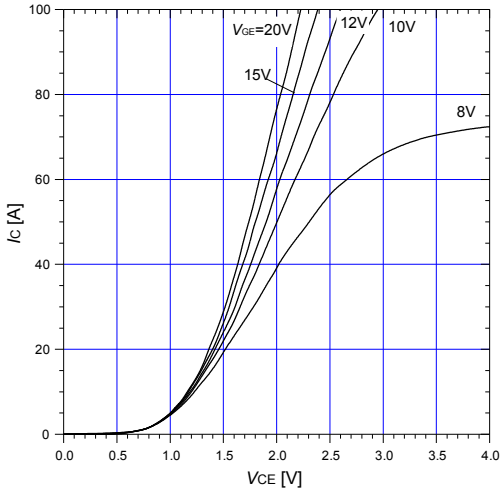
Graph.1
DC Collector Current vs *Tc*
V_{GE}≥+15V, T_{vj}≤175°C



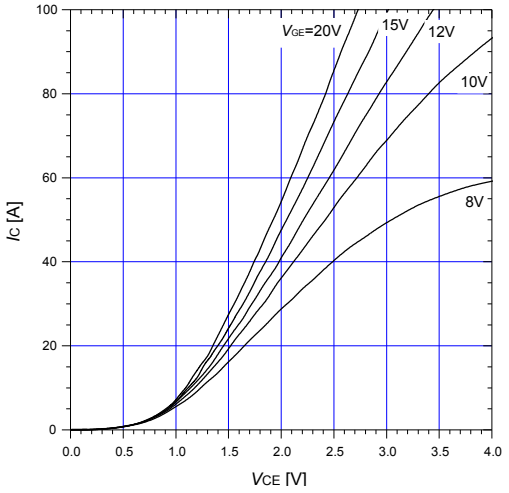
Graph.2
SOA
Duty=0(Single pulse), *Tc*=25°C



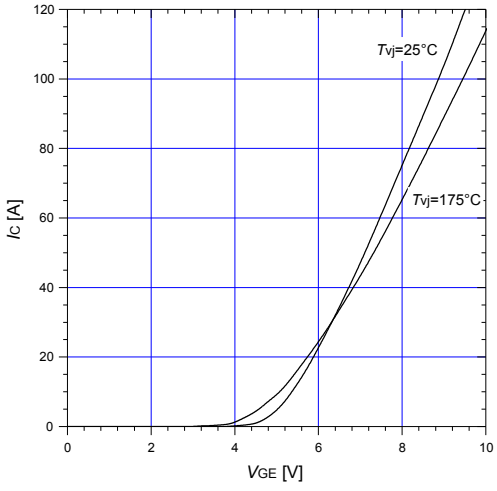
Graph.3
Typical Output Characteristics (V_{CE}-I_C)
T_{vj}=25°C



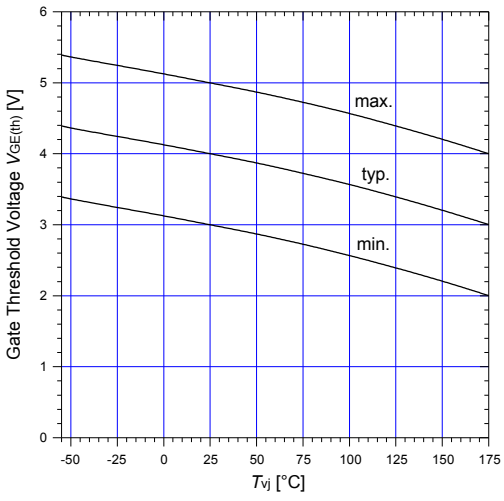
Graph.4
Typical Output Characteristics (V_{CE}-I_C)
T_{vj}=175°C



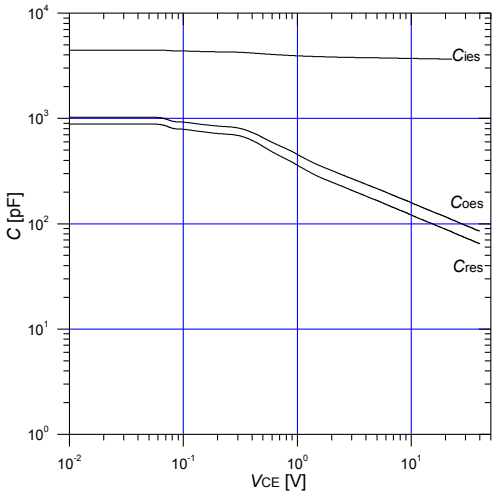
Graph.5
Typical Transfer Characteristics
V_{CE}=10V



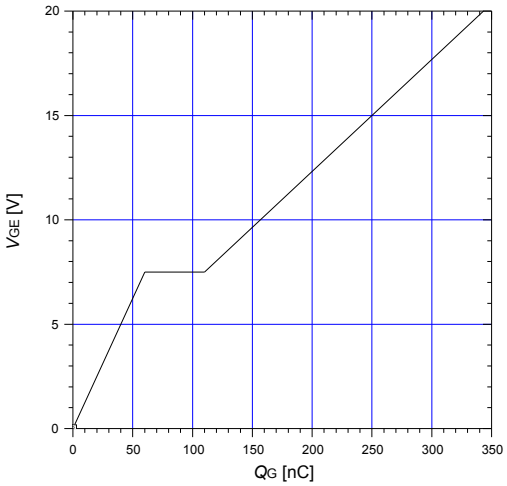
Graph.6
Gate Threshold Voltage vs. T_{vj}
I_C=50mA, V_{CE}=20V



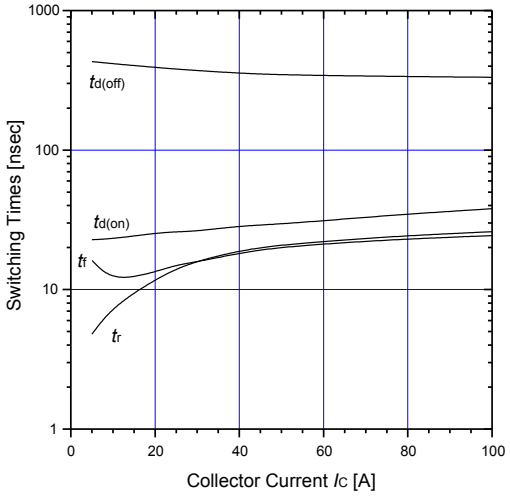
Graph.7
Typical Capacitance
V_{GE}=0V, f=1MHz, T_{vj}=25°C



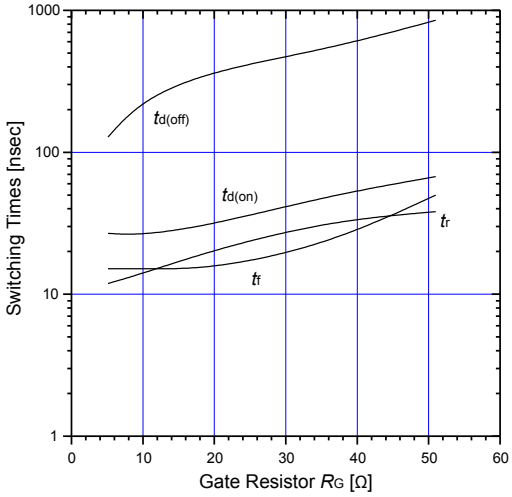
Graph.8
Typical Gate Charge
V_{CC}=520V, I_C=50A, T_{vj}=25°C



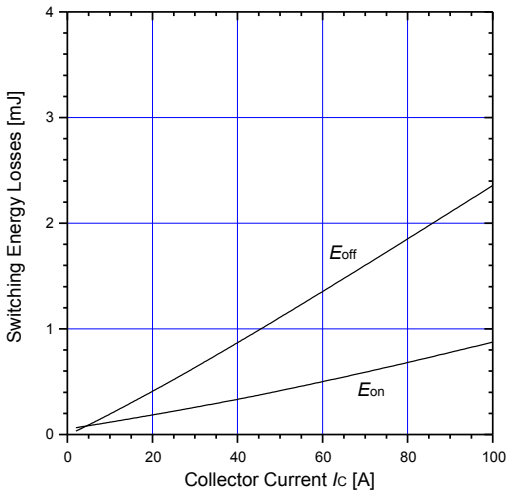
Graph.9
Typical switching time vs. I_C
T_{vj}=150°C, V_{CC}=400V
V_{GE}=15V, R_G=+10/-20Ω



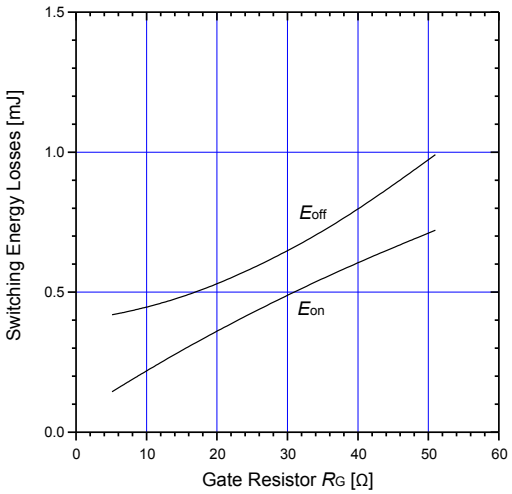
Graph.10
Typical switching time vs. R_G
T_{vj}=150°C, V_{CC}=400V, I_C=25A
V_{GE}=15V



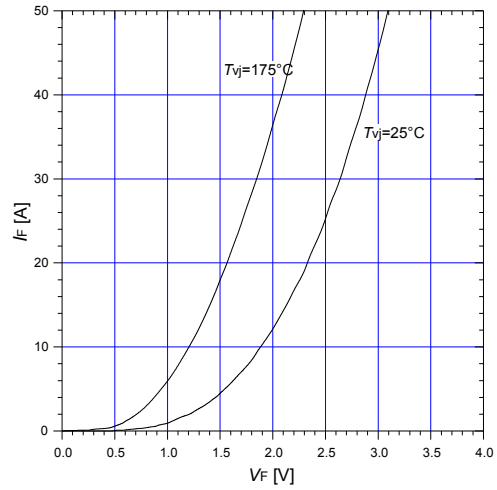
Graph.11
Typical switching losses vs. I_C
T_{vj}=150°C, V_{CC}=400V
V_{GE}=15V, R_G=+10/-20Ω



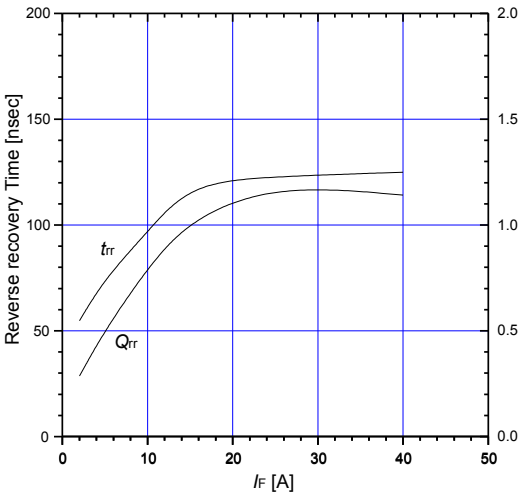
Graph.12
Typical switching losses vs. R_G
T_{vj}=150°C, V_{CC}=400V, I_C=25A
V_{GE}=15V



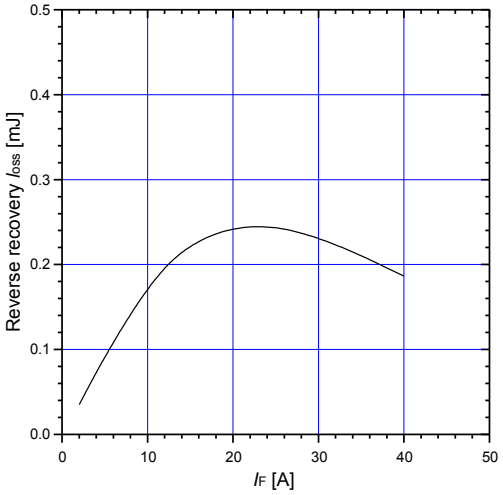
Graph.13
FWD Forward voltage drop (V_F-I_F)



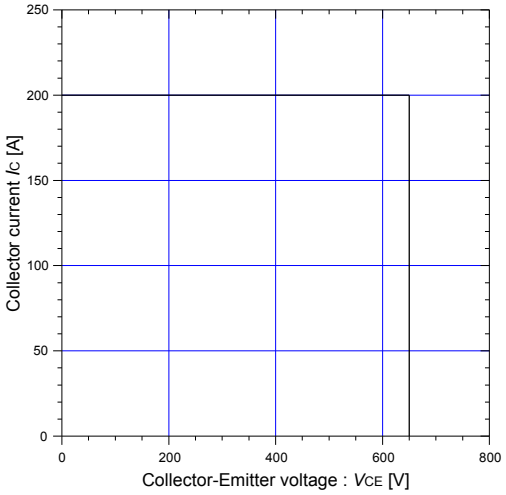
Graph.14
Typical reverse recovery characteristics vs. I_F
T_{vj}=150°C, V_{CC}=400V, L=500µH
V_{GE}=15V, R_G=10Ω



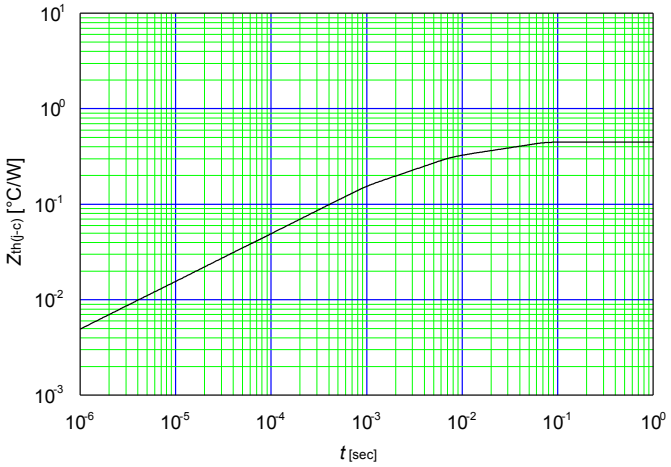
Graph.15
Typical reverse recovery loss vs. I_F
T_{vj}=150°C, V_{CC}=400V, L=500µH
V_{GE}=15V, R_G=10



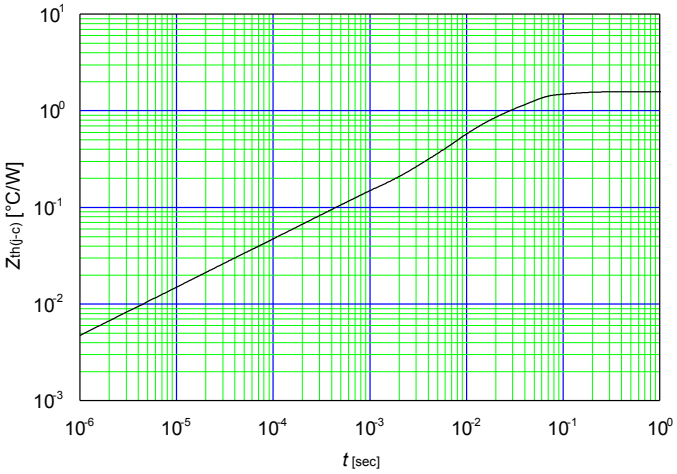
Graph.16
Reverse biased Safe Operating Area
T_{vj}≤175°C, V_{GE}=+15V/0V, R_G=10Ω



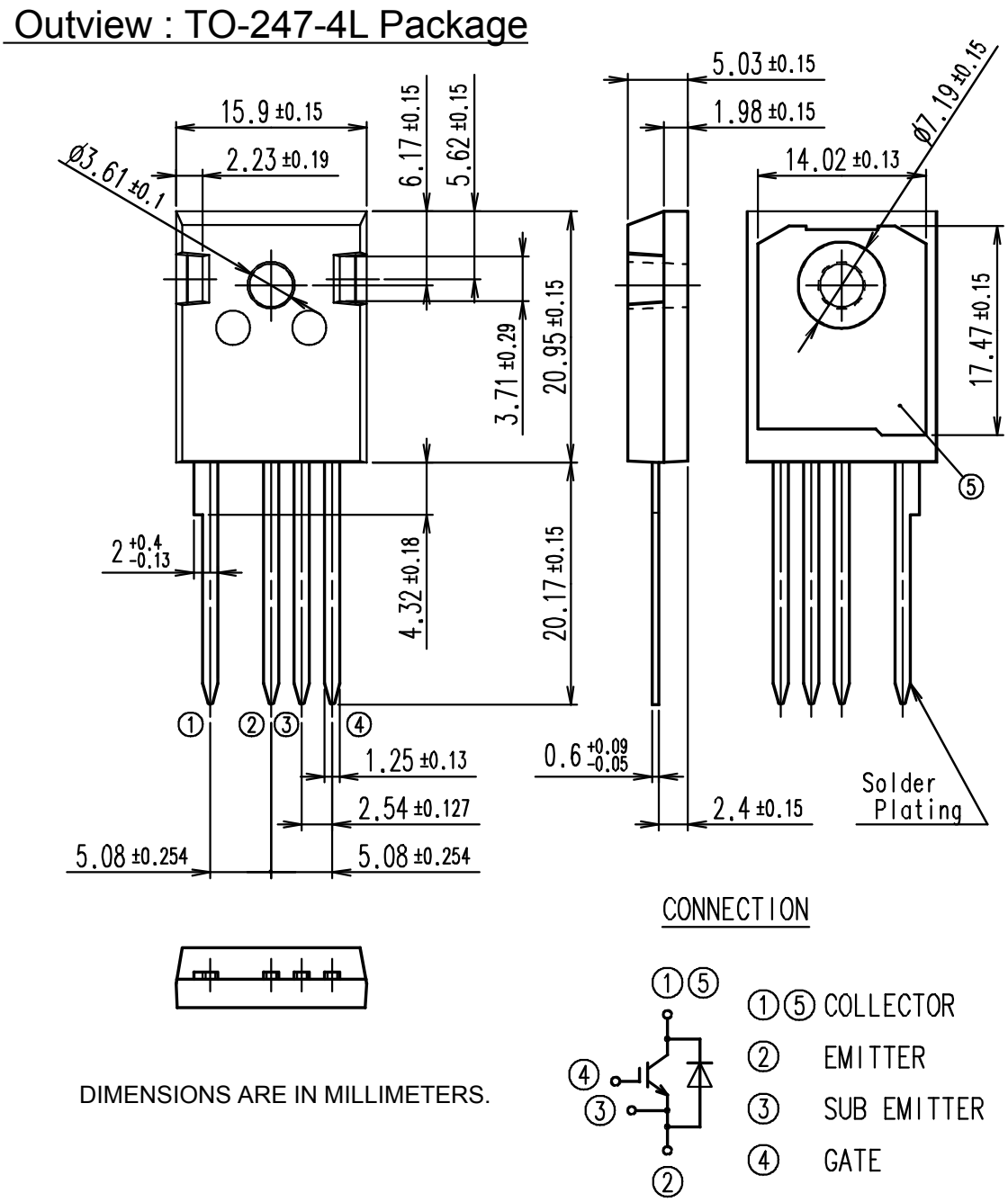
Graph.17
Transient thermal resistance of IGBT



Graph.18
Transient thermal resistance of FWD



Outline Drawings, mm



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

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- 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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