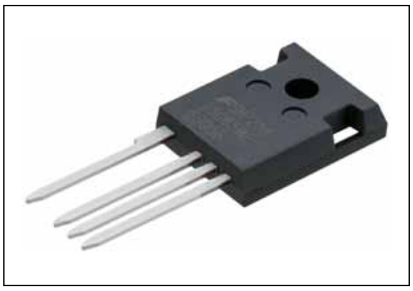
FGZ40N120WE

Discrete IGBT (High-Speed W series)
1200V / 40A

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

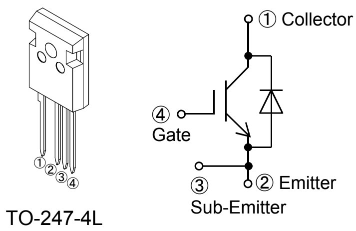
Maximum Ratings and Characteristics

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

Items	Symbol	Characteristics	Unit	Remarks
Collector-Emitter Voltage	V_{CES}	1200	V	
Gate-Emitter Voltage	V_{GES}	± 20	V	
Transient Gate-Emitter Voltage		± 30		T_p<1μs
DC Collector Current	$I_{C@25}$	65	A	T_C=25°C
	$I_{C@100}$	40	A	T_C=100°C
Pulsed Collector Current	I_{CP}	160	A	Note *1
Turn-Off Safe Operating Area	-	160	A	V_{CE}≤650V, T_{vj}≤175°C
Diode Forward Current	$I_{F@25}$	60	A	
	$I_{F@100}$	40	A	
Diode Pulsed Current	I_{FP}	160	A	Note *1
IGBT Max. Power Dissipation	P_{tot_IGBT}	430	W	T_C=25°C
FWD Max. Power Dissipation	P_{tot_FWD}	190	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



● **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} = 1200V, V_{GE} = 0V	T_{vj}=25°C	-	-	250	μA
			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 = 40mA		5.0	6.0	7.0	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C = 40A	T_{vj}=25°C	-	2.0	2.6	V
			T_{vj}=175°C	-	2.6	-	
Input Capacitance	C_{ies}	V_{CE}=25V		-	2500	-	pF
Output Capacitance	C_{oes}	V_{GE}=0V		-	110	-	
Reverse Transfer Capacitance	C_{res}	f=1MHz		-	34	-	
Gate Charge	Q_G	V_{CC} = 600V I_C = 40A V_{GE} = 15V		-	120	-	nC
Turn-On Delay Time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 600V I_C = 40A, V_{GE} = 15V R_G = 10Ω Energy loss include “tail” and FWD reverse recovery.		-	30	-	ns
Rise Time	t_r			-	16	-	
Turn-Off Delay Time	$t_{d(off)}$			-	150	-	
Fall Time	t_f			-	50	-	
Turn-On Energy	E_{on}			-	1.1	-	mJ
Turn-Off Energy	E_{off}			-	1.4	-	
Turn-On Delay Time	$t_{d(on)}$	T_{vj} = 175°C, V_{CC} = 600V I_C = 40A, V_{GE} = 15V R_G = 10Ω Energy loss include “tail” and FWD reverse recovery.		-	30	-	ns
Rise Time	t_r			-	20	-	
Turn-Off Delay Time	$t_{d(off)}$			-	190	-	
Fall Time	t_f			-	104	-	
Turn-On Energy	E_{on}			-	2.5	-	mJ
Turn-Off Energy	E_{off}			-	2.2	-	
Forward Voltage Drop	V_F	I_F=40A	T_{vj}=25°C	-	2.40	3.36	V
			T_{vj}=175°C	-	2.10	-	V
Diode Reverse Recovery Time	t_{rr}	V_{CC}=600V, I_F = 40A		-	0.45	-	μs
Diode Reverse Recovery Charge	Q_{rr}	-di_F/dt=600A/μs, T_{vj}=25°C		-	2.20	-	μC
Diode Reverse Recovery Time	t_{rr}	V_{CC}=600V, I_F=40A		-	0.85	-	μs
Diode Reverse Recovery Charge	Q_{rr}	-di_F/dt=600A/μs, T_{vj}=175°C		-	7.10	-	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	$R_{th(j-c)\_IGBT}$	-	-	0.347	°C/W
Thermal Resistance, FWD Junction to Case	$R_{th(j-c)\_FWD}$	-	-	0.781	°C/W

Characteristics (Representative)

Figure 4. DC Collector Current vs T_C
$V_{GE} \geq +15V$, $T_{vj} \leq 175°C$

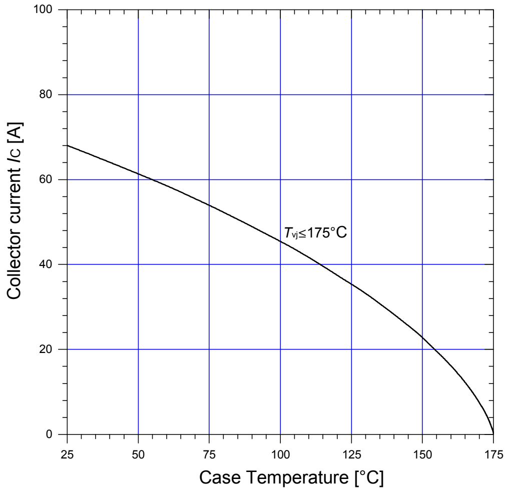


Figure 5. Collector Current vs. switching frequency
$V_{GE}=15V$, $T_{vj} \leq 150°C$, $V_{cc}=600V$, $R_G=10Ω$
Duty=0.5, $T_c=100°C$

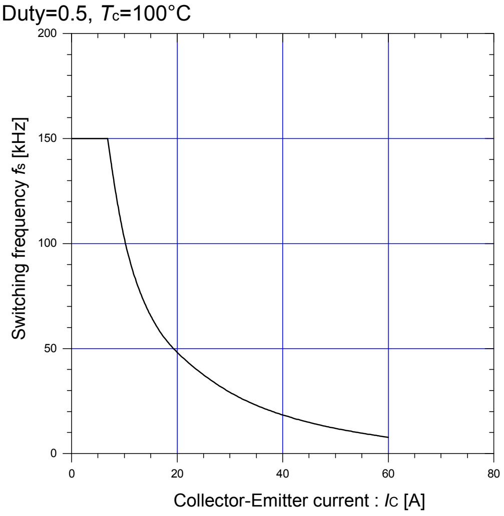


Figure 6. Typical output characteristics
$T_{vj}=25°C$

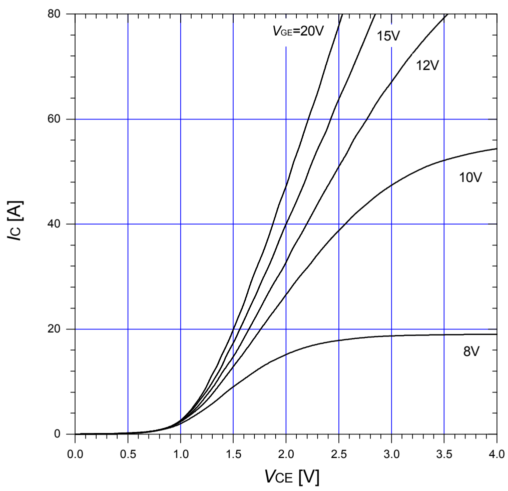


Figure 7. Typical output characteristics
$T_{vj}=175°C$

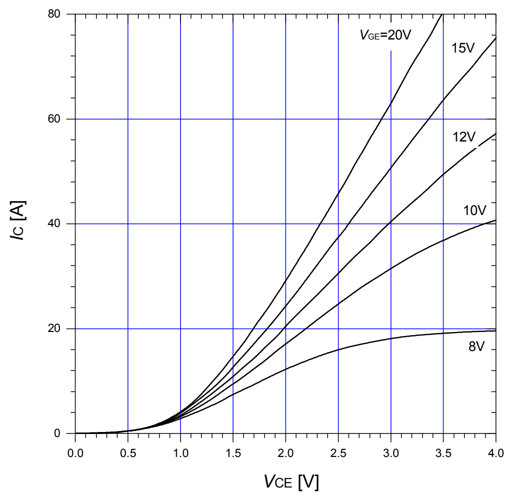


Figure 8. Typical transfer characteristics
$V_{CE}=10V$

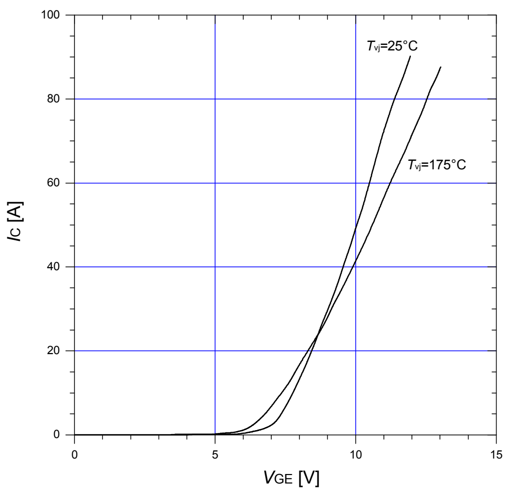


Figure 9. Gate threshold voltage
$I_C= 40mA$, $V_{CE}=20V$

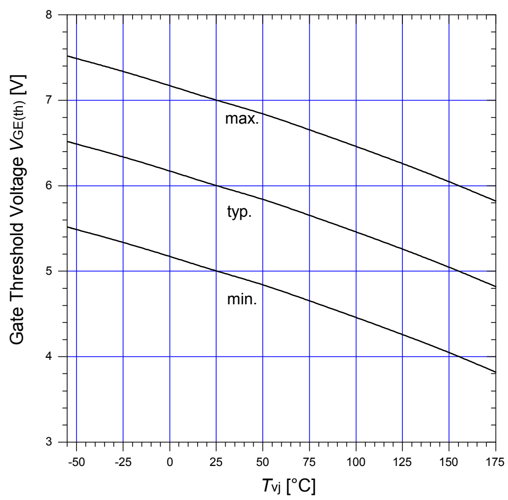


Figure 10. Typical capacitance
V_{GE} = 0 V, f = 1 MHz

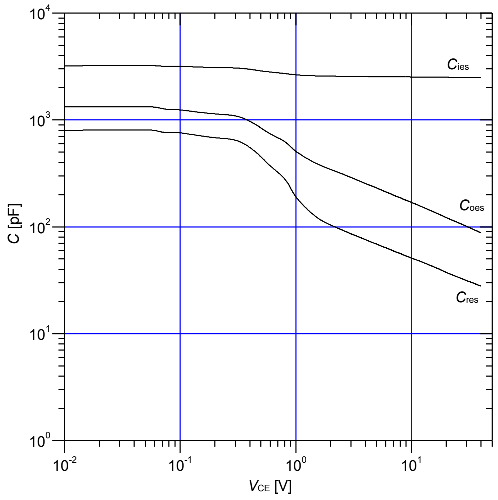


Figure 11. Typical gate charge
I_C = 40 A, V_{CC} = 600 V, T_{vj} = 25°C

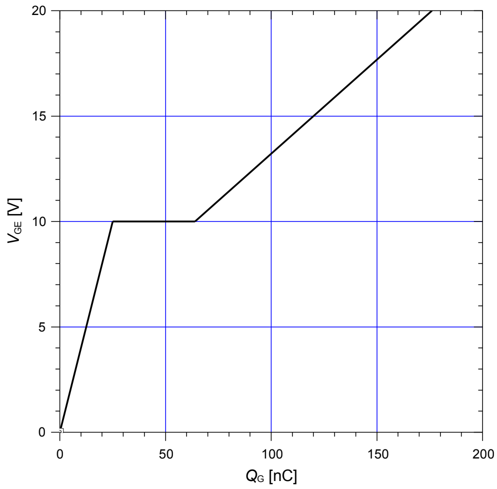


Figure 12. Typical switching times vs. I_C
V_{CC} = 600 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 175°C

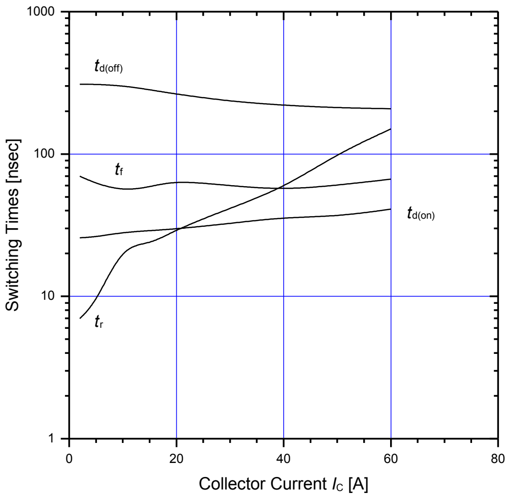


Figure 13. Typical switching times vs. R_G
V_{CC} = 600 V, V_{GE} = 15 V, I_C = 40 A, T_{vj} = 175°C

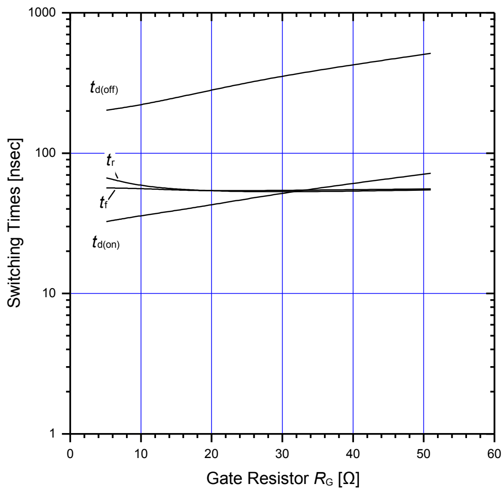


Figure 14. Typical switching losses vs. I_C
V_{CC} = 600 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 175°C

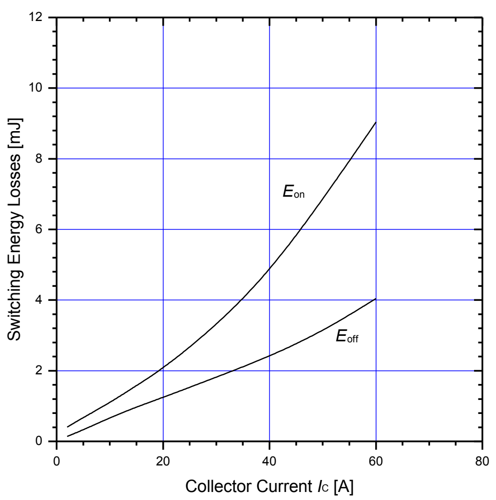


Figure 15. Typical switching losses vs. R_G
V_{CC} = 600 V, V_{GE} = 15 V, I_C = 40 A, T_{vj} = 175°C

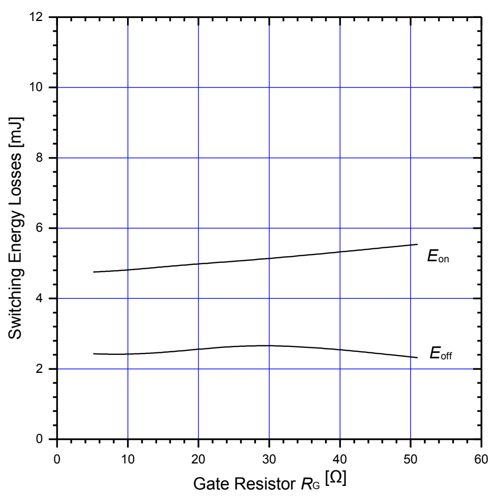


Figure 16. Typical forward characteristics of FWD

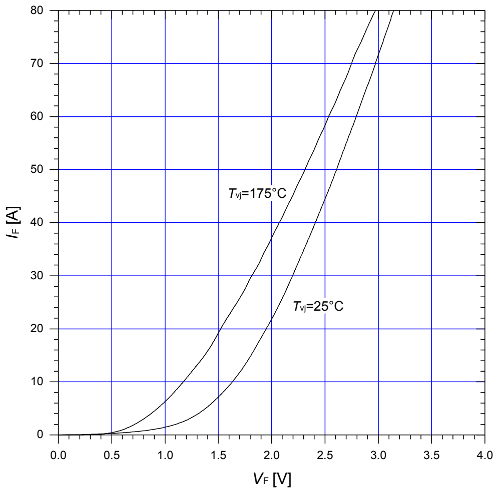


Figure 17.
Typical reverse recovery characteristics vs. I_F
V_{CC} = 600 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 175°C

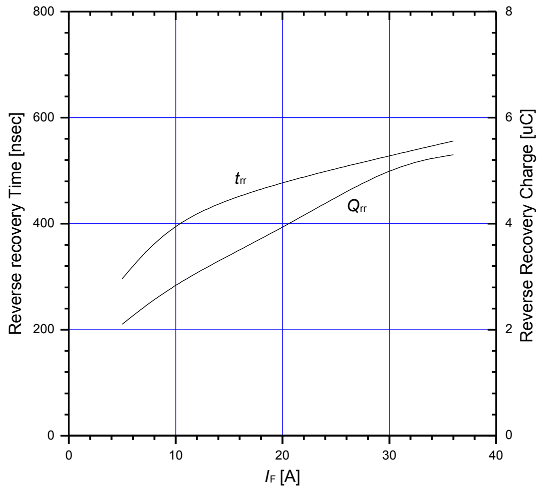


Figure 18. Typical reverse recovery loss vs. I_F
V_{CC} = 600 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 175°C

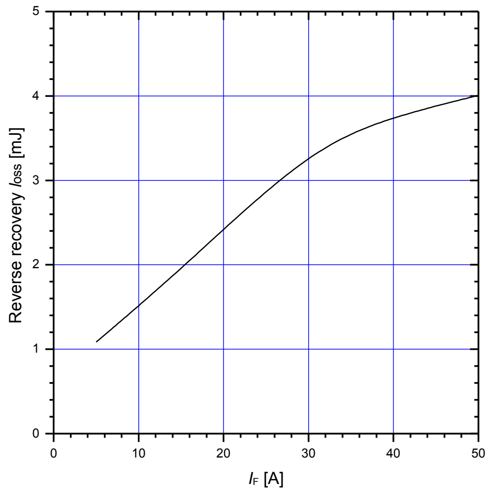


Figure 19. Reverse biased safe operating area
V_{GE} = 15 V / 0 V, R_G = 10 Ω, T_{vj} ≤ 175°C

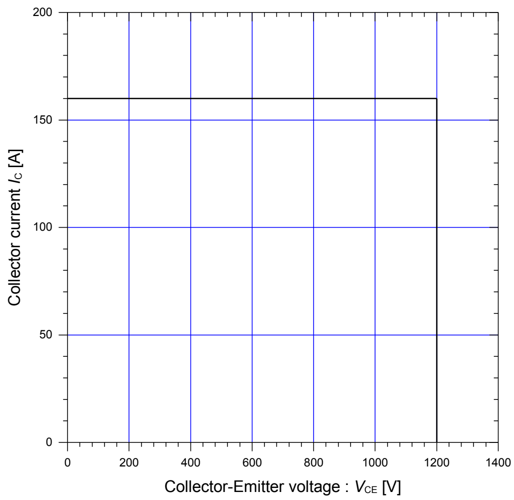


Figure 20. Transient Thermal Impedance of IGBT
D = 0

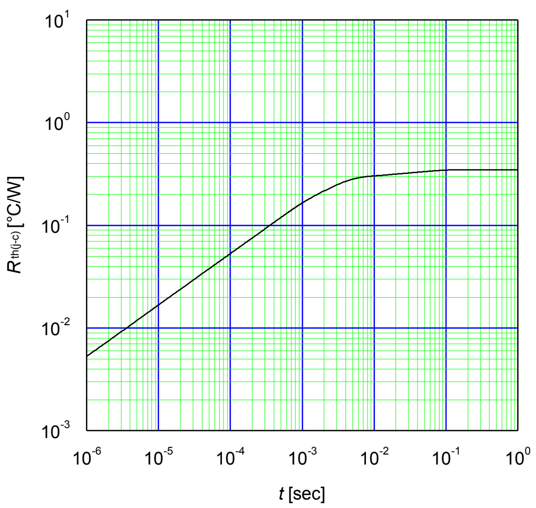
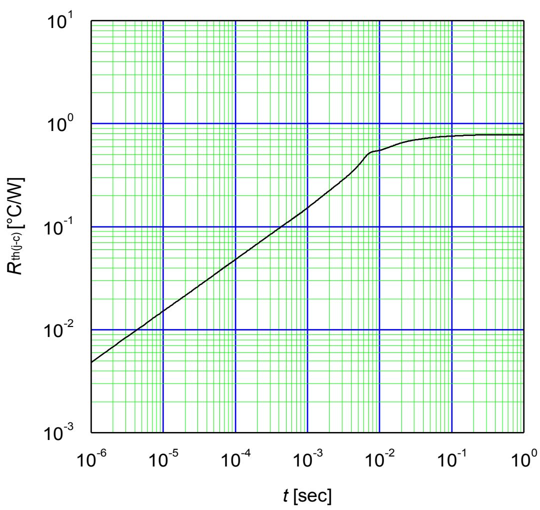
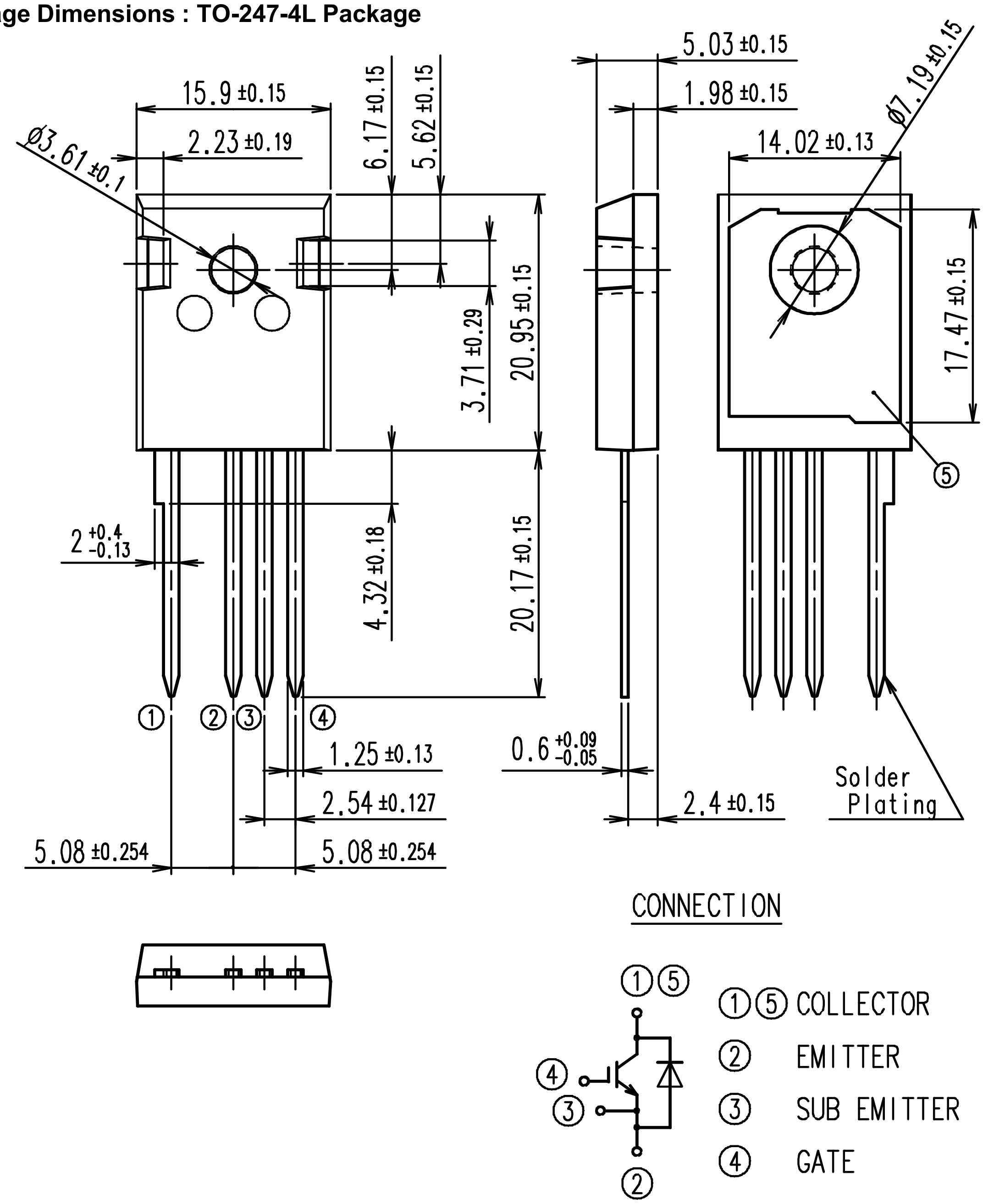


Figure 21. Transient Thermal Impedance of FWD
D = 0



Outline Drawings, mm

Package Dimensions : TO-247-4L Package



WARNING

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