

FGW40XS120C

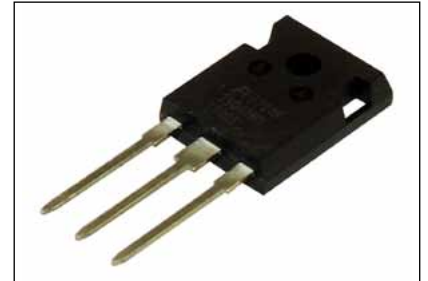
Discrete IGBT (XS-series) 1200V / 40A

Features

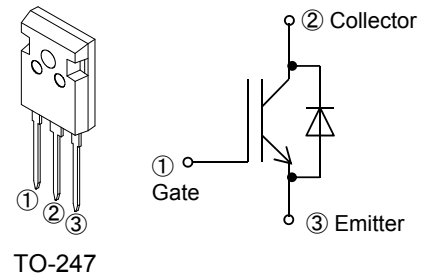
- Pb-free lead terminal; RoHS compliant
- Halogen-free molding compound

Applications

- Uninterrupted Power Supply, PV Power Conditioner,
- Inverter welding machine



Equivalent circuit



TO-247

Maximum Ratings and Characteristics

Absolute Maximum Ratings at $T_{vj} = 25\text{ }^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Value	Unit	Remarks
Collector-Emitter Voltage	V_{CES}	1200	V	
Gate-Emitter Voltage	V_{GES}	± 20	V	
Transient Gate-Emitter Voltage		± 30	V	$t_p < 1\text{ }\mu\text{s}$
DC Collector Current	$I_{C@25}$	63	A	$T_c = 25\text{ }^\circ\text{C}$
	$I_{C@100}$	40	A	$T_c = 100\text{ }^\circ\text{C}$
Pulsed Collector Current	I_{CP}	160	A	Note *1
Turn-Off Safe Operating Area	-	160	A	$V_{CE} \leq 1200\text{ V}$ $T_{vj} \leq 175\text{ }^\circ\text{C}$
Diode Forward Current	$I_{F@25}$	63	A	
	$I_{F@100}$	40	A	
Diode Pulsed Current	I_{FP}	160	A	Note *1
IGBT Max. Power Dissipation	P_{tot_IGBT}	351	W	$T_c = 25\text{ }^\circ\text{C}$
FWD Max. Power Dissipation	P_{tot_FWD}	127	W	$T_c = 25\text{ }^\circ\text{C}$
Operating Junction Temperature	T_{vj}	$-40 \sim +175$	$^\circ\text{C}$	
Storage Temperature	T_{stg}	$-55 \sim +175$	$^\circ\text{C}$	

Note *1 : Pulse width limited by $T_{vj\text{max}}$.

Electrical Characteristics at $T_{vj} = 25\text{ }^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE} = 1200\text{ V}$ $V_{GE} = 0\text{ V}$	-	-	250	μA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE} = 0\text{ V}$ $V_{GE} = \pm 20\text{ V}$	-	-	200	nA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{CE} = 20\text{ V}$ $I_C = 40\text{ mA}$	4.9	5.5	6.1	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}$ $I_C = 40\text{ A}$	-	1.60	1.90	V
Input Capacitance	C_{ies}	$V_{CE} = 25\text{ V}$	-	4700	-	pF
Output Capacitance	C_{oes}	$V_{GE} = 0\text{ V}$	-	66	-	pF
Reverse Transfer Capacitance	C_{res}	$f = 1\text{ MHz}$	-	38	-	pF
Gate Charge	Q_G	$V_{CC} = 600\text{ V}$ $I_C = 40\text{ A}$ $V_{GE} = 15\text{ V}$	-	250	-	nC
Turn-On Delay Time	$t_{d(on)}$	$T_{vj} = 25\text{ }^\circ\text{C}$	-	45	-	ns
Rise Time	t_r	$V_{CC} = 600\text{ V}$	-	32	-	ns
Turn-Off Delay Time	$t_{d(off)}$	$I_C = 40\text{ A}$	-	250	-	ns
Fall Time	t_f	$V_{GE} = 15\text{ V}$	-	60	-	ns
Turn-On Energy	E_{on}	$R_G = 10\text{ }\Omega$	-	1.4	-	mJ
Turn-Off Energy	E_{off}	Energy loss include "tail" and FWD reverse recovery.	-	1.7	-	mJ
Turn-On Delay Time	$t_{d(on)}$	$T_{vj} = 175\text{ }^\circ\text{C}$	-	44	-	ns
Rise Time	t_r	$V_{CC} = 600\text{ V}$	-	26	-	ns
Turn-Off Delay Time	$t_{d(off)}$	$I_C = 40\text{ A}$	-	280	-	ns
Fall Time	t_f	$V_{GE} = 15\text{ V}$	-	130	-	ns
Turn-On Energy	E_{on}	$R_G = 10\text{ }\Omega$	-	2.2	-	mJ
Turn-Off Energy	E_{off}	Energy loss include "tail" and FWD reverse recovery.	-	2.0	-	mJ
Forward Voltage Drop	V_F	$I_F = 40\text{ A}$	-	2.90	3.30	V
			-	3.20	-	V
			-	3.20	-	V
Diode Reverse Recovery Time	t_{rr}	$V_{CC} = 600\text{ V}$ $I_F = 40\text{ A}$	-	230	-	ns
Diode Reverse Recovery Charge	Q_{rr}	$-di_F/dt = 300\text{ A}/\mu\text{s}$ $T_{vj} = 25\text{ }^\circ\text{C}$	-	1.10	-	μC
Diode Reverse Recovery Time	t_{rr}	$V_{CC} = 600\text{ V}$ $I_F = 40\text{ A}$	-	500	-	ns
Diode Reverse Recovery Charge	Q_{rr}	$-di_F/dt = 300\text{ A}/\mu\text{s}$ $T_{vj} = 175\text{ }^\circ\text{C}$	-	2.30	-	μC

● Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	50	°C/W
Thermal Resistance, IGBT Junction to Case	$R_{th(j-c)}_{IGBT}$	-	-	0.427	°C/W
Thermal Resistance, FWD Junction to Case	$R_{th(j-c)}_{FWD}$	-	-	1.176	°C/W

■ Characteristics (Representative)

Figure 1. IGBT Power Dissipation vs T_c
 $T_{vj} \leq 175^\circ\text{C}$

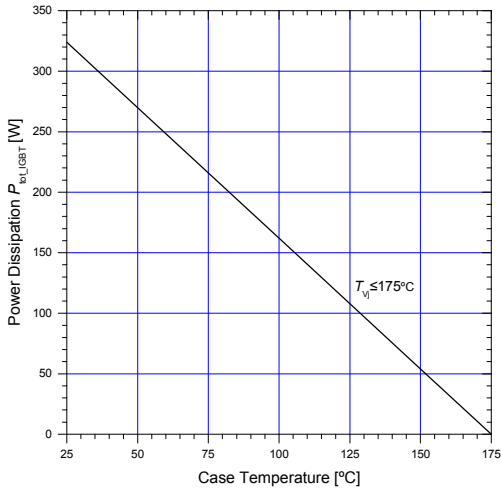


Figure 2. DC Collector Current vs T_c
 $V_{GE} \geq +15\text{ V}, T_{vj} \leq 175^\circ\text{C}$

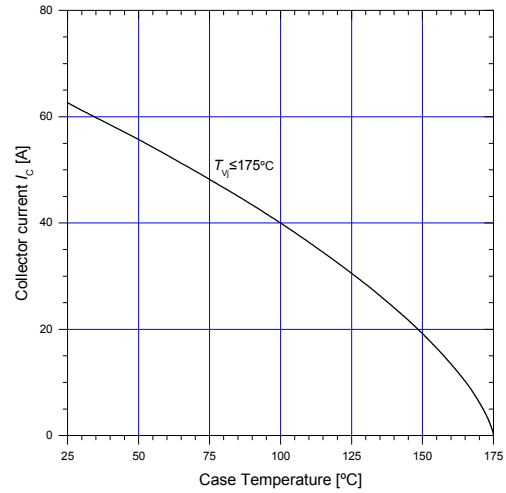


Figure 3. Typical output characteristics
 $T_{vj} = 25^\circ\text{C}$

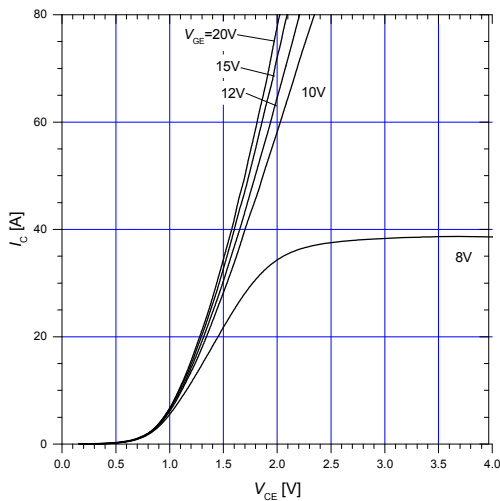


Figure 4. Typical output characteristics
 $T_{vj} = 175^\circ\text{C}$

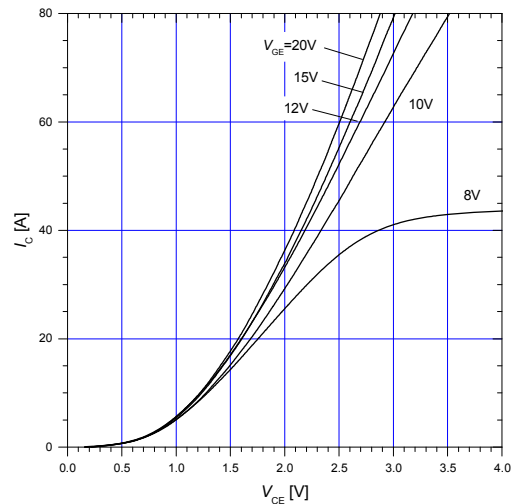


Figure 5. Typical transfer characteristics
 $V_{CE} = 20\text{ V}$

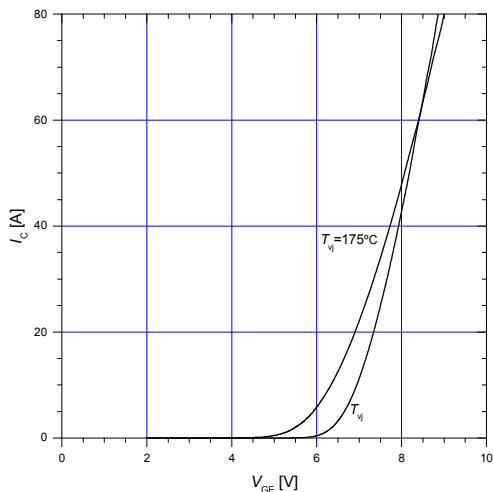


Figure 6. Gate threshold voltage
 $I_C = 40\text{ mA}, V_{CE} = 20\text{ V}$

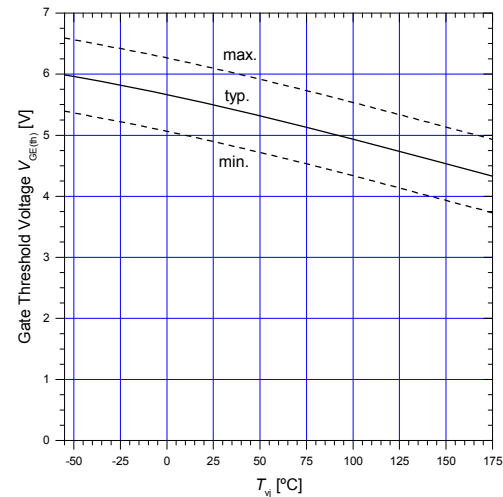


Figure 7. Typical capacitance

$V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$

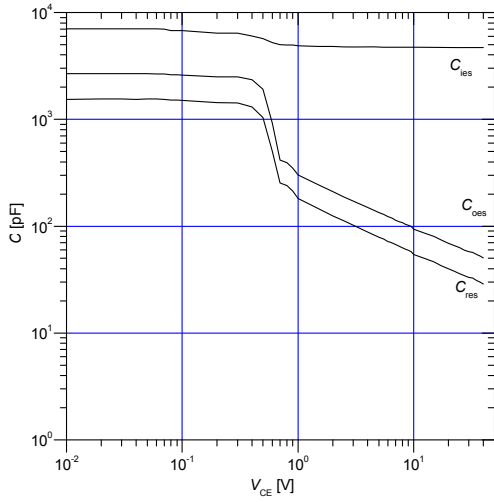


Figure 8. Typical gate charge

$I_C = 40\text{ A}$, $V_{CC} = 600\text{ V}$, $T_{vj} = 25^\circ\text{C}$

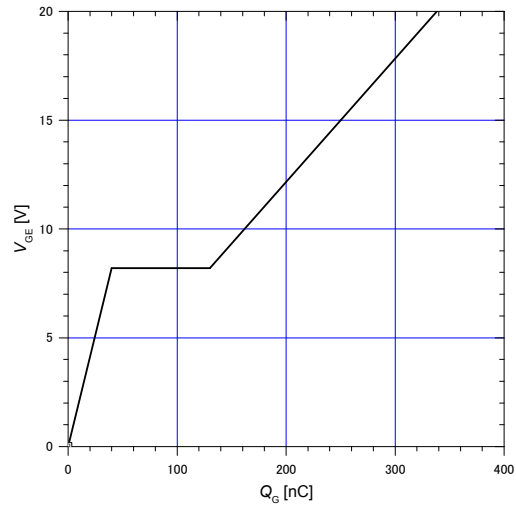


Figure 9. Typical switching times vs. Ic

$V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $T_{vj} = 175^\circ\text{C}$

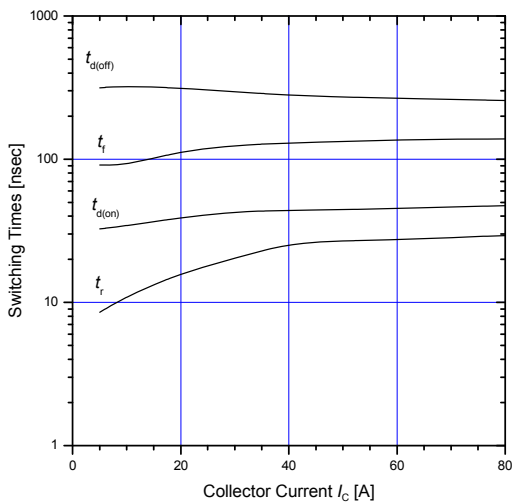


Figure 10. Typical switching times vs. Rg

$V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 40\text{ A}$, $T_{vj} = 175^\circ\text{C}$

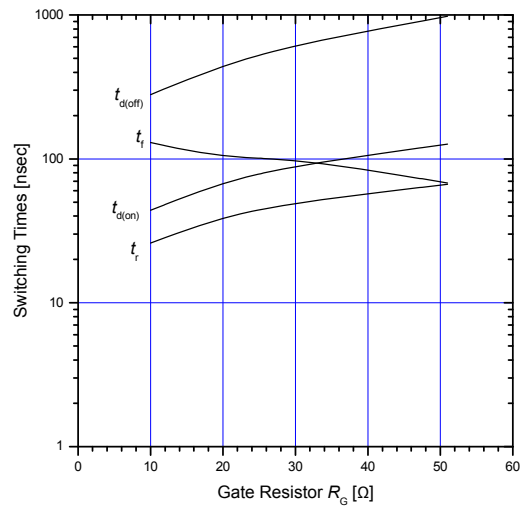


Figure 11. Typical switching losses vs. Ic

$V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $T_{vj} = 175^\circ\text{C}$

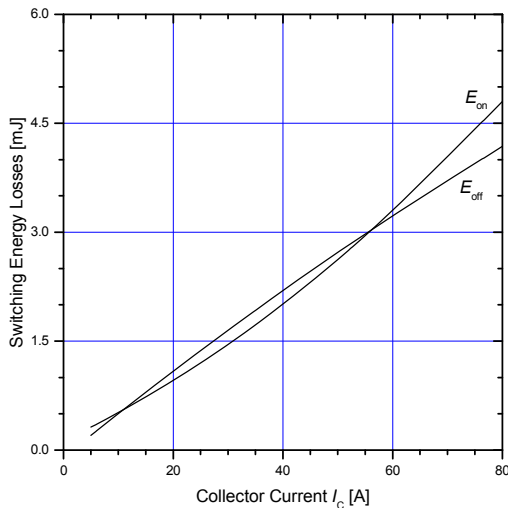


Figure 12. Typical switching losses vs. Rg

$V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 40\text{ A}$, $T_{vj} = 175^\circ\text{C}$

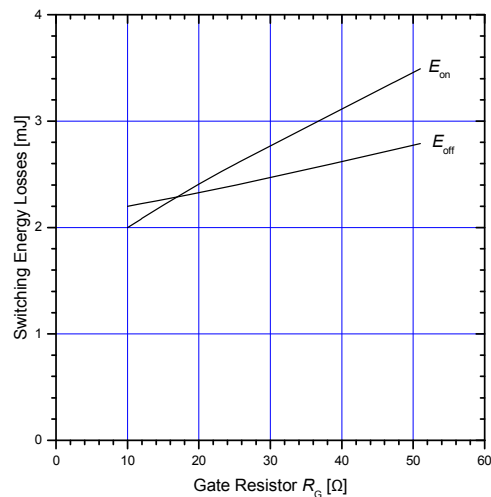


Figure 13. Typical forward characteristics of FWD

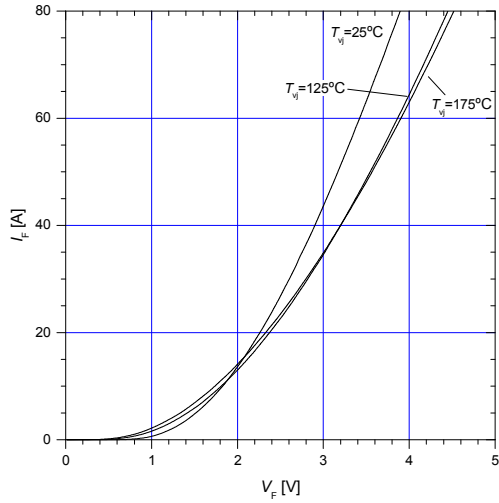


Figure 14. Typical reverse recovery characteristics vs. I_F

$V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $T_{vj} = 175^\circ\text{C}$

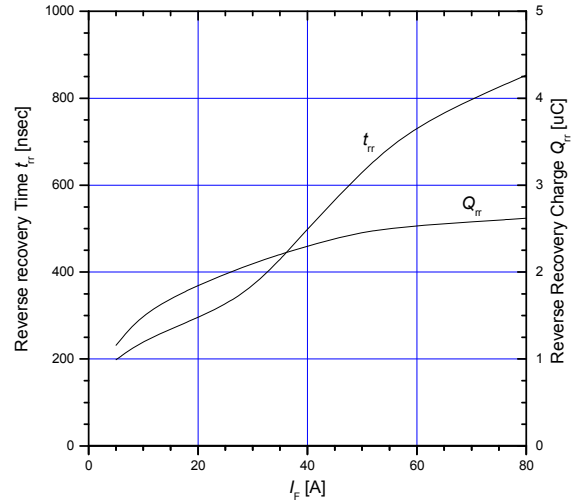


Figure 15. Typical reverse recovery loss vs. I_F

$V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$, $R_G = 10\ \Omega$, $T_{vj} = 175^\circ\text{C}$

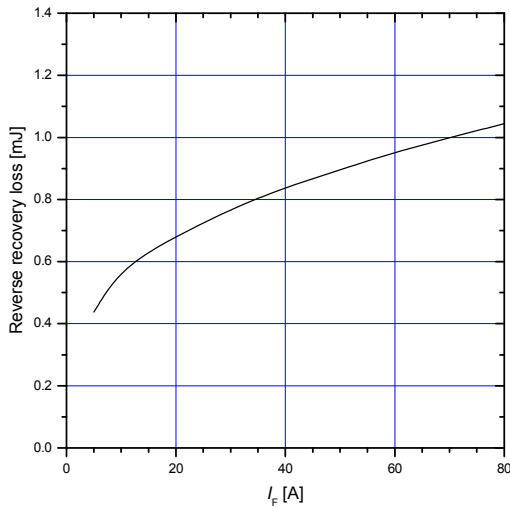


Figure 16. Reverse biased safe operating area

$V_{GE} = 15\text{ V} / 0\text{ V}$, $R_G = 10\ \Omega$, $T_{vj} \leq 175^\circ\text{C}$

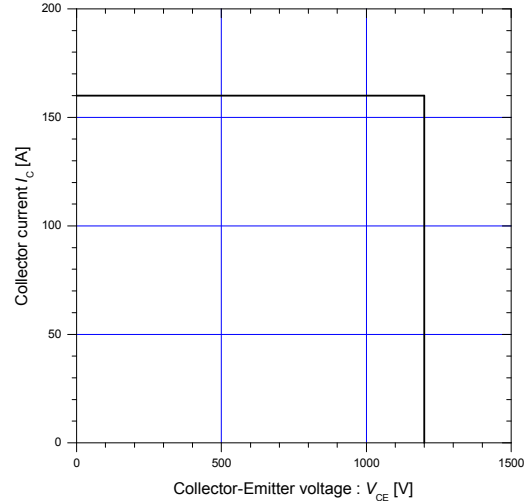


Figure 17. Transient Thermal Impedance of IGBT

$D = 0$

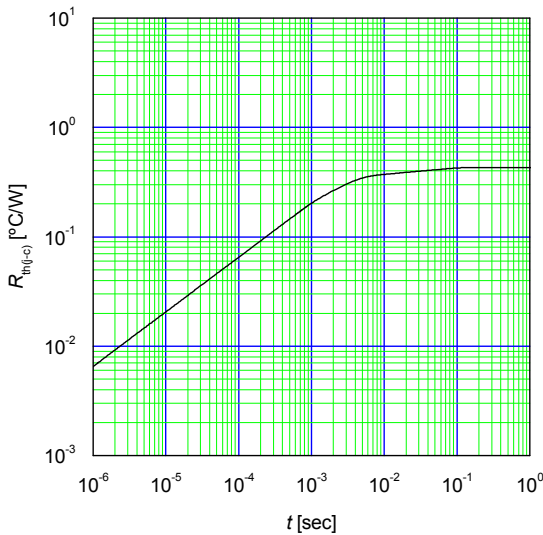
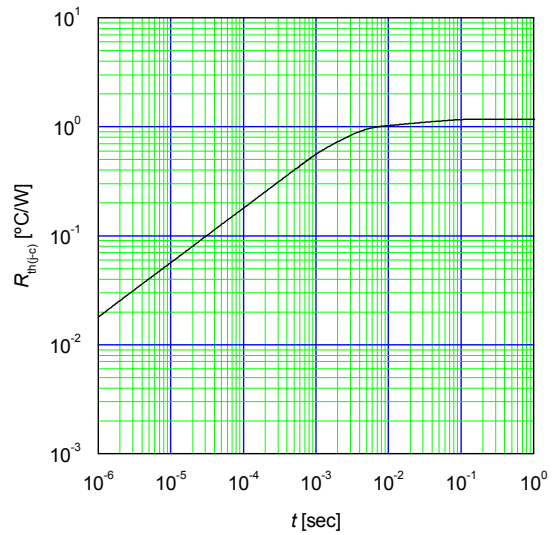


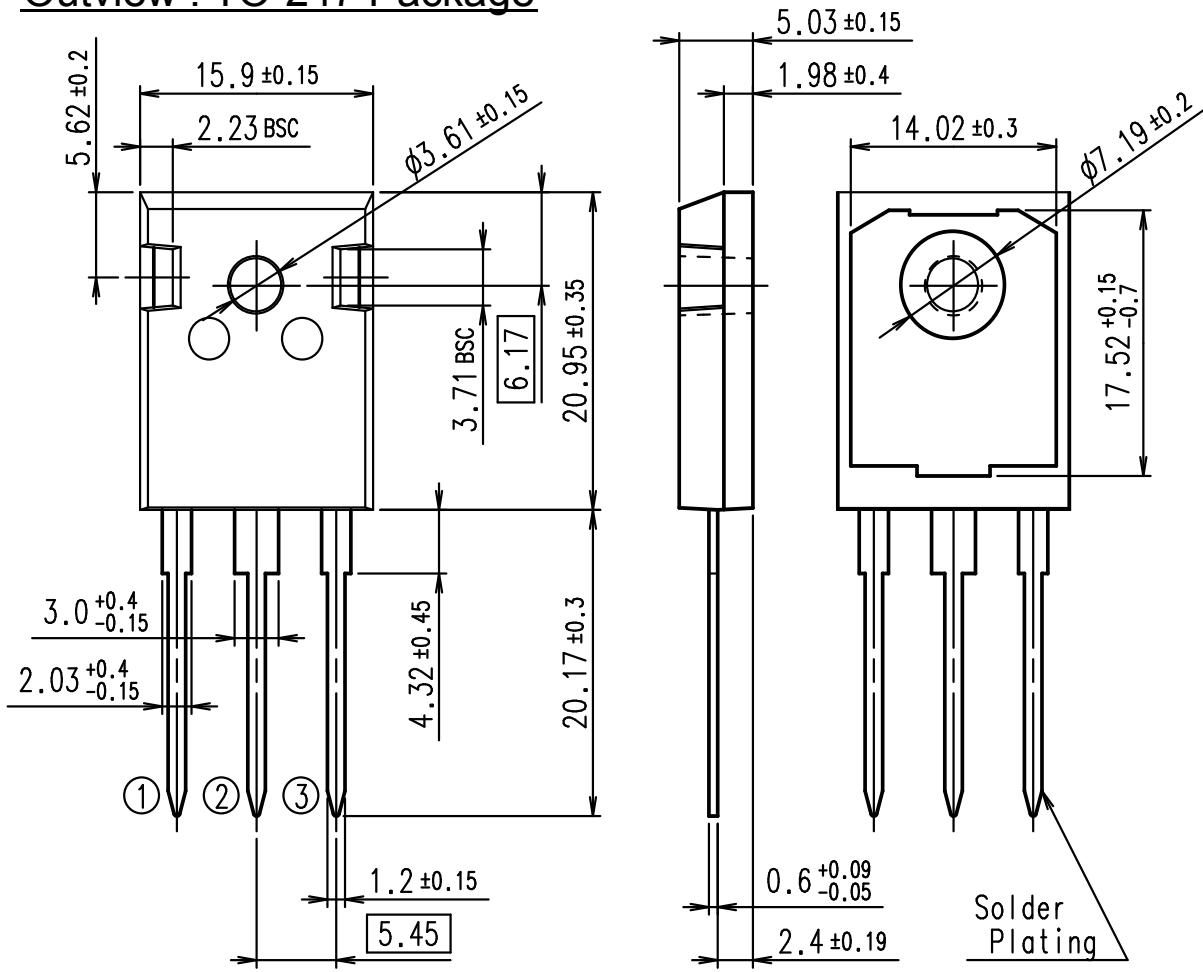
Figure 18. Transient Thermal Impedance of FWD

$D = 0$



■ Outline Drawings, mm

Outview : TO-247 Package



WARNING

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