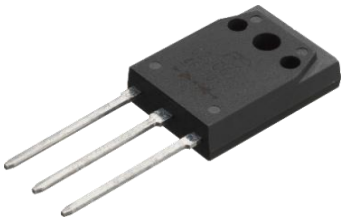
FGW40XS120C

Discrete IGBT

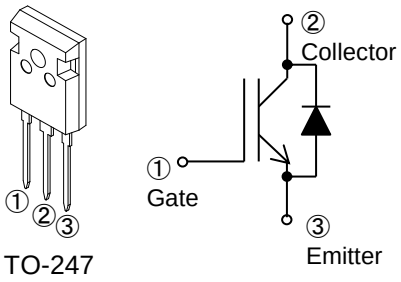
Discret IGBT (XS-series)
1200V/40A



■ Features
Pb-free lead terminal ;RoHS compliant
Helogen-free molding compound

■ Applications
Uniterruptible Power Supply,PV Power Conditioner,
Inverter welding machine

■ Equivalent Circuit



TO-247

■ Maximum ratings and characteristics

●Absolute maximum ratings at T_{vj}=25℃ (unless otherwise specified)

Parameter	Symbol	Value	Unit	Remarks
Collecter-Emitter voltage	V_{CES}	1200	V	
Gate-Emitter voltage	V_{GES}	±20	V	
Transient Gate-Emitter voltage		±30		t_p<1μs
DC collector current	$I_{C@25}$	63	A	T_C=25℃
	$I_{C@100}$	40	A	T_C=100℃
Pulsed collector current	I_{CP}	160	A	Note*1
Turn-off safe operating area	-	160	A	V_{CE} ≤ 1200 V,T_{vj} ≤ 175℃
Diode forward current	$I_{C@25}$	63	A	
	$I_{C@100}$	40	A	
Diode pulsed current	I_{FP}	160	A	Note*1
IGBT max. power dissipation	P_{tot_IGBT}	351	W	T_C=25℃
FWD max. power dissipation	P_{tot_FWD}	127	W	T_C=25℃
Operating junction temperature	T_{vj}	-40～+175	°C	
Storage temperature	T_{stg}	-55～+175	°C	

Note*1 : Pulse width limited by T_{vjmax}

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● Electrical characteristics (at T_{vj}= 25°C unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Zero-gate voltage collector current	I_{CES}	V_{CE}=1200V	T_{vj}=25℃	-	-	250	
		V_{GE}=0V	T_{vj}=175℃	-	-	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		4.9	5.5	6.1	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V I_C=40A	T_{vj}=25℃	1.3	1.6	1.9	V
			T_{vj}=125℃	-	2.05	-	
			T_{vj}=175℃	-	2.15	-	
Input capacitance	C_{ies}	V_{CE}=25V		2350	4700	7050	pF
Oputput capacitance	C_{oes}	V_{GE}=0V		33	66	100	
Reverse transfer capacitance	C_{res}	f = 1MHz		19	38	60	
Gate charge	Q_G	V_{CC}= 600V,I_C=40A,V_{GE}=15V		125	250	380	nC
Turn-on delay time	$t_{d(on)}$	T_{vj}=25℃,V_{CC}=600V,I_C=40A		22	45	70	ns
Rise time	t_r	V_{GE}=15V,R_G=10Ω		16	32	50	
Turn-off delay time	$t_{d(off)}$	Energy loss include "tail"		125	250	380	
Fall time	t_f	and FWD reverse recovery.		30	60	90	
Turn-on energy	E_{on}			0.7	1.4	2.1	mJ
Turn-off energy	E_{off}			0.85	1.7	2.6	
Turn-on delay time	$t_{d(on)}$	T_{vj}=175℃,V_{CC}=600V,I_C=40A		22	44	66	ns
Rise time	t_r	V_{GE}=15V,R_G=10Ω		13	26	39	
Turn-off delay time	$t_{d(off)}$	Energy loss include "tail"		140	280	420	
Fall time	t_f	and FWD reverse recovery.		65	130	195	
Turn-on energy	E_{on}			1.1	2.2	3.3	mJ
Turn-off energy	E_{off}			1.0	2.0	3.0	

※ Recommended external R_G value range is from 5.1Ω to 51Ω.

● FWD characteristics

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Forward voltage drop	V_F	I_F=40A	T_{vj}=25℃	2.5	2.9	3.3	V
			T_{vj}=125℃	-	3.2	-	
			T_{vj}=175℃	-	3.2	-	
Diode reverse recovery time	t_{rr}	V_{CC}=600V,I_F=40A		115	230	345	ns
Diode reverse recovery charge	Q_{rr}	-di_F/dt =300A/μs,T_{vj}=25℃		0.55	1.10	1.65	μc
Diode reverse recovery time	t_{rr}	V_{CC}=600V,I_F=40A		250	500	750	ns
Diode reverse recovery charge	Q_{rr}	-di_F/dt =300A/μs,T_{vj}=175℃		1.15	2.30	3.45	μc

■ Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Termal resistance, junction-anbient	$R_{th(j-a)}$	-	-	50	℃/W
Termal resistance, IGBT junction to case	$R_{th(j-c)\_IGBT}$	-	-	0.427	℃/W
Termal resistance, FWD junction to case	$R_{th(j-c)\_FWD}$	-	-	1.176	℃/W

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Figure 1. IGBT power dissipation vs T_c

$T_{vj} \leq 175$ °C

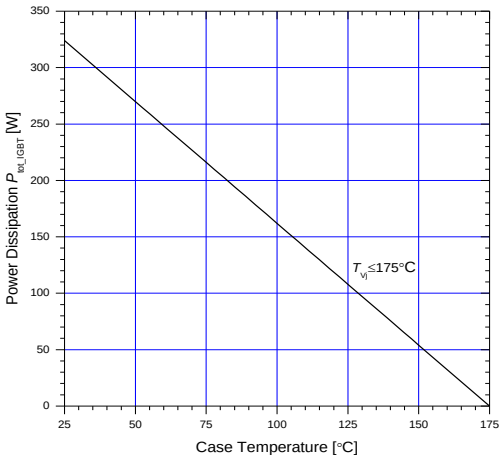

Figure 2. DC collector current vs T_c

$V_{GE} \geq +15$ V, $T_{vj} \leq 175$ °C

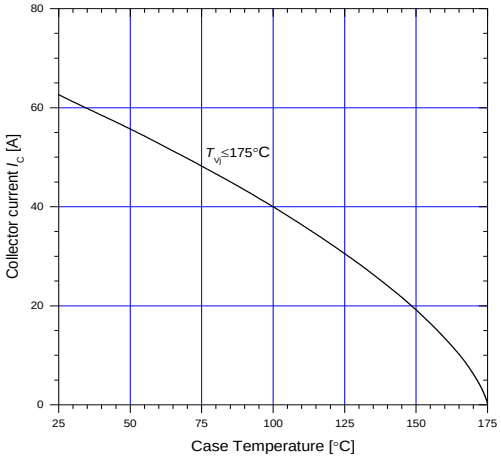

Figure 3. Typical output characteristics

T_{vj} = 25 °C

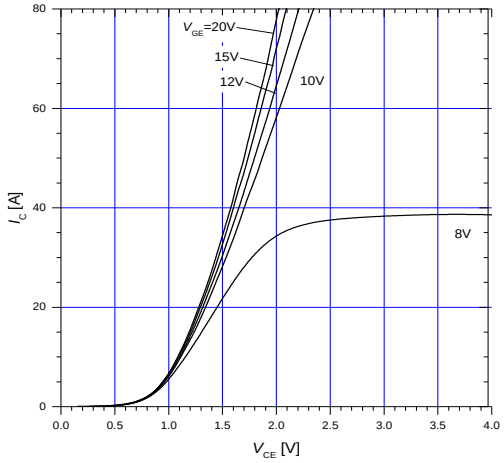

Figure 4. Typical output characteristics

T_{vj} = 175 °C

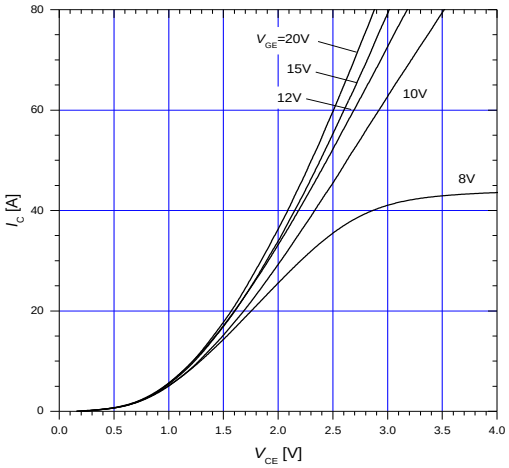

Figure 5. Typical transfer characteristics

V_{CE} = 20 V

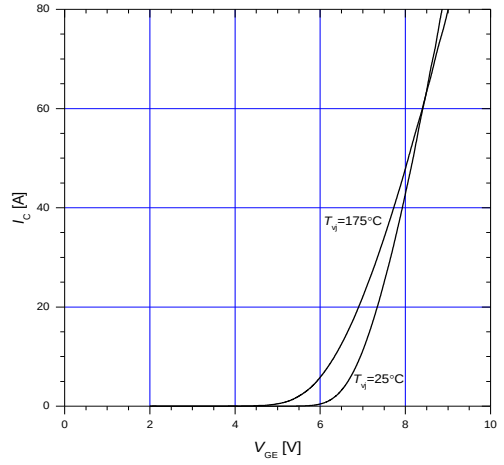

Figure 6. Gate threshold voltage

I_C = 40 mA, V_{CE} = 20 V

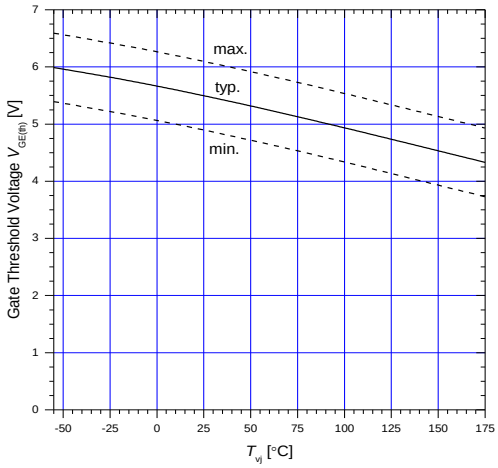

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Figure 7. Typical capacitance
V_{GE} = 0 V, f = 1 MHz

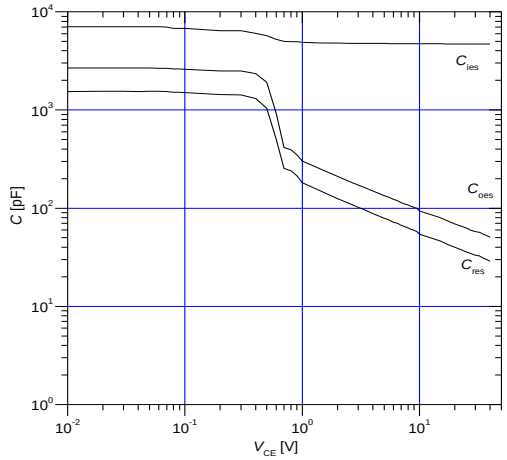


Figure 8. Typical gate charge
I_C = 40 A, V_{CC} = 600 V, T_{vj} = 25 °C

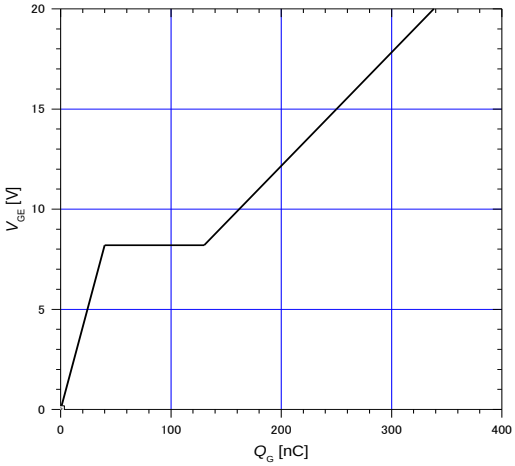


Figure 9. Typical switching times vs. I_C
V_{CC} = 600 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 175 °C

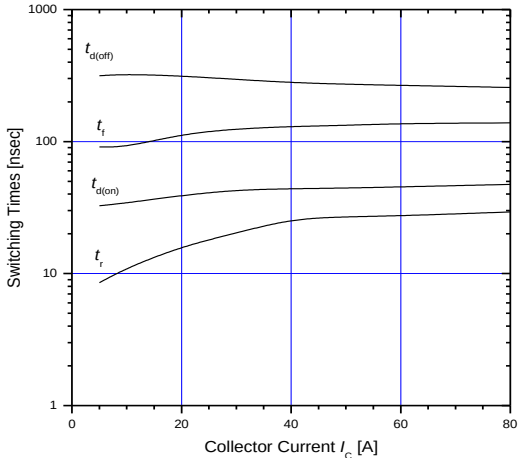


Figure 10. Typical switching times vs. R_G
V_{CC} = 600 V, V_{GE} = 15 V, I_C = 40 A, T_{vj} = 175 °C

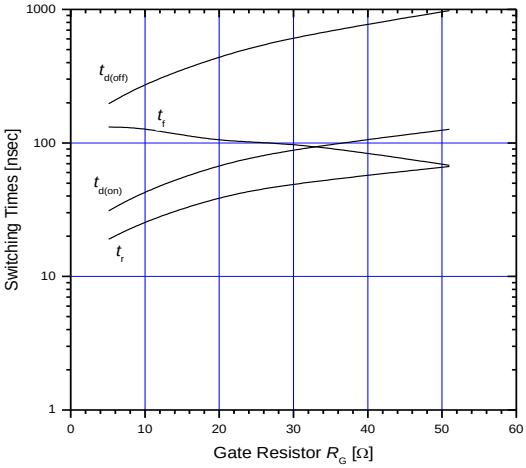


Figure 11. Typical switching losses vs. I_C
V_{CC} = 600 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 175 °C

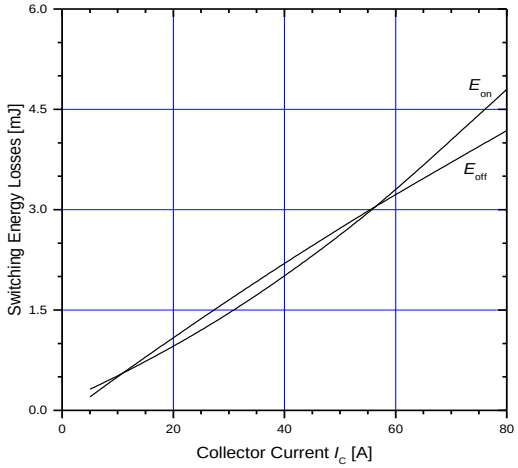


Figure 12. Typical switching losses vs. R_G
V_{CC} = 600 V, V_{GE} = 15 V, I_C = 40 A, T_{vj} = 175 °C

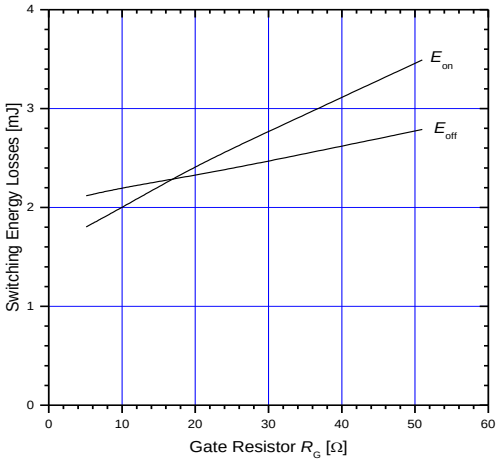


Figure 13. Typical forward characteristics of FWD

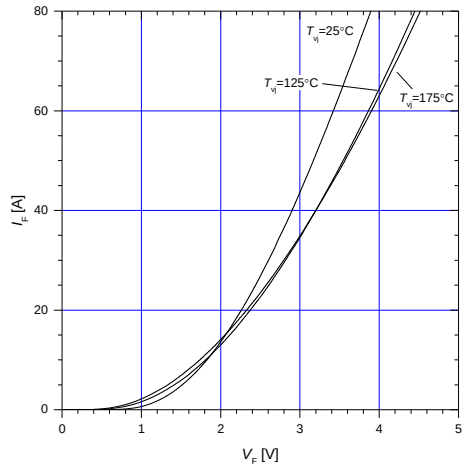


Figure 14.
Typical reverse recovery characteristics vs. I_F
V_{CC} = 600 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 175 °C

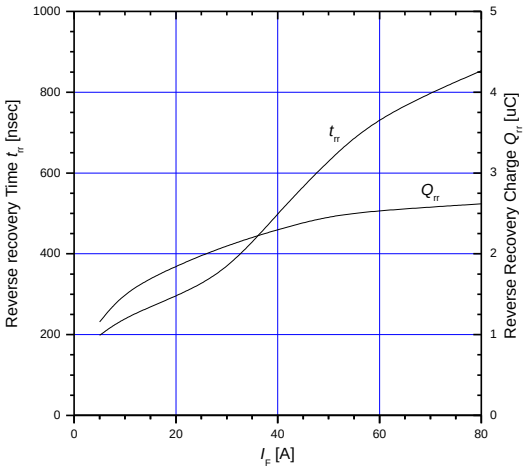


Figure 15. Typical reverse recovery loss vs. I_F
V_{CC} = 600 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 175 °C

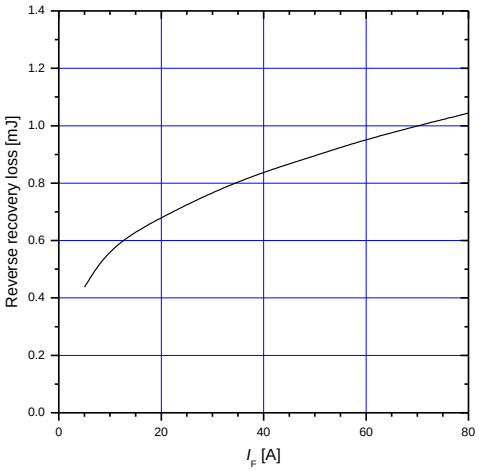


Figure 16. Reverse biased safe operating area
V_{GE} = 15 V / 0 V, R_G = 10 Ω, T_{vj} ≤ 175 °C

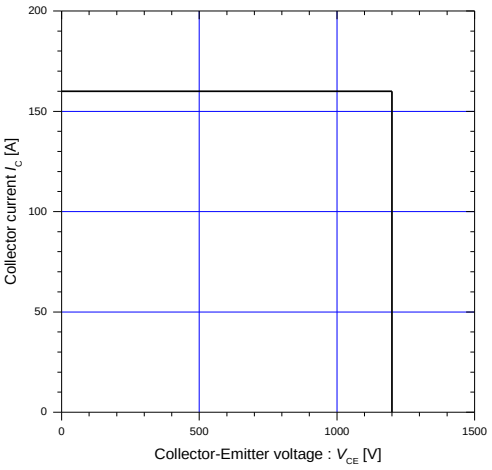


Figure 17. Transient Thermal Impedance of IGBT
D = 0

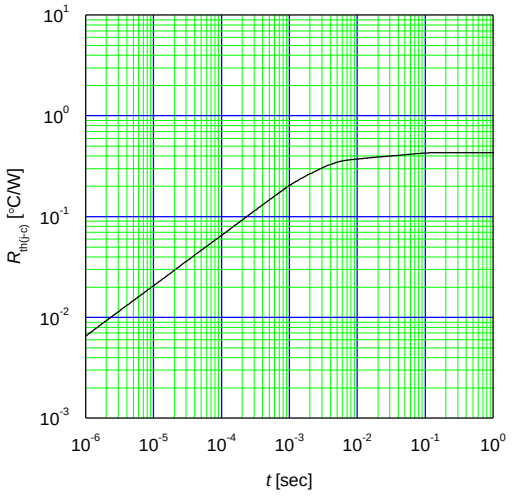
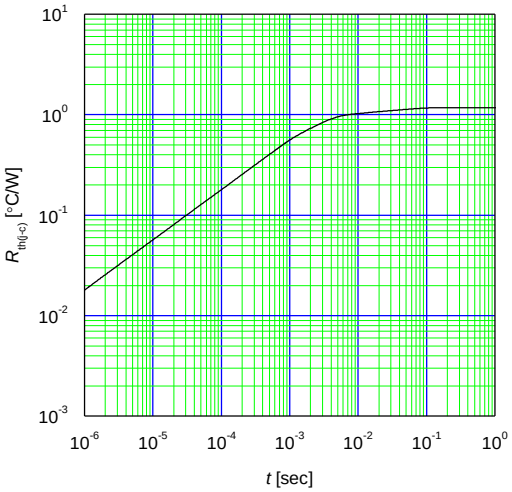


Figure 18. Transient Thermal Impedance of FWD
D = 0



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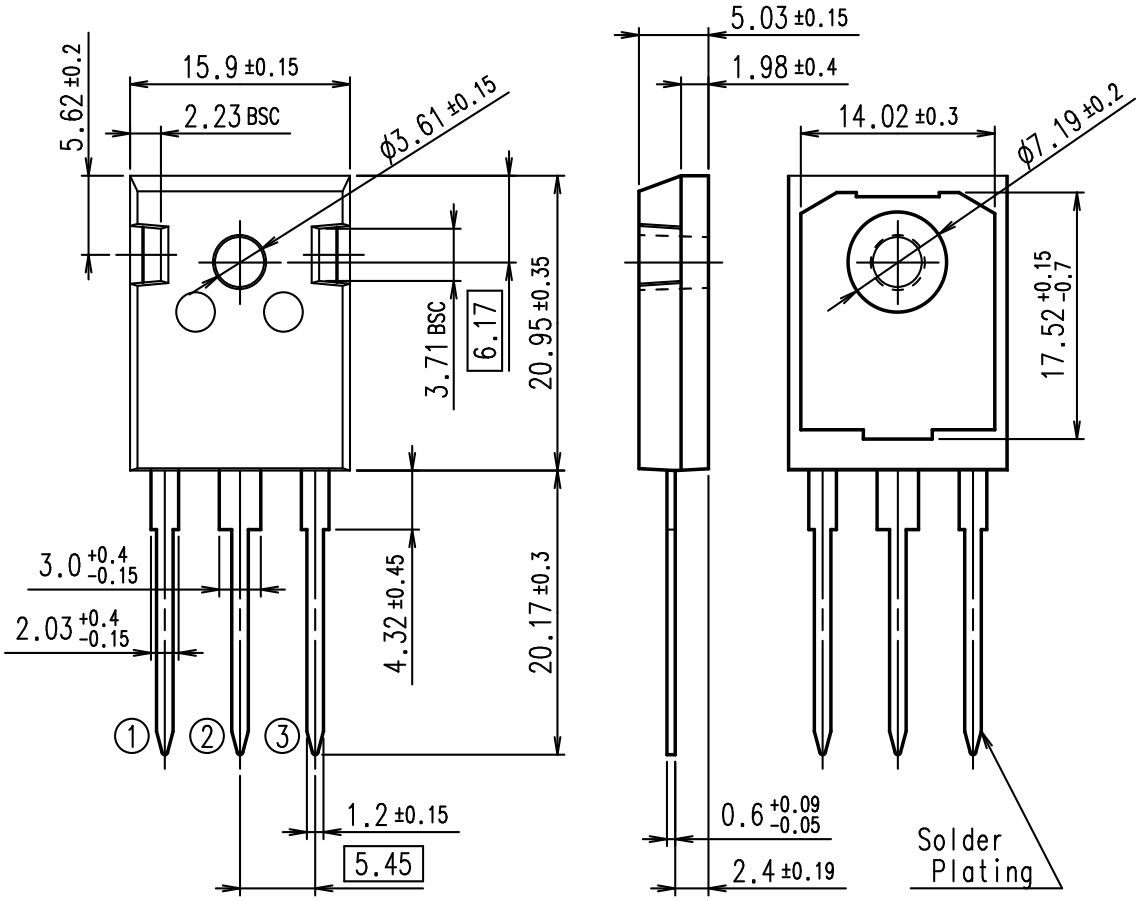
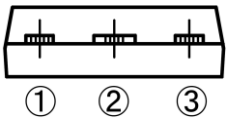
■ Outline drawings,mm

Outview : TO-247 package





Connection

① Gate

② Collector

③ Emitter

Dimensions are in millimeters.

Warnings

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of 1/2022.
The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sure to obtain the latest specifications.

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