

FGW40XS120

Discrete IGBT

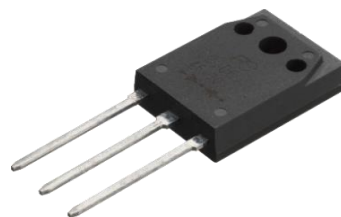
Discret IGBT (XS-series) 1200V/40A

■ Features

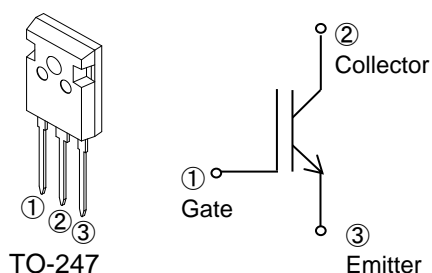
Pb-free lead terminal ;RoHS compliant
Helogen-free molding compound

■ Applications

Uninterruptible Power Supply,PV Power Conditioner,
Inverter welding machine



■ Equivalent Circuit



■ Maximum ratings and characteristics

●Absolute maximum ratings at $T_{vj}=25^{\circ}\text{C}$ (unless otherwise specified)

Parameter	Symbol	Value	Unit	Remarks
Collector-Emitter voltage	V_{CES}	1200	V	
Gate-Emitter voltage	V_{GES}	± 20	V	$t_p < 1\mu\text{s}$
Transient Gate-Emitter voltage		± 30		
DC collector current	$I_{C@25}$	63	A	$T_C=25^{\circ}\text{C}$
	$I_{C@100}$	40	A	$T_C=100^{\circ}\text{C}$
Pulsed collector current	I_{CP}	160	A	Note*1
Turn-off safe operating area	-	160	A	$V_{CE} \leq 1200\text{V}, T_{vj} \leq 175^{\circ}\text{C}$
Max.power dissipation	P_{tot}	351	W	$T_C=25^{\circ}\text{C}$
Operating junction temperature	T_{vj}	$-40 \sim +175$	$^{\circ}\text{C}$	
Storage temperature	T_{slg}	$-55 \sim +175$	$^{\circ}\text{C}$	

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

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Zero-gate voltage collector current	I_{CES}	$V_{CE}=1200V$	$T_{vj}=25^{\circ}C$	-	-	250	mA
		$V_{GE}=0V$	$T_{vj}=175^{\circ}C$	-	-	2	
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V$ $V_{GE}=\pm 20V$		-	-	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	$V_{CE(sat)}$	$V_{GE}=15V$ $I_C=40A$	$T_{vj}=25^{\circ}C$	1.3	1.6	1.9	V
			$T_{vj}=125^{\circ}C$	-	2.05	-	
			$T_{vj}=175^{\circ}C$	-	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	$t_{d(on)}$	$T_{vj}=25^{\circ}C, V_{CC}=600V, I_C=40A$		22	45	70	ns
Rise time	t_r	$V_{GE}=15V, R_G=10\Omega$		16	32	50	
Turn-off delay time	$t_{d(off)}$	Energy loss include "tail" and FWD reverse recovery.		125	250	380	
Fall time	t_f			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	$t_{d(on)}$	$T_{vj}=175^{\circ}C, V_{CC}=600V, I_C=40A$		22	44	66	ns
Rise time	t_r	$V_{GE}=15V, R_G=10\Omega$		13	26	39	
Turn-off delay time	$t_{d(off)}$	Energy loss include "tail" and FWD reverse recovery.		140	280	420	
Fall time	t_f			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.

■ Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction-ambient	$R_{th(j-a)}$	-	-	50	$^{\circ}\text{C/W}$
Thermal resistance, IGBT junction to case	$R_{th(j-c)}_{IGBT}$	-	-	0.427	$^{\circ}\text{C/W}$

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

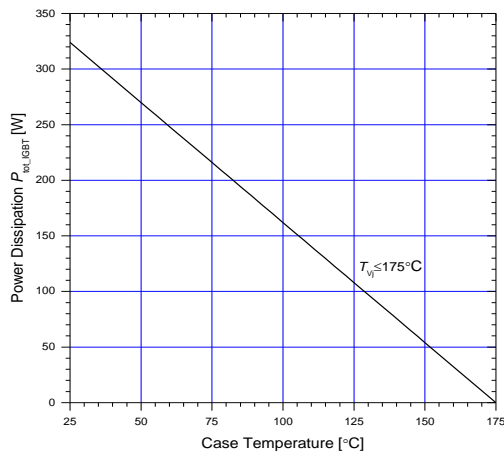


Figure 2. DC collector current vs T_c
 $V_{GE} \geq +15\text{ V}, T_{vj} \leq 175^\circ\text{C}$

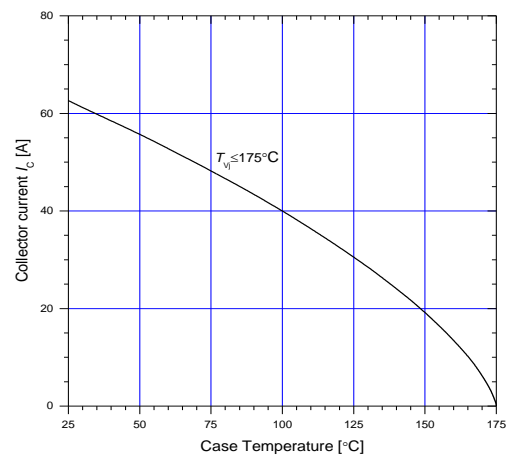


Figure 3. Typical output characteristics
 $T_{vj} = 25^\circ\text{C}$

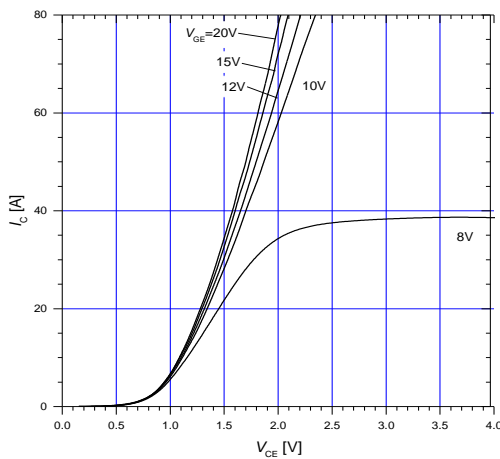


Figure 4. Typical output characteristics
 $T_{vj} = 175^\circ\text{C}$

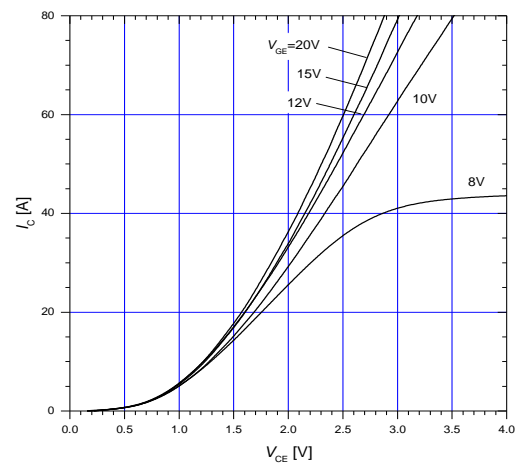


Figure 5. Typical transfer characteristics
 $V_{CE} = 20\text{ V}$

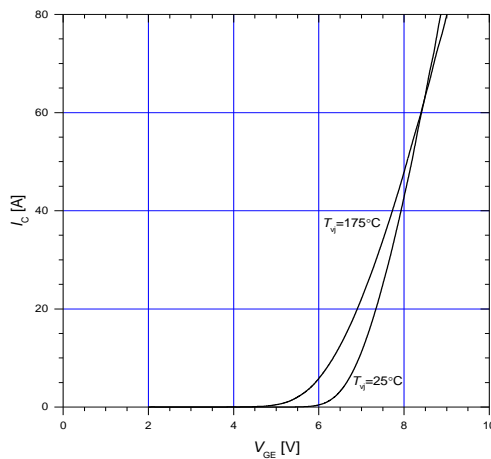
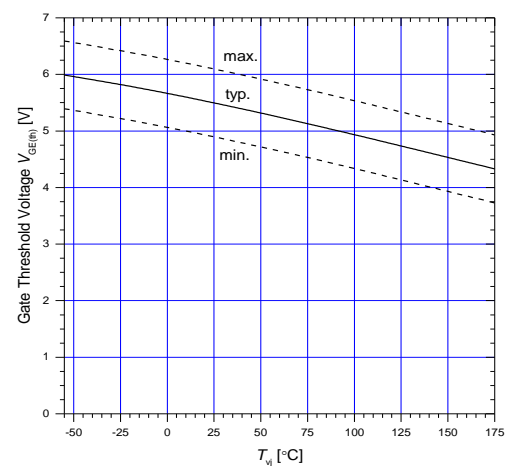


Figure 6. Gate threshold voltage
 $I_C = 40\text{ mA}, V_{CE} = 20\text{ V}$



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Figure 7. Typical capacitance

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

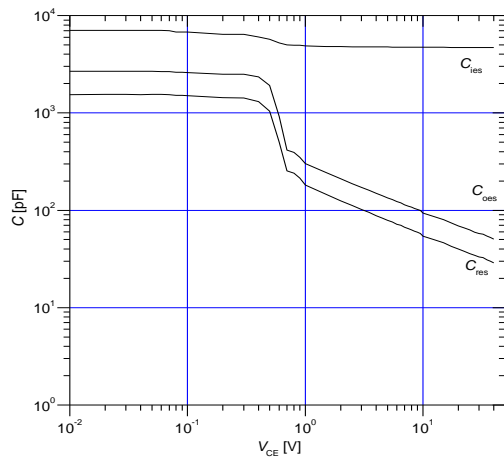


Figure 8. Typical gate charge

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

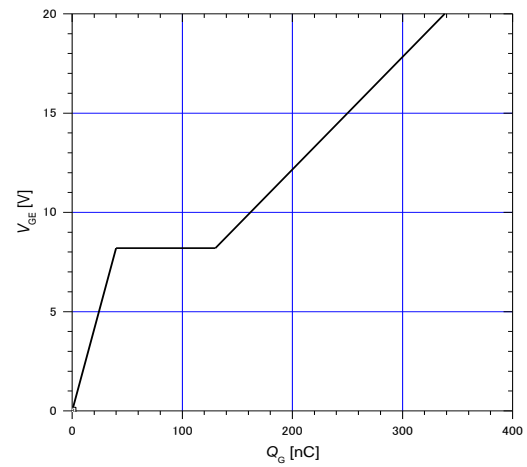


Figure 9. Typical switching times vs. I_C

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

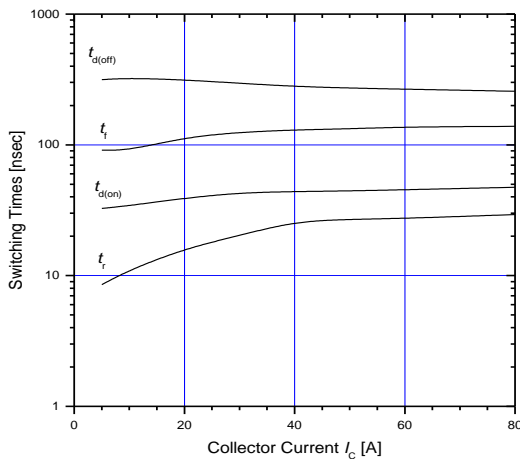


Figure 10. Typical switching times vs. R_G

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

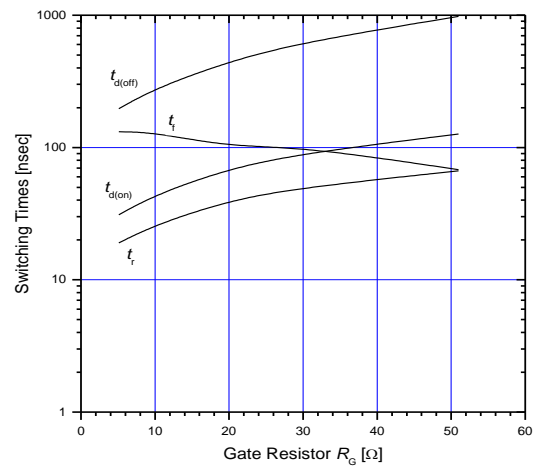


Figure 11. Typical switching losses vs. I_C

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

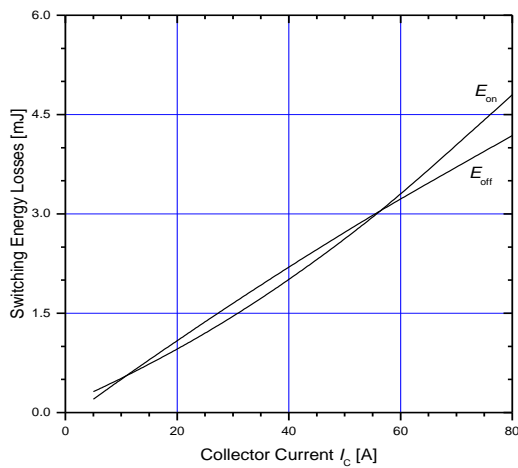
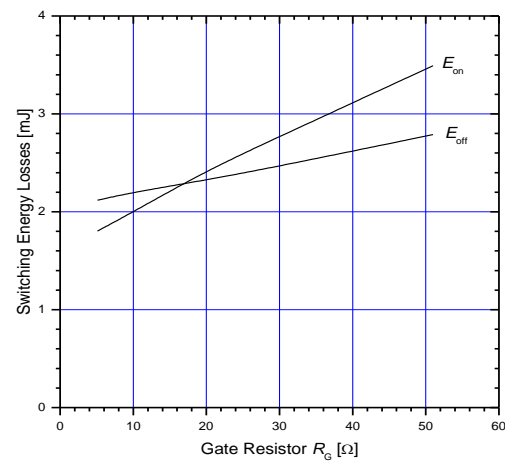


Figure 12. Typical switching losses vs. R_G

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



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Figure 13. Reverse biased safe operating area

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

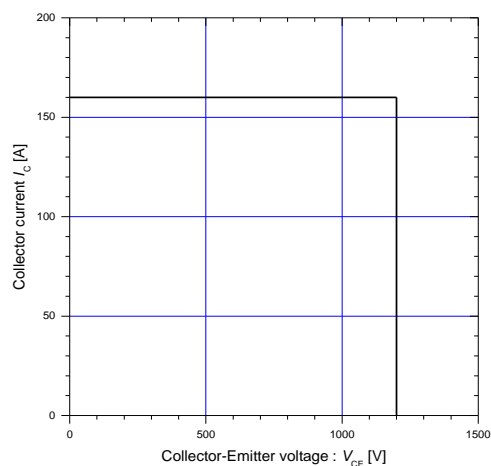
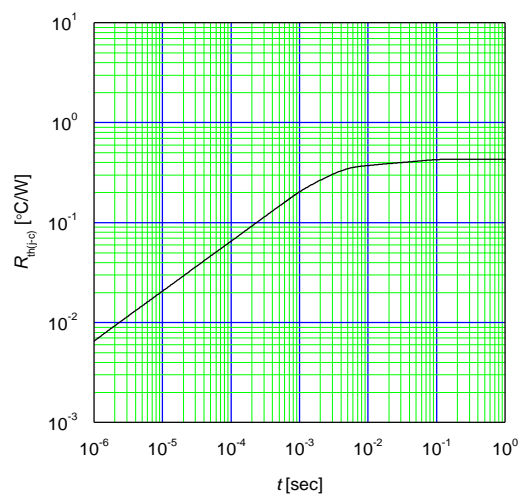


Figure 14. Transient thermal impedance of IGBT

$D = 0$

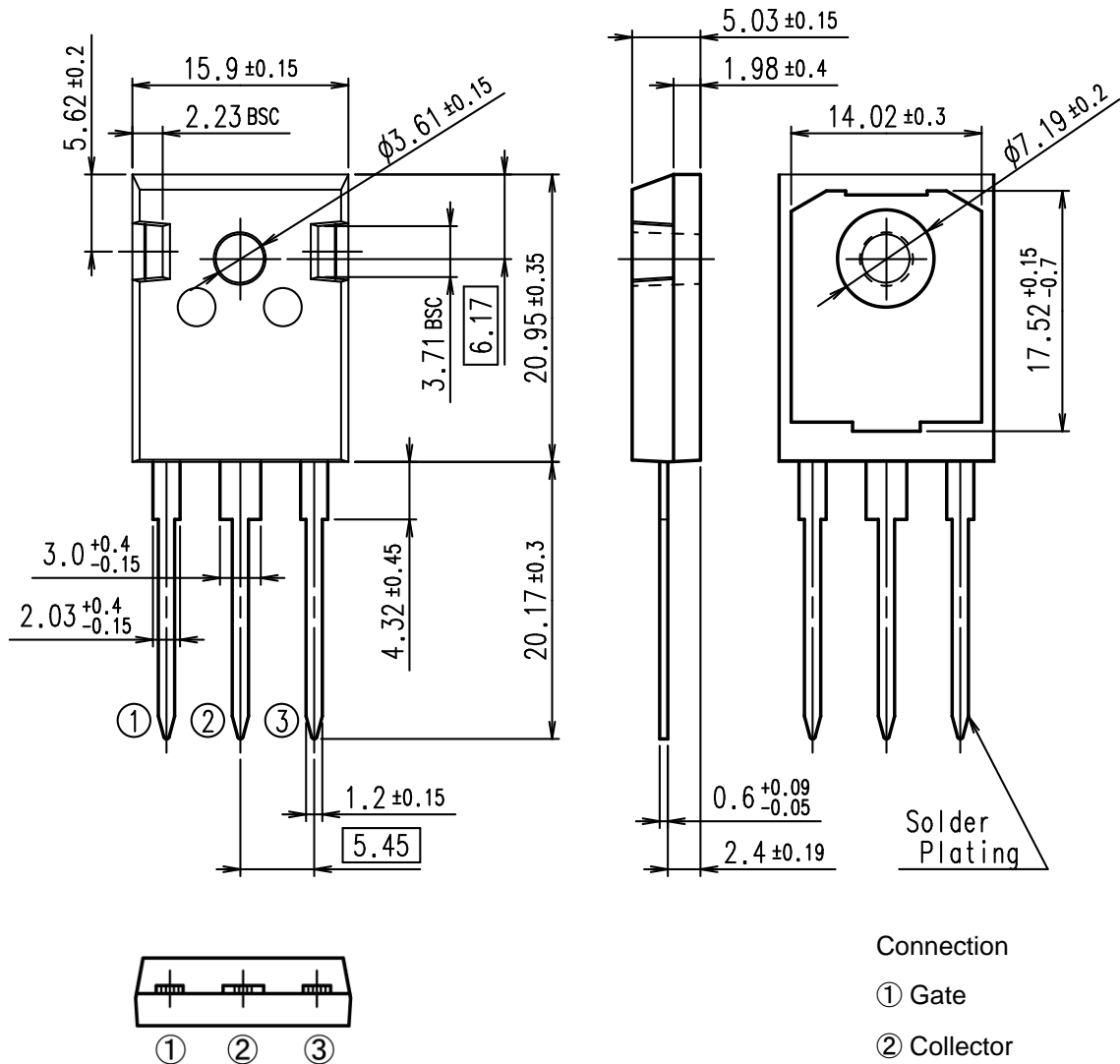


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■ Outline drawings,mm

Outview : TO-247 package



Dimensions are in millimeters.

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