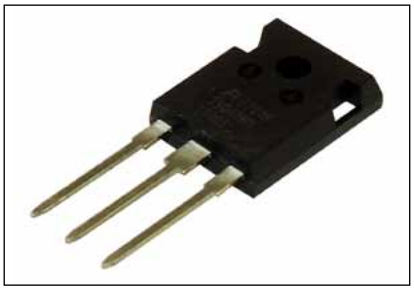
FGW40N120W

Discrete IGBT

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 coditionner
Inverter welding machine



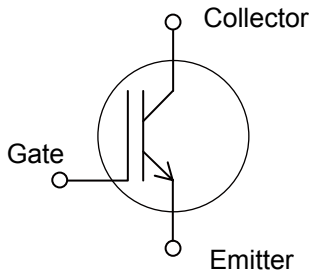
Maximum Ratings and Characteristics

● **Absolute Maximum Ratings (at T_c=25°C unless otherwise specified)**

Items	Symbols	Characteristics	Units	Remarks
Collector-Emitter Voltage	V_{CES}	1200	V	
Gate-Emitter Voltage	V_{GES}	±20	V	
DC Collector Current	$I_{C@25}$	65	A	T_C=25°C, T_j=150°C
	$I_{C@100}$	40	A	T_C=100°C, T_j=150°C
Pulsed Collector Current	I_{CP}	160	A	Note *1
Turn-Off Safe Operating Area	-	160	A	V_{CE}≤1200V, T_j≤175°C
Short Circuit Withstand Time	t_{SC}	5	µs	V_{CC}≤600V, V_{GE}=15V T_j≤150°C
IGBT Max. Power Dissipation	P_D	430	W	T_C=25°C
Operating Junction Temperature	T_j	-40 ~ +175	°C	
Storage Temperature	T_{stg}	-55 ~ +175	°C	

Note *1 : Pulse width limited by Tjmax.

Equivalent circuit



● **Electrical characteristics (at T_j= 25°C unless otherwise specified)**

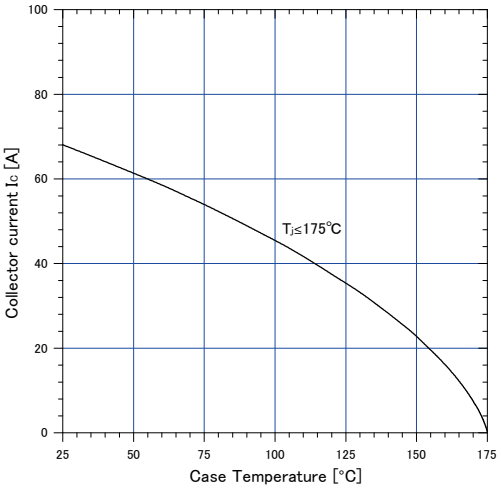
Description	Symbols	Conditions		Characteristics min.	typ.	max.	Units
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V	T_j=25°C	-	-	250	µA
			T_j=175°C	-	-	2	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V		-	-	200	nA
Gate-Emitter Threshold Voltage	$V_{GE\ (th)}$	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_j=25°C	1.4	2.0	2.6	V
			T_j=175°C	-	2.6	-	
Input Capacitance	C_{ies}	V_{CE}=25V		1250	2500	3750	pF
Output Capacitance	C_{oes}	V_{GE}=0V		55	110	165	
Reverse Transfer Capacitance	C_{res}	f=1MHz		17	34	51	
Gate Charge	Q_G	V_{CC} = 400V I_C = 40A V_{GE} = 15V		60	120	180	nC
Turn-On Delay Time	$t_{d(on)}$	T_j = 25°C		16	32	48	ns
Rise Time	t_r	V_{CC} = 600V		27	54	81	
Turn-Off Delay Time	$t_{d(off)}$	I_C = 40A		89	178	267	
Fall Time	t_f	V_{GE} = 15V		20	40	60	
Turn-On Energy	E_{on}	R_G = 10Ω		1.4	2.8	4.2	mJ
Turn-Off Energy	E_{off}	L = 500µH Energy loss include “tail” and FWD (FDRW20S120J) reverse recovery.		0.8	1.6	2.4	
Turn-On Delay Time	$t_{d(on)}$	T_j = 150°C		16	32	48	ns
Rise Time	t_r	V_{CC} = 600V		24	48	72	
Turn-Off Delay Time	$t_{d(off)}$	I_C = 40A		110	220	330	
Fall Time	t_f	V_{GE} = 15V		28	56	84	
Turn-On Energy	E_{on}	R_G = 10Ω		2.3	4.6	6.9	mJ
Turn-Off Energy	E_{off}	L = 500µH Energy loss include “tail” and FWD (FDRW20S120J) reverse recovery.		1.2	2.4	3.6	

● **Thermal resistance characteristics**

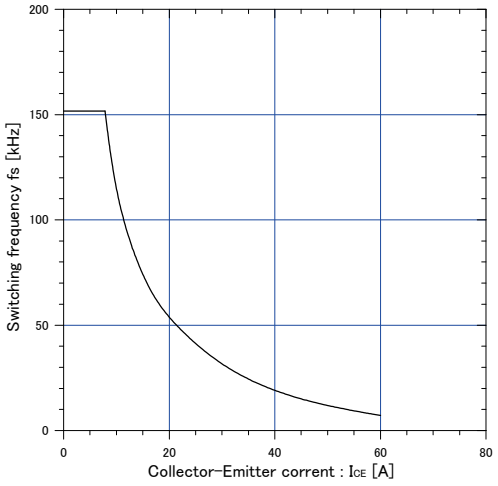
Items	Symbols	Conditions	Characteristics min.	typ.	max.	Units
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	-	50	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)\_IGBT}$	-	-	-	0.347	

■ Characteristics (Representative)

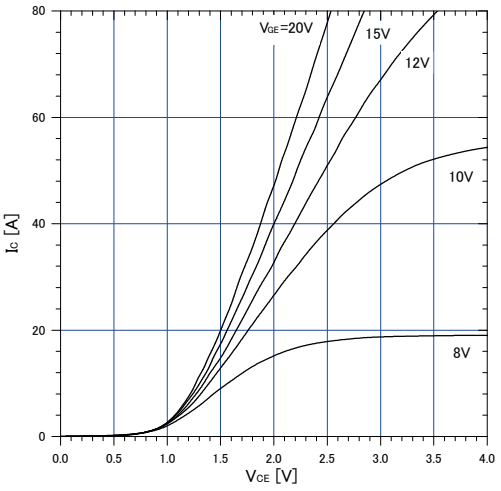
Graph.1
DC Collector Current vs T_c
V_{GE}≥+15V, T_j≤175°C



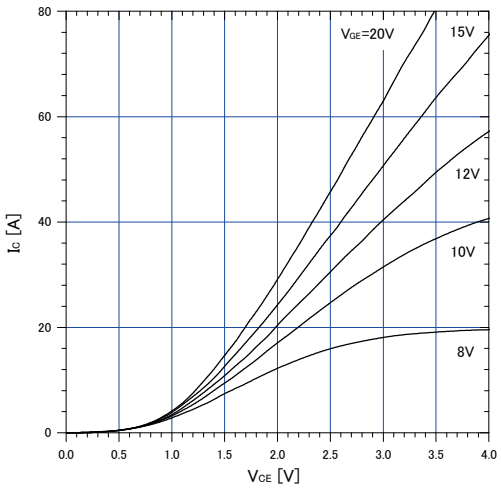
Graph.2
Collector Current vs. switching frequency
V_{GE}=+15V, T_C≤175°C, V_{CC}=600V, D=0.5,
R_G=10Ω, T_c=100°C



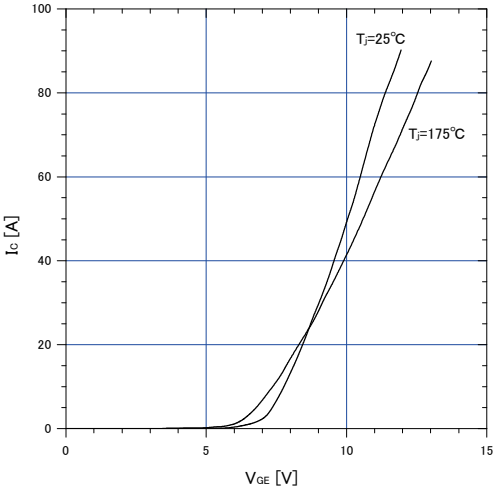
Graph.3
Typical Output Characteristics (V_{CE}-I_C)
T_j=25°C



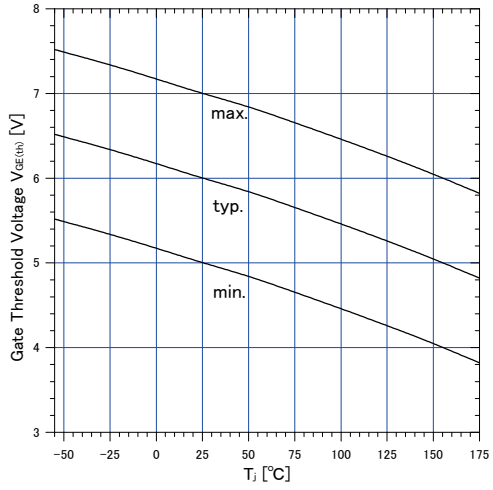
Graph.4
Typical Output Characteristics (V_{CE}-I_C)
T_j=175°C



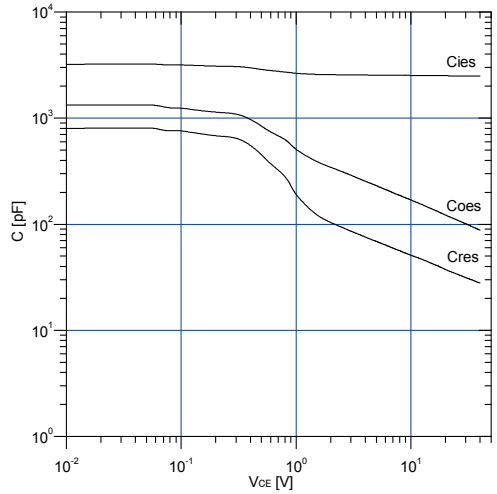
Graph.5
Typical Transfer Characteristics
V_{GE}=+15V



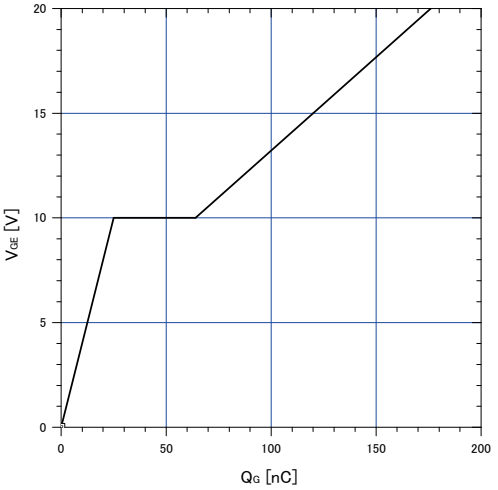
Graph.6
Gate Threshold Voltage vs. T_j
I_C=40mA, V_{CE}=20V



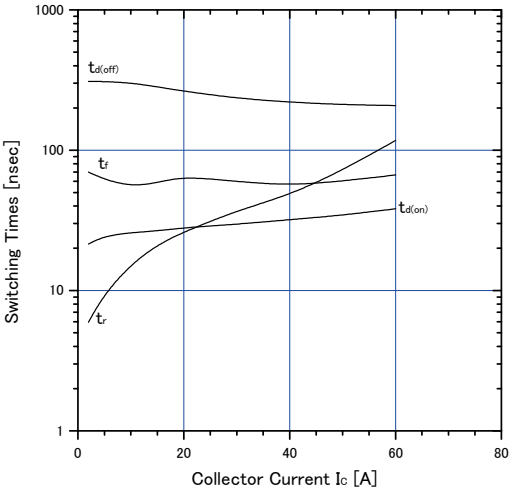
Graph.7
Typical Capacitance
V_{GE}=0V,f=1MHz,T_j=25°C



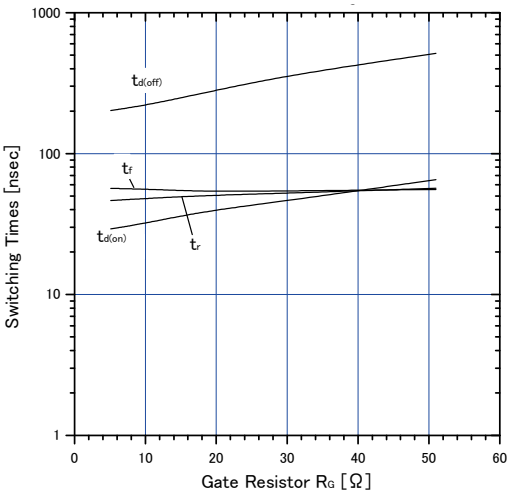
Graph.8
Typical Gate Charge
V_{CC}=600V,I_C=40A,T_j=25°C



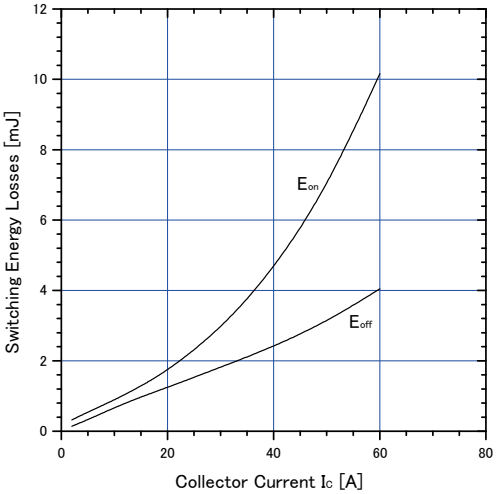
Graph.9
Typical switching time vs. I_C
T_j=175°C,V_{CC}=600V,L=500µH
V_{GE}=15V,R_G=10Ω



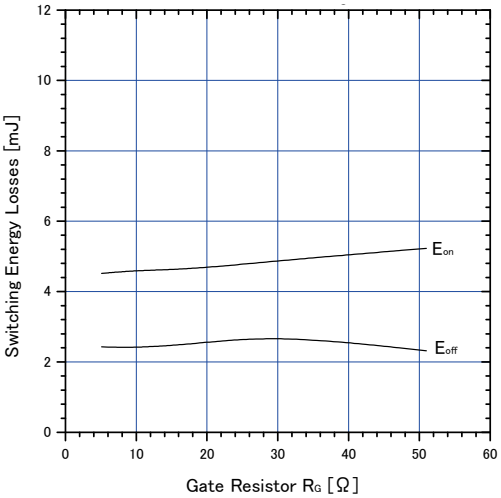
Graph.10
Typical switching time vs. R_G
T_j=175°C,V_{CC}=600V,I_C=40A,L=500µH
V_{GE}=15V



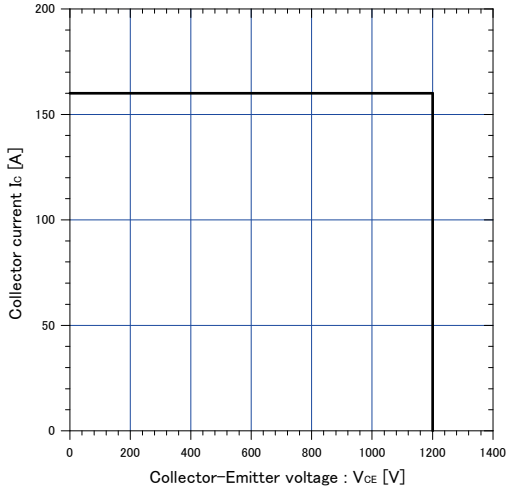
Graph.11
Typical switching losses vs. I_C
T_j=175°C,V_{CC}=600V,L=500µH
V_{GE}=15V,R_G=10Ω



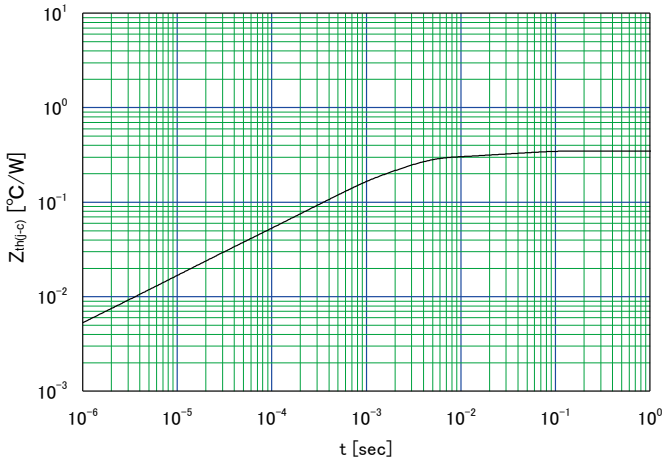
Graph.12
Typical switching losses vs. R_G
T_j=175°C,V_{CC}=600V,I_C=40A,L=500µH
V_{GE}=15V



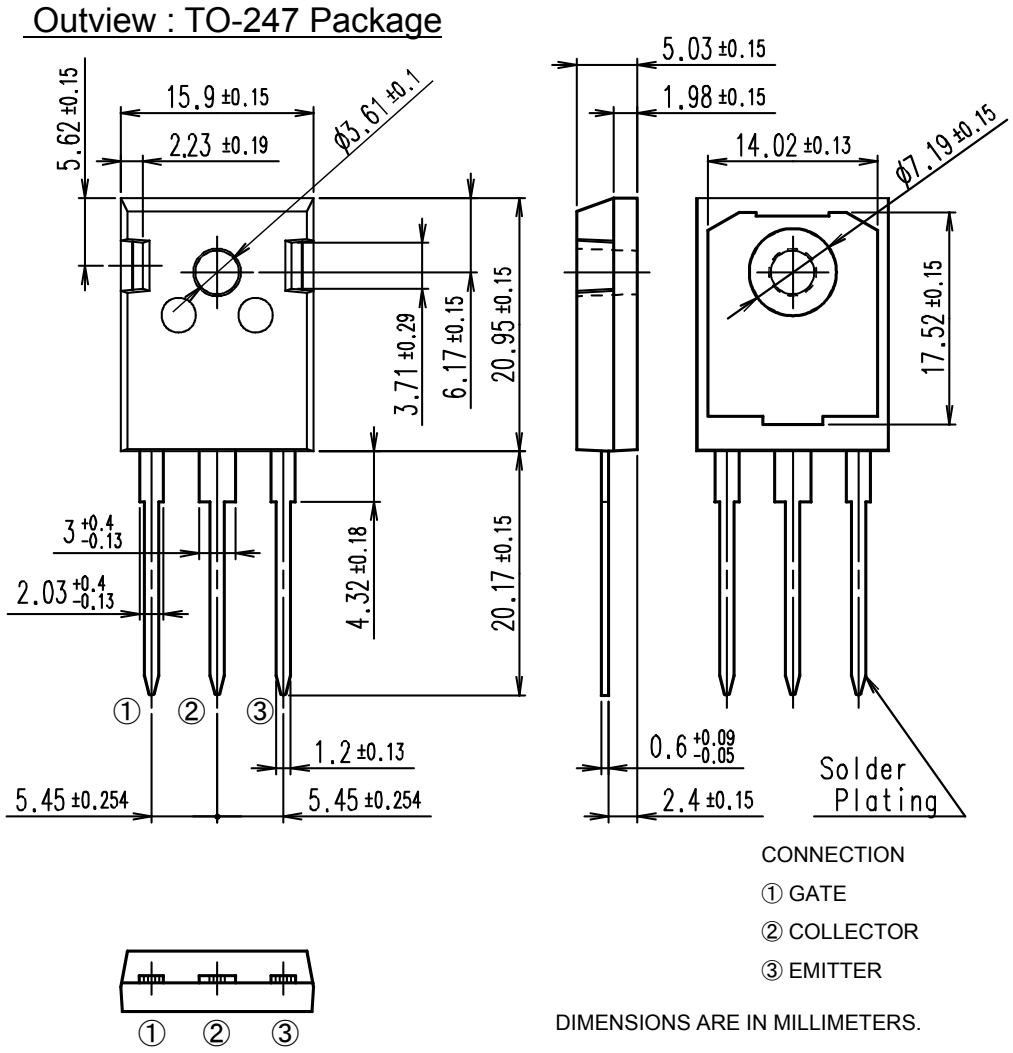
Graph.13
Reverse biased Safe Operating Area
$T_j \leq 175°C, V_{GE}=+15V/0V, R_G=10\Omega$



Graph.14
Transient thermal resistance



■ Outline Drawings, mm



CONNECTION

① GATE

② COLLECTOR

③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

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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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- Safety devices
- Medical equipment

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富士電機 Innovating Energy Technology

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IGBT Modules

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