

FGW40N120H

Discrete IGBT

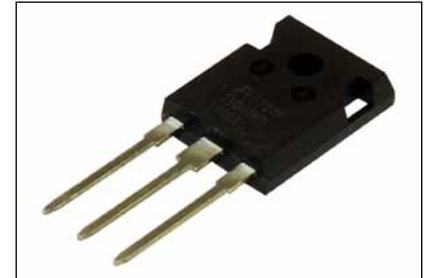
Discrete IGBT (High-Speed V series) 1200V / 40A

■ Features

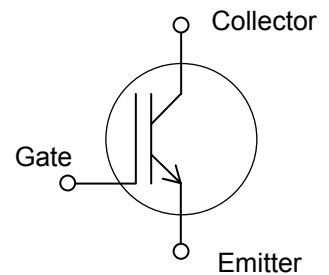
- Low power loss
- Low switching surge and noise
- High reliability, high ruggedness (RBSOA, SCSOA etc.)

■ Applications

- Uninterruptible power supply
- Power conditioner
- Power factor correction circuit



■ Equivalent circuit



■ 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}	70	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}	120	A	Note *1
Turn-Off Safe Operating Area	-	120	A	V _{CE} ≤1200V, T _j ≤175°C
Short Circuit Withstand Time	t _{sc}	5	μs	V _{CC} ≤600V, V _{GE} =12V, T _j ≤150°C
Maximum Power Dissipation	P _D	340	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 T_{jmax}.

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

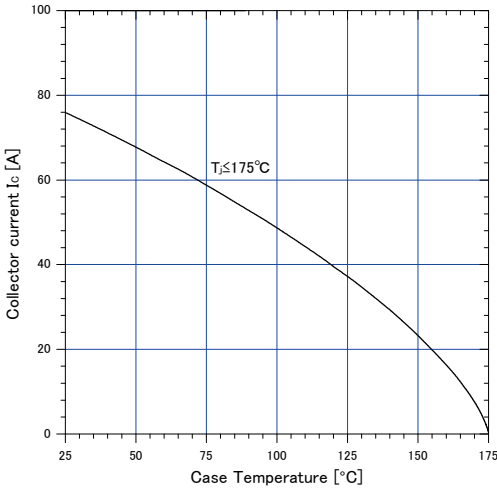
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Collector-Emitter Breakdown Voltage	V _{BR(CES)}	I _C = 50μA, V _{GE} = 0V	1200	-	-	V
Zero Gate Voltage Collector Current	I _{CES}	V _{CE} = 1200V, V _{GE} = 0V	-	-	250	μA
		T _j =25°C	-	-	2	mA
		T _j =175°C	-	-	-	-
Gate-Emitter Leakage Current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	200	nA
Gate-Emitter Threshold Voltage	V _{GE(th)}	V _{CE} = +20V, I _C = 40mA	4.0	5.0	6.0	V
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} = +15V, I _C = 40A	-	1.8	2.34	V
		T _j =25°C	-	2.3	-	-
		T _j =175°C	-	-	-	-
Input Capacitance	C _{ies}	V _{GE} =25V	-	3000	-	pF
Output Capacitance	C _{oes}	V _{GE} =0V	-	130	-	-
Reverse Transfer Capacitance	C _{res}	f=1MHz	-	100	-	-
Gate Charge	Q _G	V _{CC} = 600V I _C = 40A V _{GE} = 15V	-	300	-	nC
Turn-On Delay Time	t _{d(on)}	T _j = 25°C	-	35	-	ns
Rise Time	t _r	V _{CC} = 600V	-	60	-	
Turn-Off Delay Time	t _{d(off)}	I _C = 40A	-	315	-	
Fall Time	t _f	V _{GE} = 15V	-	40	-	
Turn-On Energy	E _{on}	R _G = 10Ω	-	2.8	-	mJ
Turn-Off Energy	E _{off}	L = 500μH Energy loss include "tail" and FWD (FDRW30S120J) reverse recovery.	-	1.8	-	
Turn-On Delay Time	t _{d(on)}	T _j = 175°C	-	35	-	
Rise Time	t _r	V _{CC} = 600V	-	60	-	
Turn-Off Delay Time	t _{d(off)}	I _C = 40A	-	350	-	ns
Fall Time	t _f	V _{GE} = 15V	-	75	-	
Turn-On Energy	E _{on}	R _G = 10Ω	-	4.8	-	
Turn-Off Energy	E _{off}	L = 500μH Energy loss include "tail" and FWD (FDRW30S120J) reverse recovery.	-	3.0	-	

● Thermal resistance characteristics

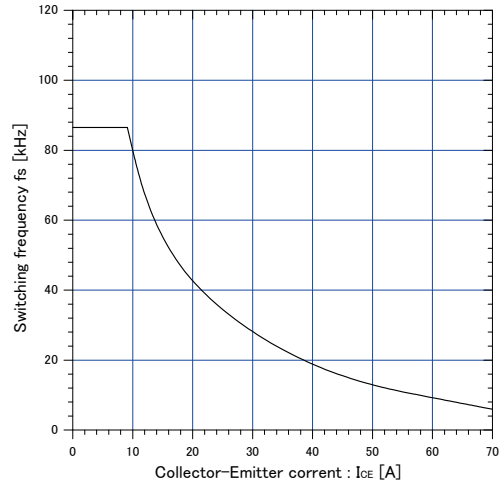
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal Resistance, Junction-Ambient	R _{th(j-a)}	-	-	-	50	°C/W
Thermal Resistance, Junction to Case	R _{th(j-c)_IGBT}	-	-	-	0.439	

■ Characteristics (Representative)

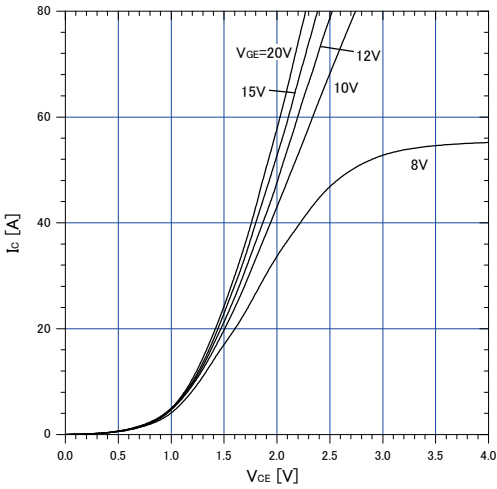
Graph.1
DC Collector Current vs T_c
 $V_{GE} \geq +15V, T_j \leq 175^\circ C$



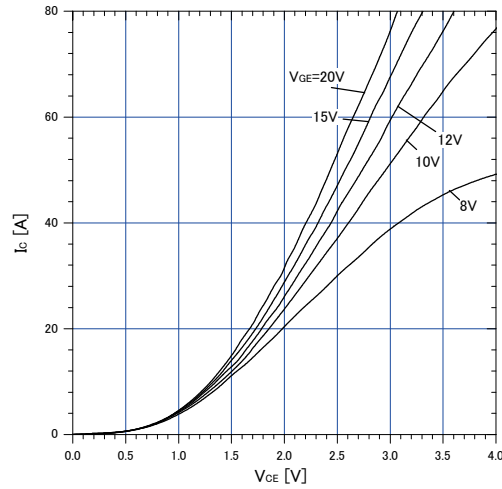
Graph.2
Collector Current vs. switching frequency
 $V_{GE} = +15V, T_c \leq 175^\circ C, V_{CC} = 600V, D = 0.5, R_G = 10\Omega, T_c = 100^\circ C$



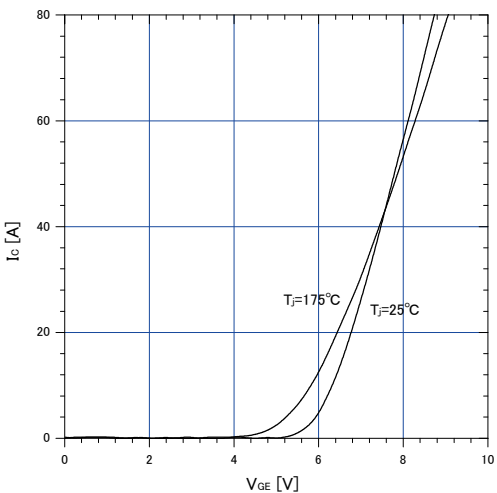
Graph.3
Typical Output Characteristics ($V_{CE}-I_c$)
 $T_j = 25^\circ C$



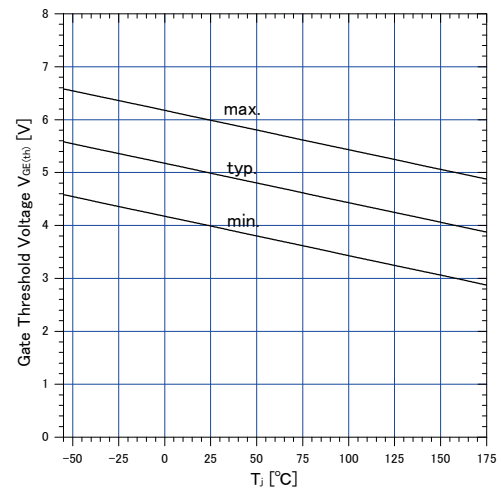
Graph.4
Typical Output Characteristics ($V_{CE}-I_c$)
 $T_j = 175^\circ C$



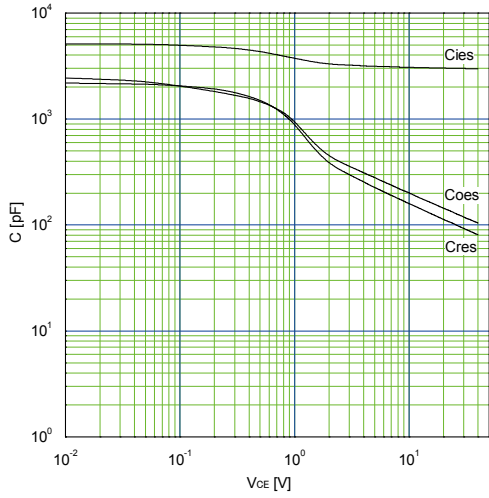
Graph.5
Typical Transfer Characteristics
 $V_{GE} = +15V$



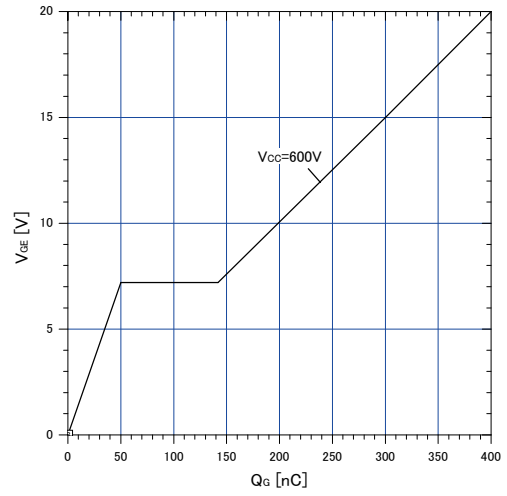
Graph.6
Gate Threshold Voltage vs. T_j
 $I_c = 40mA, V_{CE} = 20V$



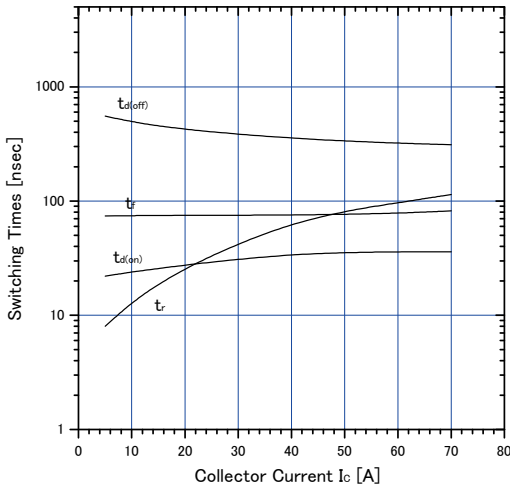
Graph.7
 Typical Capacitance
 $V_{GE}=0V, f=1MHz, T_J=25^{\circ}C$



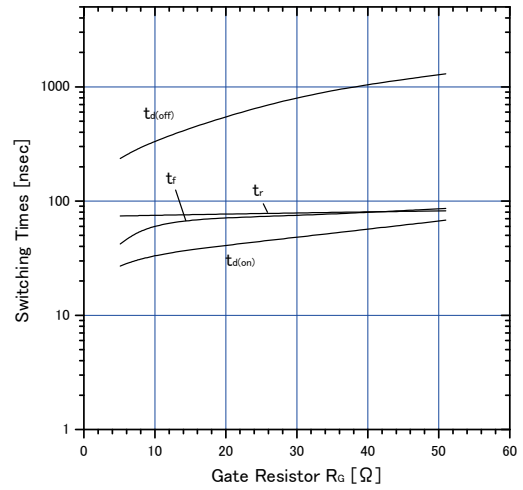
Graph.8
 Typical Gate Charge
 $V_{CC}=600V, I_c=40A, T_J=25^{\circ}C$



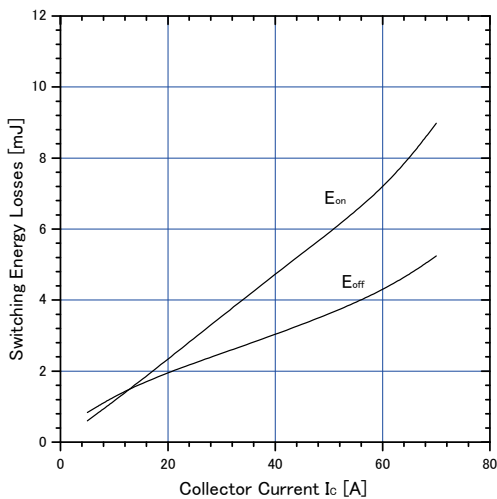
Graph.9
 Typical switching time vs. I_c
 $T_J=175^{\circ}C, V_{CC}=600V, L=500\mu H$
 $V_{GE}=15V, R_G=10\Omega$



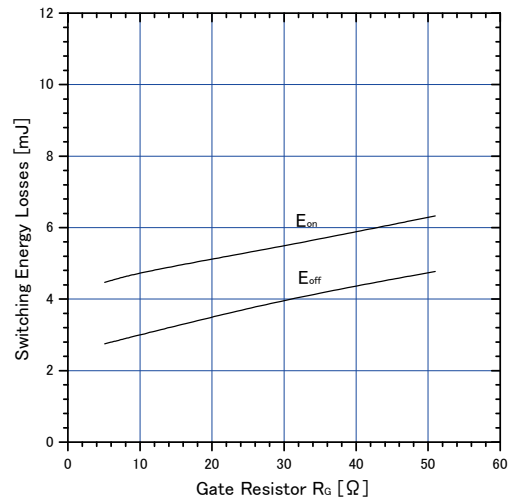
Graph.10
 Typical switching time vs. R_G
 $T_J=175^{\circ}C, V_{CC}=600V, I_c=40A, L=500\mu H$
 $V_{GE}=15V$



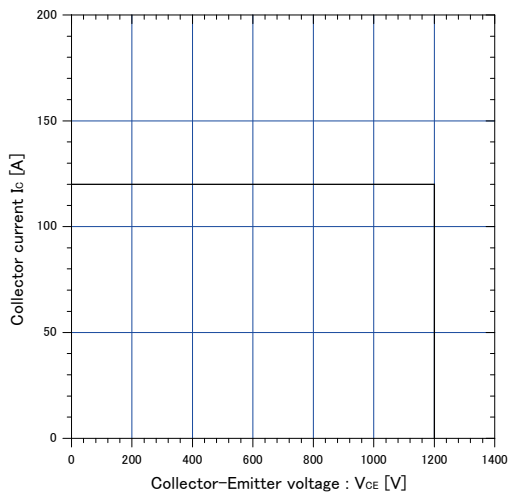
Graph.11
 Typical switching losses vs. I_c
 $T_J=175^{\circ}C, V_{CC}=600V, L=500\mu H$
 $V_{GE}=15V, R_G=10\Omega$



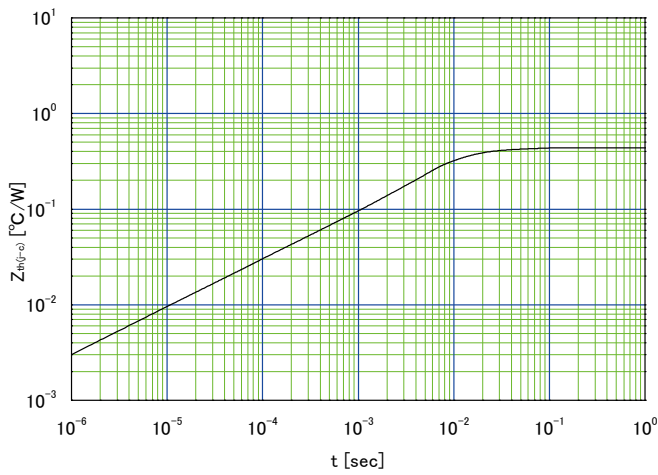
Graph.12
 Typical switching losses vs. R_G
 $T_J=175^{\circ}C, V_{CC}=600V, I_c=40A, L=500\mu H$
 $V_{GE}=15V$



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

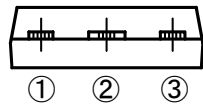
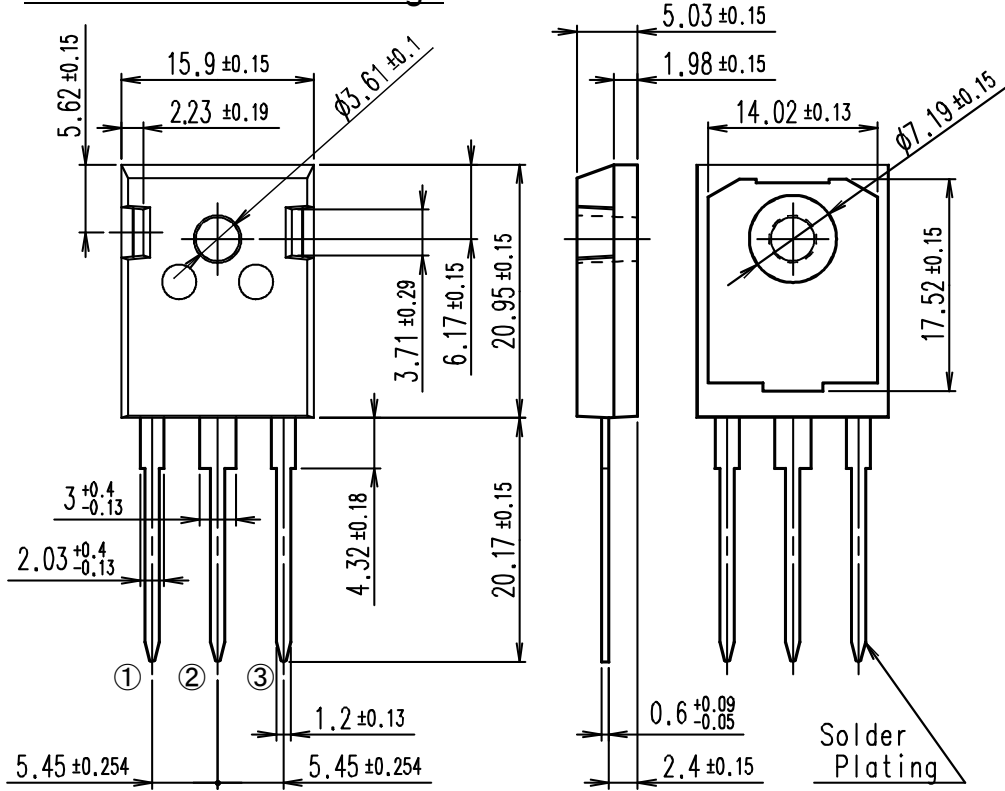


Graph.14
Transient thermal resistance of IGBT



■ Outline Drawings, mm

Outview : TO-247 Package



CONNECTION

- ① GATE
- ② COLLECTOR
- ③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

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