

FGW40N65W

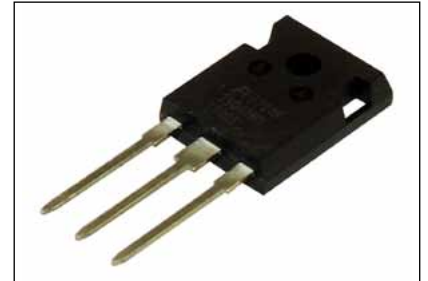
Discrete IGBT (High-Speed W series) 650V / 40A

■ Features

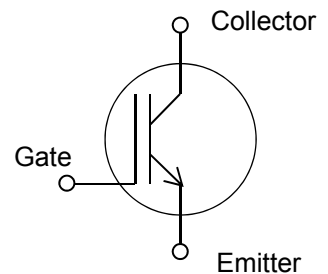
- Low power loss
- Low switching surge and noise
- High reliability, high ruggedness (RBSOA, SCSOA etc.)

■ Applications

- Uninterruptible power supply
- PV Power conditioner
- Inverter welding machine



■ 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}	650	V	
Gate-Emitter Voltage	V _{GES}	±20	V	T _p <1μs
Transient Gate-Emitter Voltage		±30		
DC Collector Current	I _{C@25}	56	A	T _c =25°C
	I _{C@100}	40	A	T _c =100°C
Pulsed Collector Current	I _{CP}	160	A	Note *1
Turn-Off Safe Operating Area	-	160	A	V _{CE} ≤650V T _j ≤175°C
Max. Power Dissipation	P _D	155	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)

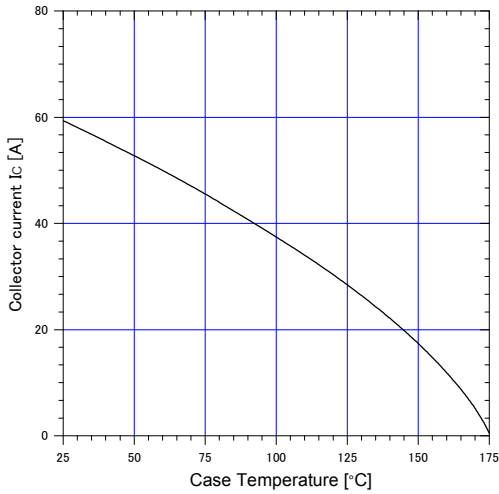
Description	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero Gate Voltage Collector Current	I _{CEs}	V _{CE} = 650V, V _{GE} = 0V	-	-	250	μA	
		T _j =25°C	-	-	2	mA	
		T _j =175°C	-	-	200	nA	
Gate-Emitter Leakage Current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	-	-	
Gate-Emitter Threshold Voltage	V _{GE(th)}	V _{CE} = 20V, I _C = 40mA	3.0	4.0	5.0	V	
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} = 15V, I _C = 40A	T _j =25°C	1.40	1.80	2.20	V
			T _j =125°C	-	2.05	-	
			T _j =175°C	-	2.10	-	
Input Capacitance	C _{ies}	V _{CE} =25V	1500	3000	4500	pF	
Output Capacitance	C _{oes}	V _{GE} =0V	43	85	128		
Reverse Transfer Capacitance	C _{res}	f=1MHz	32	64	96		
Gate Charge	Q _G	V _{CC} = 520V I _C = 40A V _{GE} = 15V	90	180	270	nC	
Turn-On Delay Time	t _{d(on)}	T _j = 25°C, V _{CC} = 400V I _C = 20A, V _{GE} = 15V R _G = 10Ω, L = 500μH Energy loss include "tail" and FWD (FGW40N65WD) reverse recovery.	12	24	36	ns	
Rise Time	t _r		13	25	38		
Turn-Off Delay Time	t _{d(off)}		93	185	278		
Fall Time	t _f		24	47	71		
Turn-On Energy	E _{on}		0.15	0.29	0.44		mJ
Turn-Off Energy	E _{off}	0.15	0.29	0.44			
Turn-On Delay Time	t _{d(on)}	T _j = 150°C, V _{CC} = 400V I _C = 20A, V _{GE} = 15V R _G = 10Ω, L = 500μH Energy loss include "tail" and FWD (FGW40N65WD) reverse recovery.	12	24	36	ns	
Rise Time	t _r		13	25	38		
Turn-Off Delay Time	t _{d(off)}		108	215	323		
Fall Time	t _f		20	40	60		
Turn-On Energy	E _{on}		0.25	0.50	0.75		mJ
Turn-Off Energy	E _{off}	0.16	0.32	0.48			

● Thermal resistance characteristics

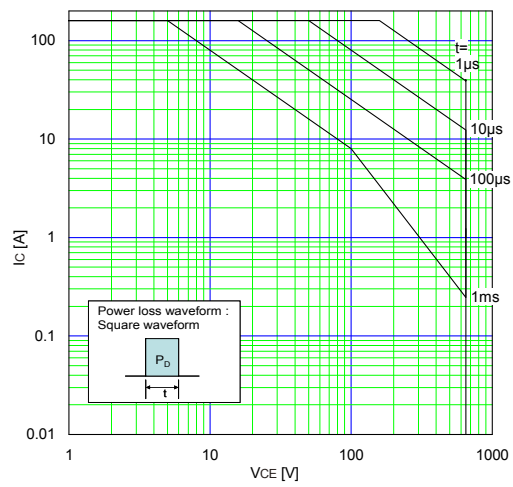
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal Resistance, Junction-Ambient	R _{th(j-a)}	-	-	-	50	°C/W
Thermal Resistance, Junction to Case	R _{th(j-c)}	-	-	-	0.962	

■ Characteristics (Representative)

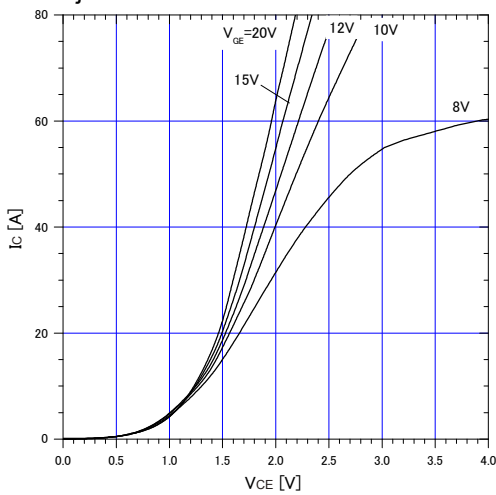
Graph.1
DC Collector Current vs Tc
 $V_{GE} \geq +15V, T_j \leq 175^\circ C$



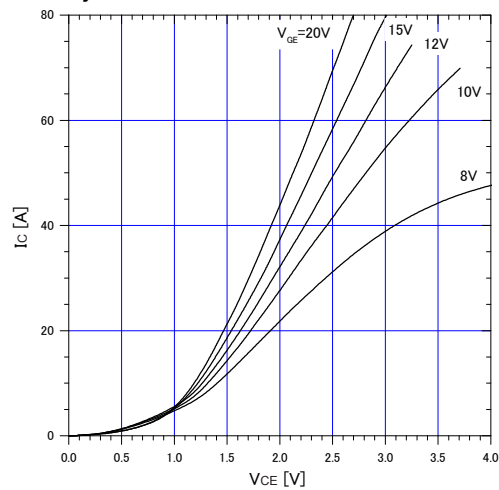
Graph.2
SOA
Duty=0(Single pulse), Tc=25°C



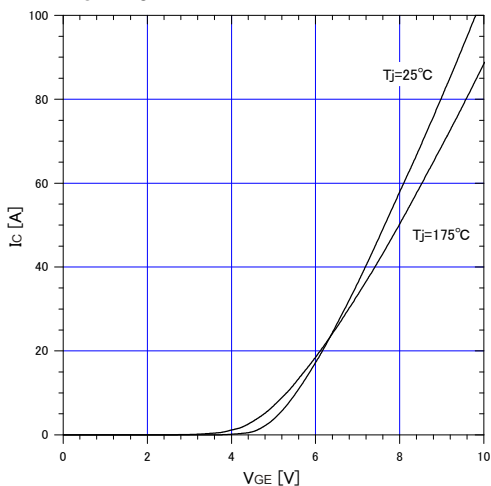
Graph.3
Typical Output Characteristics ($V_{CE}-I_c$)
Tj=25°C



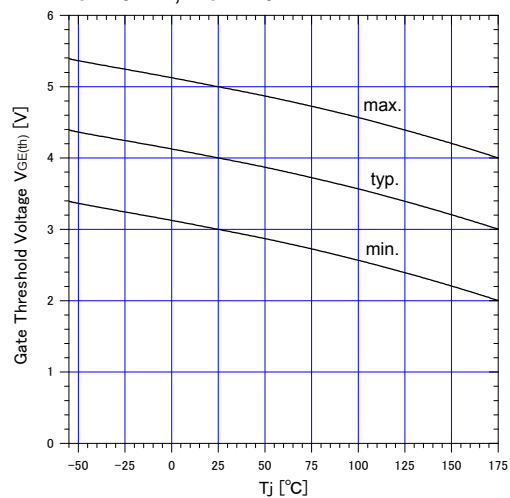
Graph.4
Typical Output Characteristics ($V_{CE}-I_c$)
Tj=175°C



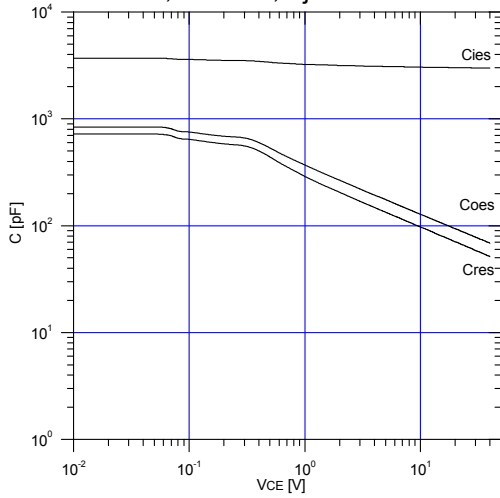
Graph.5
Typical Transfer Characteristics
VCE=10V



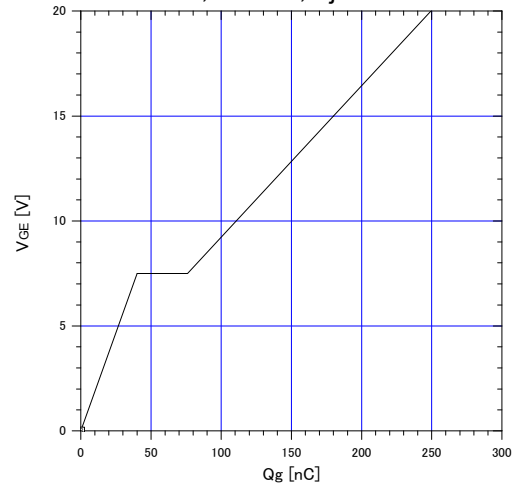
Graph.6
Gate Threshold Voltage vs. Tj
Ic=40mA, VCE=20V



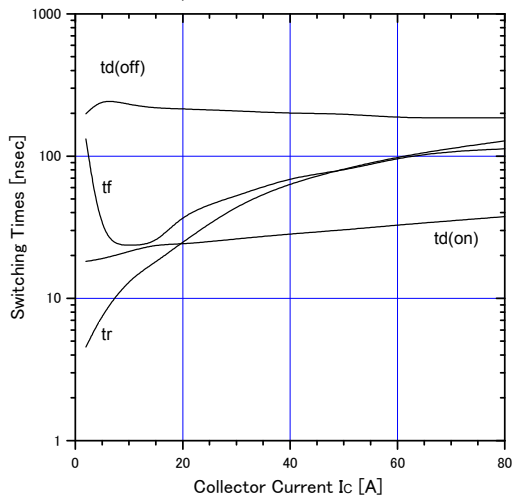
Graph.7
 Typical Capacitance
 $V_{GE}=0V, f=1MHz, T_j=25^\circ C$



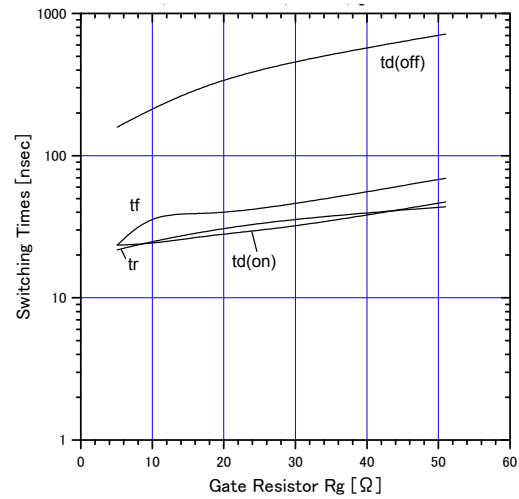
Graph.8
 Typical Gate Charge
 $V_{CC}=520V, I_C=40A, T_j=25^\circ C$



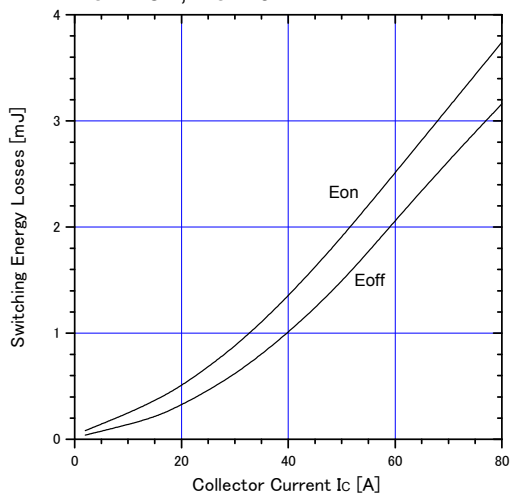
Graph.9
 Typical switching time vs. I_C
 $T_j=150^\circ C, V_{CC}=400V, L=500\mu H$
 $V_{GE}=15V, R_G=10\Omega$



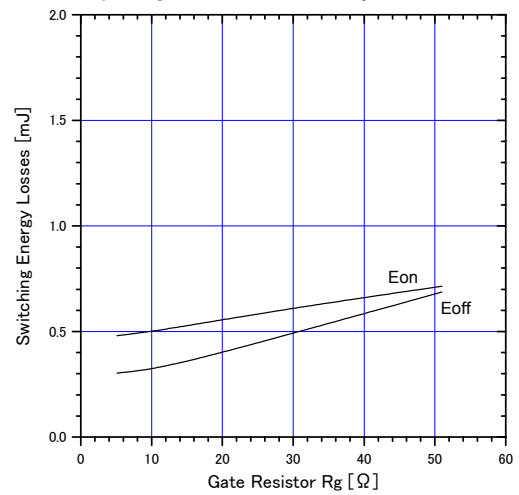
Graph.10
 Typical switching time vs. R_G
 $T_j=150^\circ C, V_{CC}=400V, I_C=20A, L=500\mu H$
 $V_{GE}=15V$



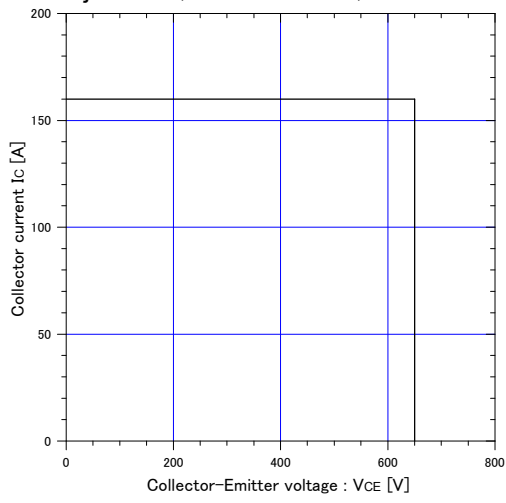
Graph.11
 Typical switching losses vs. I_C
 $T_j=150^\circ C, V_{CC}=400V, L=500\mu H$
 $V_{GE}=15V, R_G=10\Omega$



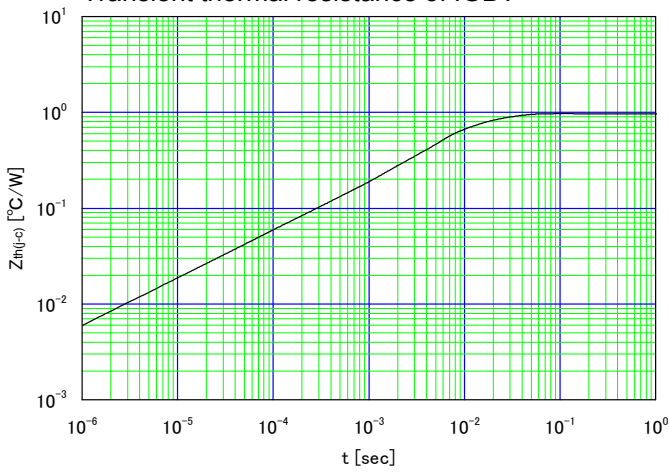
Graph.12
 Typical switching losses vs. R_G
 $T_j=150^\circ C, V_{CC}=400V, I_C=20A, L=500\mu H$
 $V_{GE}=15V$



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

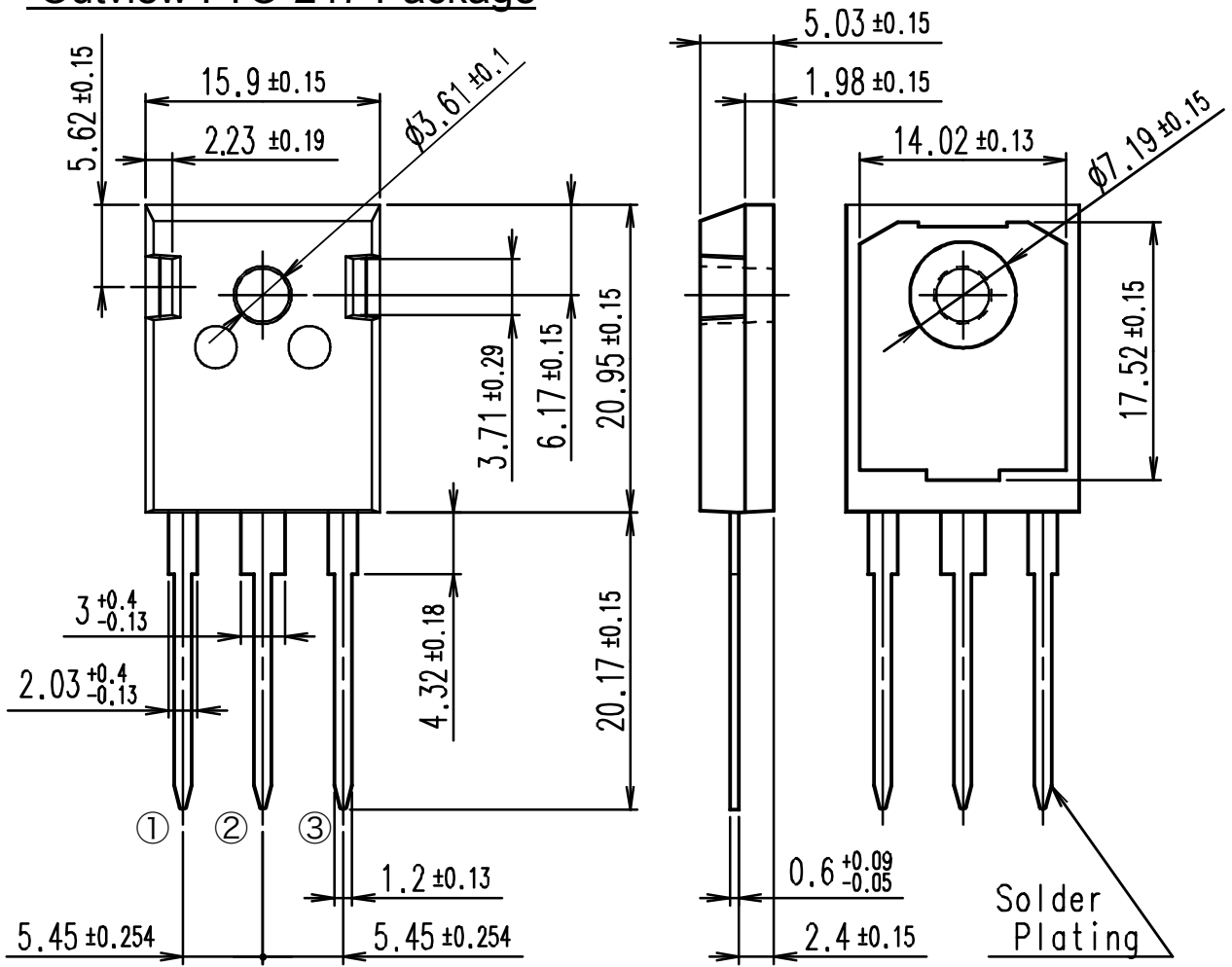


Graph.14
Transient thermal resistance of IGBT



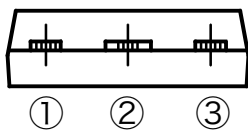
■ Outline Drawings, mm

Outview : TO-247 Package



CONNECTION

- ① GATE
- ② COLLECTOR
- ③ EMITTER



DIMENSIONS ARE IN MILLIMETERS.

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