

# FGW50N60H

Discrete IGBT

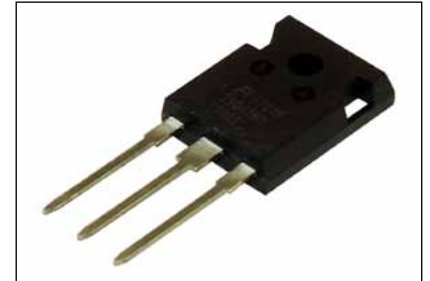
## Discrete IGBT (High-Speed V series) 600V / 50A

### ■ Features

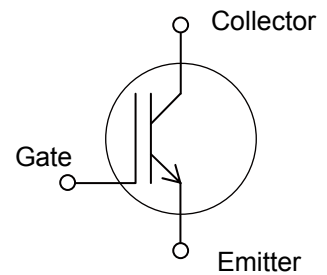
- Low power loss
- Low switching surge and noise
- High reliability, high ruggedness (RBSOA, SCSOA etc.)

### ■ Applications

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



### ■ Equivalent circuit



### ■ Maximum Ratings and Characteristics

#### ● Absolute Maximum Ratings (at T<sub>c</sub>=25°C unless otherwise specified)

Items	Symbols	Characteristics	Units	Remarks
Collector-Emitter voltage	V <sub>CEs</sub>	600	V	
Gate-Emitter voltage	V <sub>GES</sub>	±20	V	
DC Collector Current	I <sub>C@25</sub>	95	A	T <sub>c</sub> =25°C, T <sub>j</sub> ≤150°C
	I <sub>C@100</sub>	50	A	T <sub>c</sub> =100°C, T <sub>j</sub> ≤150°C
Pulsed Collector Current	I <sub>CP</sub>	150	A	Note *1
Turn-Off Safe Operating Area	-	150	A	V <sub>CE</sub> ≤600V, T <sub>j</sub> ≤175°C
Short Circuit Withstand Time	t <sub>SC</sub>	5	μs	V <sub>CC</sub> ≤300V, V <sub>GE</sub> =12V, T <sub>j</sub> ≤150°C
Maximum Power Dissipation	P <sub>D</sub>	360	W	T <sub>c</sub> =25°C
Operating Junction Temperature	T <sub>j</sub>	-40~+175	°C	
Storage Temperature	T <sub>stg</sub>	-55~+175	°C	

Note \*1 : Pulse width limited by T<sub>jmax</sub>.

#### ● Electrical characteristics (at T<sub>j</sub>= 25°C unless otherwise specified)

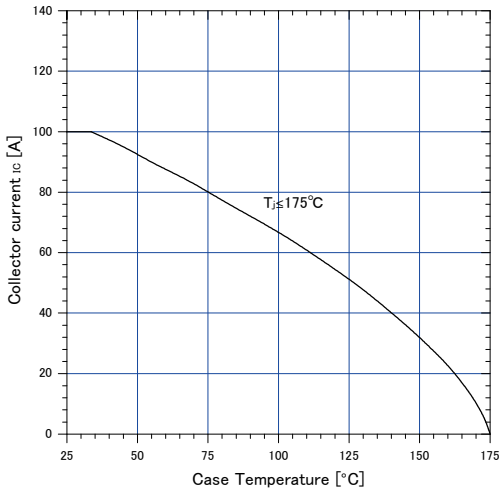
Items	Symbols	Conditions	Characteristics			Unit
			min.	typ.	max.	
Collector-Emitter Breakdown Voltage	V <sub>BR(V)CES</sub>	I <sub>C</sub> = 250μA, V <sub>GE</sub> = 0V	600	-	-	V
Zero Gate Voltage Collector Current	I <sub>CES</sub>	V <sub>CE</sub> = 600V, V <sub>GE</sub> = 0V	-	-	250	μA
		T <sub>j</sub> =25°C	-	-	10	mA
		T <sub>j</sub> =175°C	-	-	200	nA
Gate-Emitter Leakage Current	I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V	-	-	6.0	V
Gate-Emitter Threshold Voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = +20V, I <sub>C</sub> = 50mA	4.0	5.0	6.0	V
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	V <sub>GE</sub> = +15V, I <sub>C</sub> = 50A	-	1.50	1.95	V
		T <sub>j</sub> =25°C	-	1.80	-	
		T <sub>j</sub> =175°C	-	4320	-	pF
Input Capacitance	C <sub>ies</sub>	V <sub>CE</sub> =25V	-	210	-	
Output Capacitance	C <sub>oes</sub>	V <sub>GE</sub> =0V	-	160	-	
Reverse Transfer Capacitance	C <sub>res</sub>	f=1MHz	-	305	-	nC
Gate Charge	Q <sub>G</sub>	V <sub>CC</sub> = 400V I <sub>C</sub> = 50A V <sub>GE</sub> = 15V	-	35	-	ns
Turn-On Delay Time	t <sub>d(on)</sub>	T <sub>j</sub> = 25°C	-	75	-	
Rise Time	t <sub>r</sub>	V <sub>CC</sub> = 400V	-	310	-	
Turn-Off Delay Time	t <sub>d(off)</sub>	I <sub>C</sub> = 50A	-	60	-	
Fall Time	t <sub>f</sub>	V <sub>GE</sub> = 15V	-	1.4	-	mJ
Turn-On Energy	E <sub>on</sub>	R <sub>G</sub> = 10Ω	-	1.7	-	
Turn-Off Energy	E <sub>off</sub>	L = 500μH Energy loss include "tail" and FWD (FDRW25S60L) reverse recovery.	-	40	-	ns
Turn-On Delay Time	t <sub>d(on)</sub>	T <sub>j</sub> = 175°C	-	85	-	
Rise Time	t <sub>r</sub>	V <sub>CC</sub> = 400V	-	335	-	
Turn-Off Delay Time	t <sub>d(off)</sub>	I <sub>C</sub> = 50A	-	72	-	
Fall Time	t <sub>f</sub>	V <sub>GE</sub> = 15V	-	2.4	-	mJ
Turn-On Energy	E <sub>on</sub>	R <sub>G</sub> = 10Ω	-	2.2	-	
Turn-Off Energy	E <sub>off</sub>	L = 500μH Energy loss include "tail" and FWD (FDRW25S60L) reverse recovery.	-	-	-	

#### ● Thermal resistance

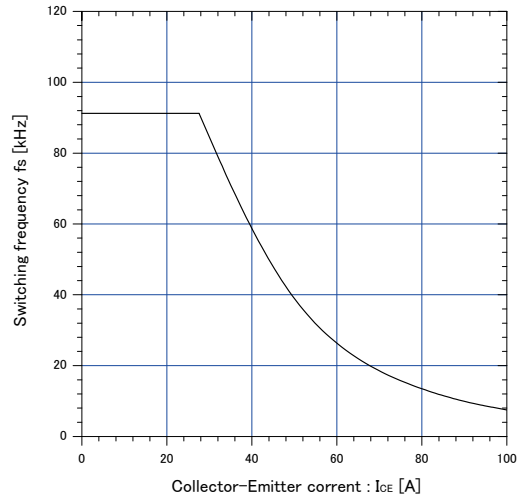
Items	Symbols	Conditions	Characteristics			Unit
			min.	typ.	max.	
Thermal Resistance, Junction-Ambient	R <sub>th(j-a)</sub>		-	-	50	°C/W
Thermal Resistance Junction to Case	R <sub>th(j-c)</sub>		-	-	0.417	

■ Characteristics (Representative)

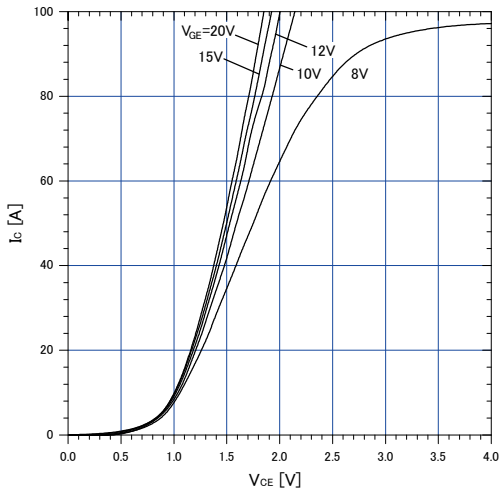
Graph.1  
DC Collector Current vs  $T_c$   
 $V_{GE} \geq +15V, T_j \leq 175^\circ C$



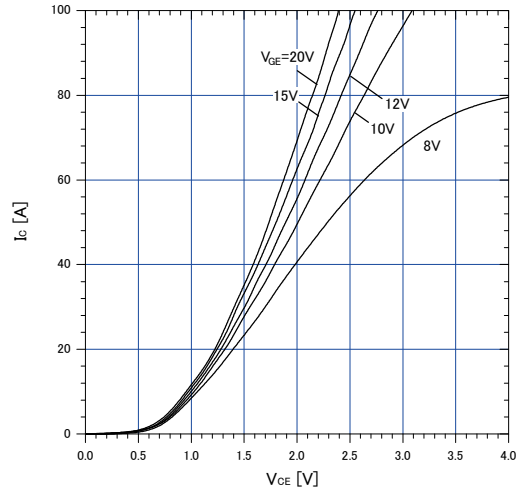
Graph.2  
Collector Current vs. switching frequency  
 $V_{GE} = +15V, T_c \leq 175^\circ C, V_{CC} = 400V, D = 0.5,$   
 $R_G = 10\Omega, T_c = 100^\circ C$



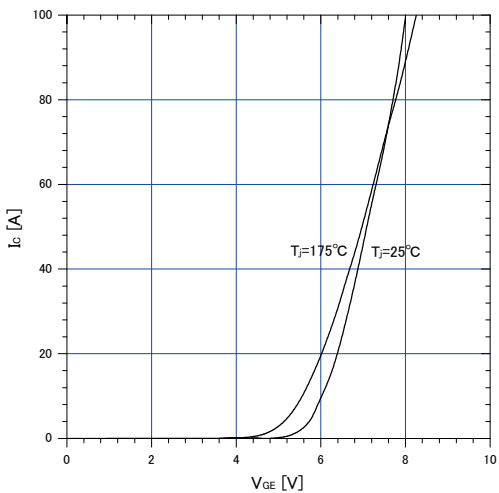
Graph.3  
Typical Output Characteristics ( $V_{CE}-I_c$ )  
 $T_j = 25^\circ C$



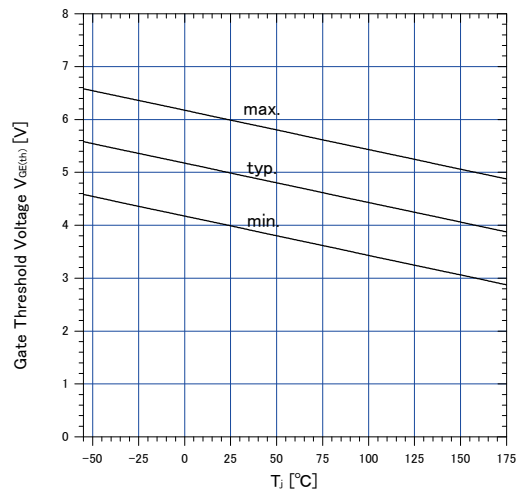
Graph.4  
Typical Output Characteristics ( $V_{CE}-I_c$ )  
 $T_j = 175^\circ C$



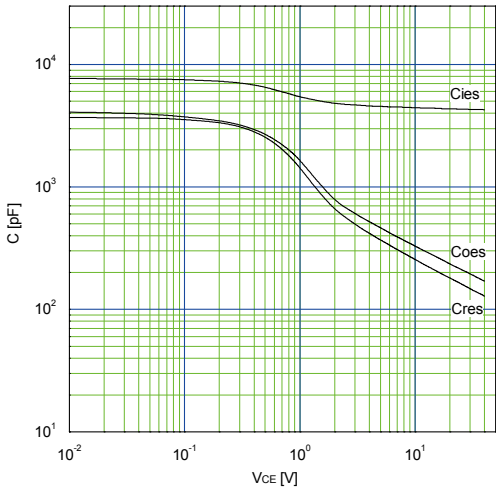
Graph.5  
Typical Transfer Characteristics  
 $V_{GE} = +15V$



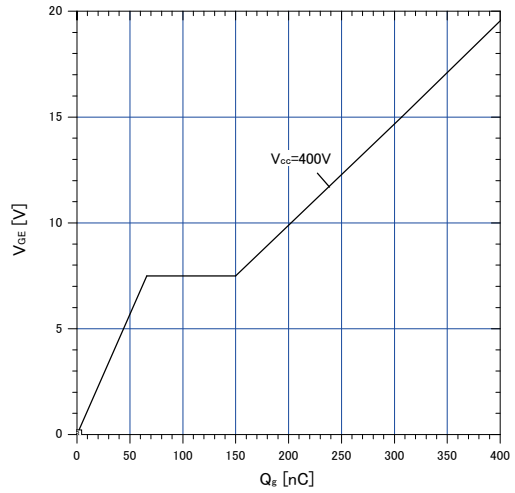
Graph.6  
Gate Threshold Voltage vs.  $T_j$   
 $I_c = 50mA, V_{CE} = 20V$



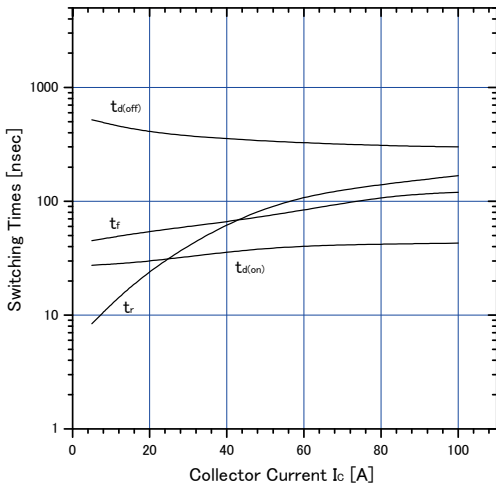
Graph.7  
Typical Capacitance  
 $V_{GE}=0V, f=1MHz, T_J=25^{\circ}C$



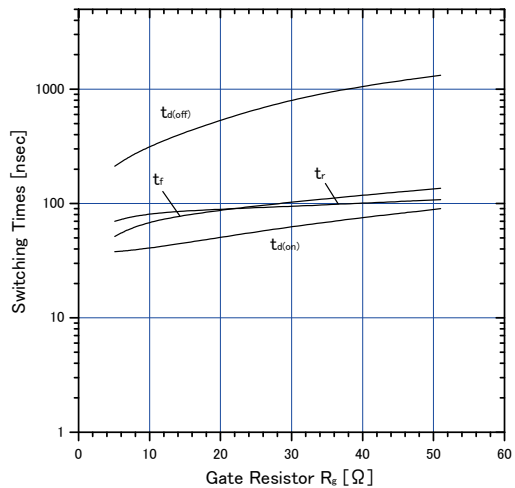
Graph.8  
Typical Gate Charge  
 $V_{CC}=400V, I_C=50A, T_J=25^{\circ}C$



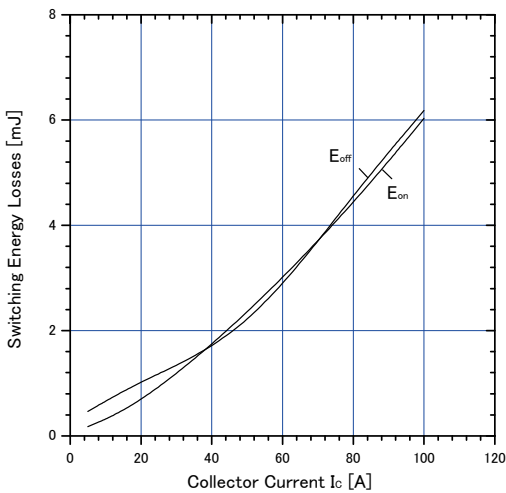
Graph.9  
Typical switching time vs.  $I_C$   
 $T_J=175^{\circ}C, V_{CC}=400V, L=500\mu H$   
 $V_{GE}=15V, R_G=10\Omega$



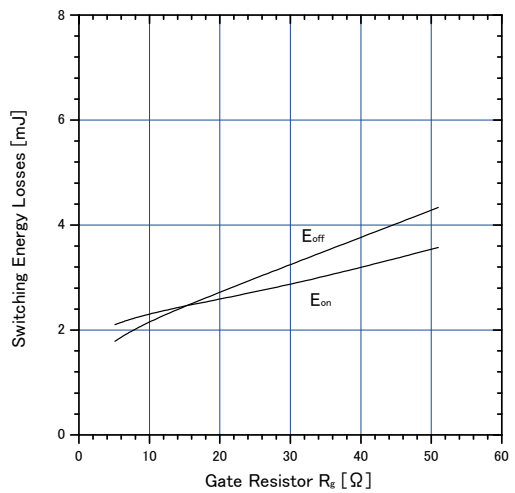
Graph.10  
Typical switching time vs.  $R_G$   
 $T_J=175^{\circ}C, V_{CC}=400V, I_C=50A, L=500\mu H$   
 $V_{GE}=15V$



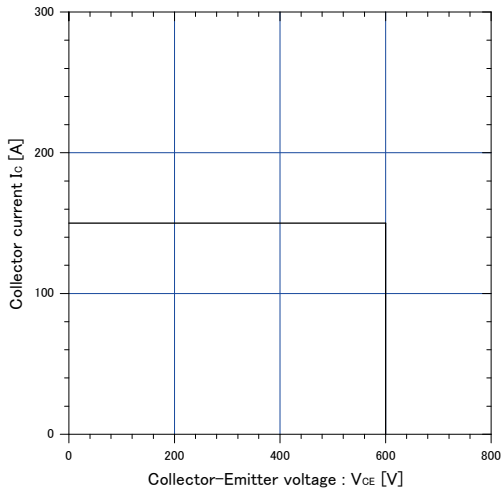
Graph.11  
Typical switching losses vs.  $I_C$   
 $T_J=175^{\circ}C, V_{CC}=400V, L=500\mu H$   
 $V_{GE}=15V, R_G=10\Omega$



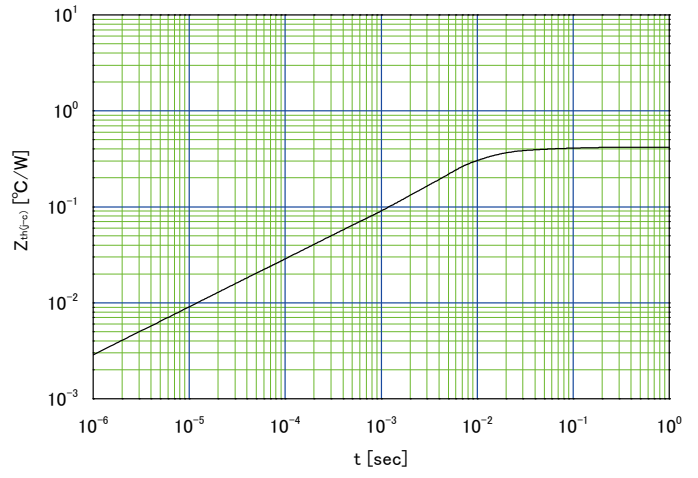
Graph.12  
Typical switching losses vs.  $R_G$   
 $T_J=175^{\circ}C, V_{CC}=400V, I_C=50A, L=500\mu H$   
 $V_{GE}=15V$



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

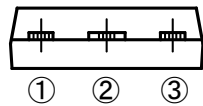
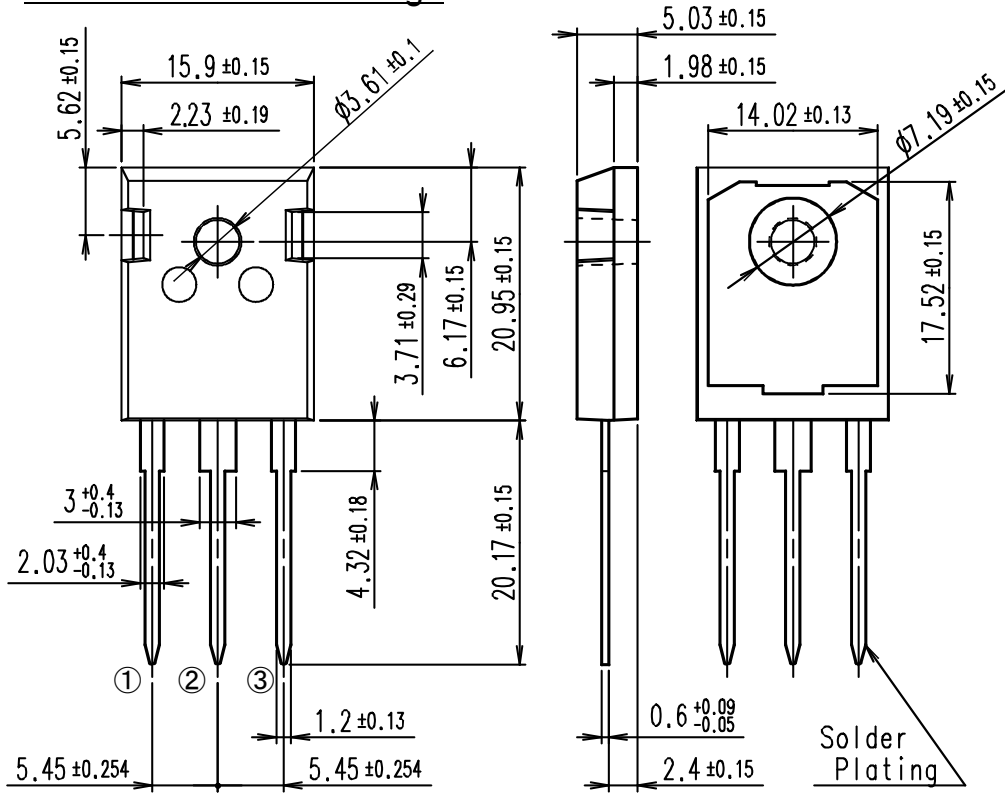


Graph.14  
Transient thermal resistance of IGBT



■ Outline Drawings, mm

Outview : TO-247 Package



CONNECTION

- ① GATE
- ② COLLECTOR
- ③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

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