

## Silicon Field Stop(FS) Planar IGBT

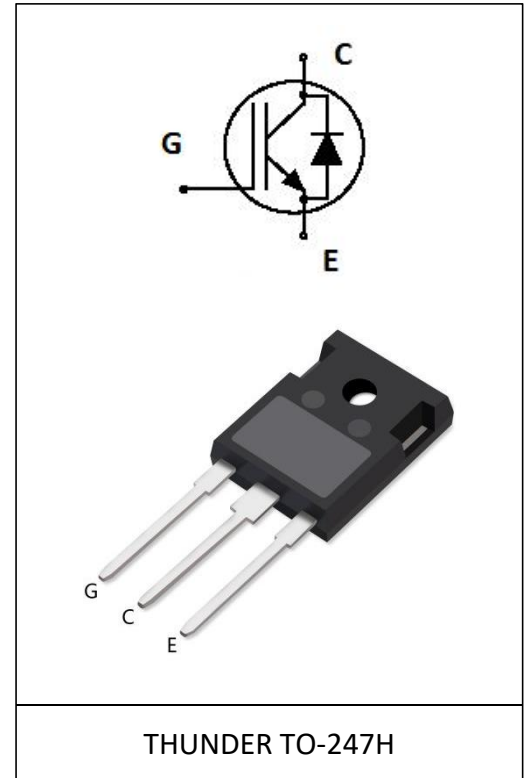
### Description

The THG40N65HQKH is use advanced field stop(FS) technology.

The 650V FS IGBT offers superior conduction and switching performances.

### General Features

- 650V Breakdown Voltage
- Low saturation voltage: $V_{CE(sat)}$ ,  $t_{yp}=1.9V@I_C=40A$
- FS Planar Technology, Positive temperature coefficient
- High speed switch & Low power loss



### Application

- Solar Converters
- Welding Converters
- UPS

### Product Summary

$V_{CE}$	650V
$V_{CE(sat)}$	1.9V
$I_C$	40A

### MAXIMUM RATINGS ( $T_J = 25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Value	Unit	
Collector-to-Emitter Voltage	$V_{CE}$	650	V	
Gate-to-Emitter Voltage	$V_{GE}$	$\pm 30$	V	
Collector Current	$I_C$	$T_C=25^{\circ}C$	80	A
		$T_C=100^{\circ}C$	40	
Power Dissipation	$P_D$	$T_C=25^{\circ}C$	300	W
		$T_C=100^{\circ}C$	150	

Pulsed Collector Current	$T_C=25^{\circ}\text{C}$ $t_p=10\mu\text{s}$ (Note 1)	$I_{CM}$	120	A
Diode Forward Current	$T_C=25^{\circ}\text{C}$	$I_F$	80	
	$T_C=100^{\circ}\text{C}$		40	
Pulsed Diode Forward Current	$T_C=25^{\circ}\text{C}$ $t_p=10\mu\text{s}$ (Note 1)	$I_{FM}$	120	
Short Circuit Withstand Time $V_{GE} = 15\text{ V}, V_{CC} = 400\text{ V}, T_C = 150^{\circ}\text{C}$		$T_{SC}$	10	$\mu\text{s}$
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 $T_o$ +175	$^{\circ}\text{C}$
Lead Temperature for Soldering Purposes		$T_L$	270	

### THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case for IGBT	$R_{thJC}$	0.5	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{thJA}$	62.5	

### ELECTRICAL CHARACTERISTICS ( $T_J = 25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

#### OFF CHARACTERISTICS

Collector-to-Emitter Breakdown Voltage	$BV_{CES}$	650	-	-	V	$V_{GE}=0\text{ V}, I_C=1\text{ mA}$
Zero Gate Voltage Collector Current	$I_{CES}$	-	-	40	$\mu\text{A}$	$V_{GE}=0\text{ V}, V_{CE}=V_{CES}$
Gate-to-Emitter leakage Current	$I_{GES}$	-	-	$\pm 400$	nA	$V_{GE}=\pm 30\text{ V}, V_{CE}=0\text{ V}$

#### ON CHARACTERISTICS

Gate-to-Emitter Threshold Voltage	$V_{GE(th)}$	4.8	-	6.6	V	$V_{GE}=V_{CE}, I_C=1\text{ mA}, T_J=25^{\circ}\text{C}$
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	-	1.9	2.3	V	$V_{GE}=15\text{ V}, I_C=40\text{ A}, T_J=25^{\circ}\text{C}$

**DYNAMIC CHARACTERISTICS**

Input Capacitance	$C_{IES}$	-	1442	-	pF	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V},$ $f = 1\text{ MHz}$
Output Capacitance	$C_{OES}$	-	225	-		
Reverse Transfer Capacitance	$C_{RES}$	-	112	-		
Total Gate Charge	$Q_G$	-	210	-	nC	$V_{CE} = 400\text{ V}, V_{GE} = 15\text{ V},$ $I_C = 40\text{ A}$

**SWITCHING CHARACTERISTICS**

Turn-On Delay Time	$t_{d(on)}$	-	54	-	ns	$V_{CE} = 400\text{ V}$ $V_{GE} = 0/15\text{ V}$ $I_C = 40\text{ A}$ $R_G = 30\ \Omega$ $T_J = 25^\circ\text{C}$
Turn-Off Delay Time	$t_{d(off)}$	-	130	-		
Rise time	$t_r$	-	21	-		
Fall time	$t_f$	-	129	-		
Turn-On Switching Loss	$E_{on}$	-	3.1	-	mJ	
Turn-Off Switching Loss	$E_{off}$	-	0.6	-		
Total Switching Loss	$E_{ts}$	-	3.7	-		

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise specified) (continued)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

**SWITCHING CHARACTERISTICS**
**DIODE CHARACTERISTICS**

Diode Forward Voltage	$V_F$	-	1.5	2.3	-	$I_F = 40\text{ A}, T_J = 25^\circ\text{C}$
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**DIODE SWITCHING CHARACTERISTICS, INDUCTIVE LOAD**

Reverse Recovery Time	$t_{rr}$	-	32	-	ns	$V_R = 400\text{ V}, I_F = 40\text{ A},$ $dI_F/dt = 200\text{ A}/\mu\text{s}$ $T_J = 25^\circ\text{C}$
Reverse Recovery Charge	$Q_{rr}$	-	0.28	-	nC	
Reverse Recovery Energy	$E_{rec}$	-	0.02	-	mJ	
Peak Reverse Recovery Current	$I_{RRM}$	-	12	-	A	

Typical Performance Characteristics

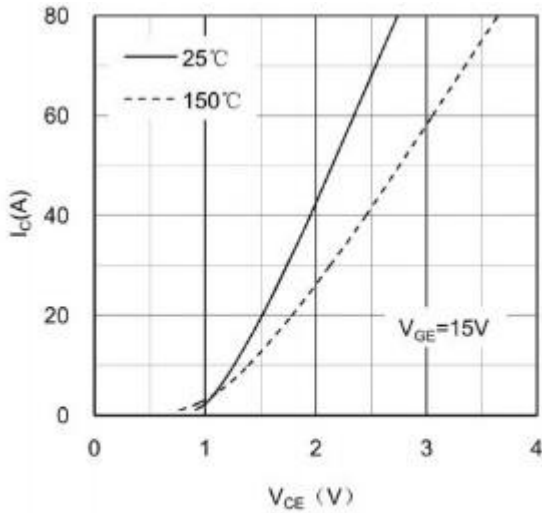


Figure 1. Typical Output Characteristics IGBT

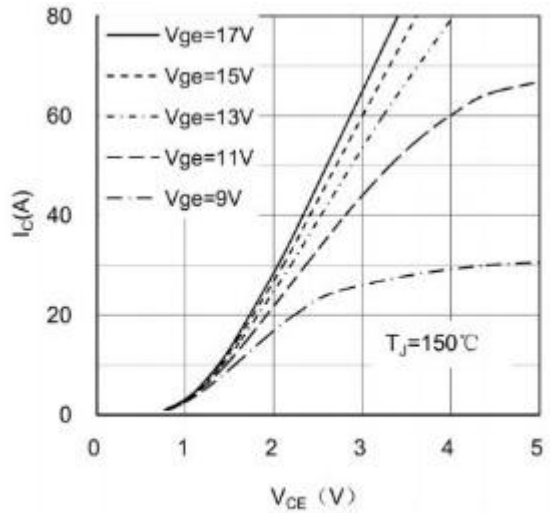


Figure 2. Typical Output Characteristics IGBT

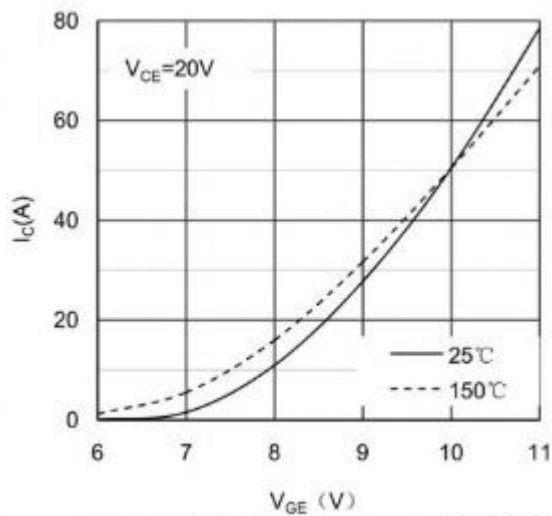


Figure 3. Typical Transfer characteristics IGBT

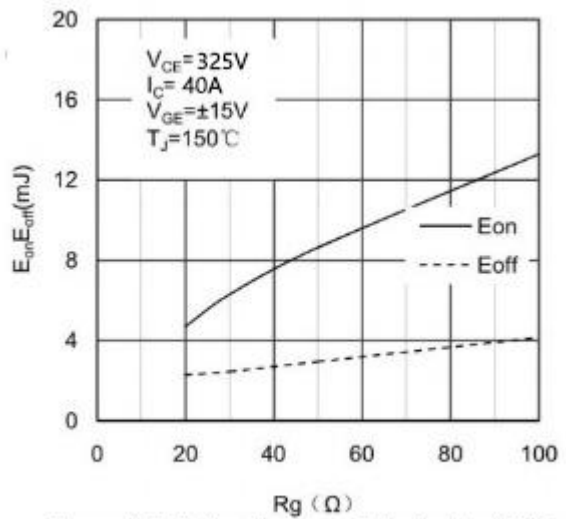


Figure 4. Switching Energy vs Gate Resistor IGBT

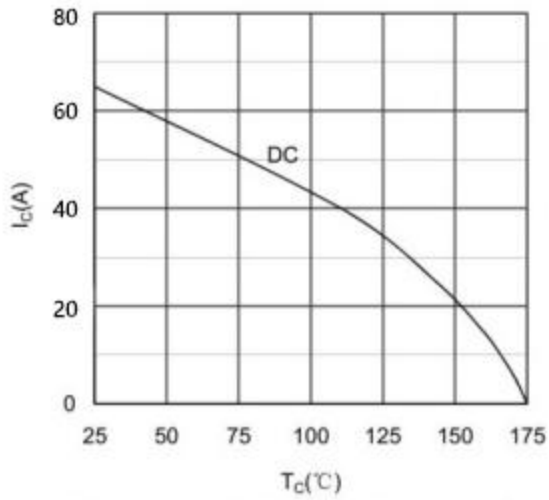


Figure 5. Collector Current vs Case temperature IGBT

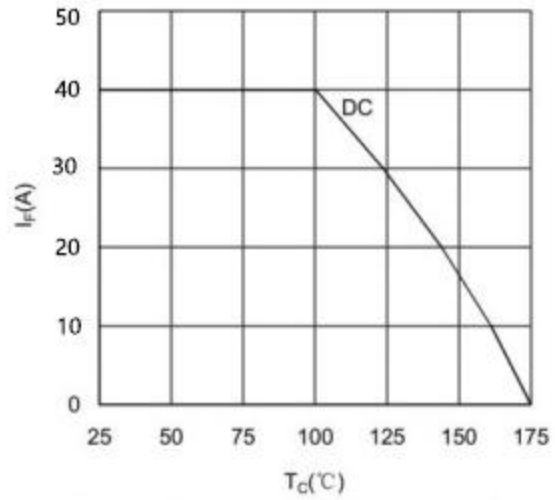


Figure 6. Forward current vs Case temperature Diode

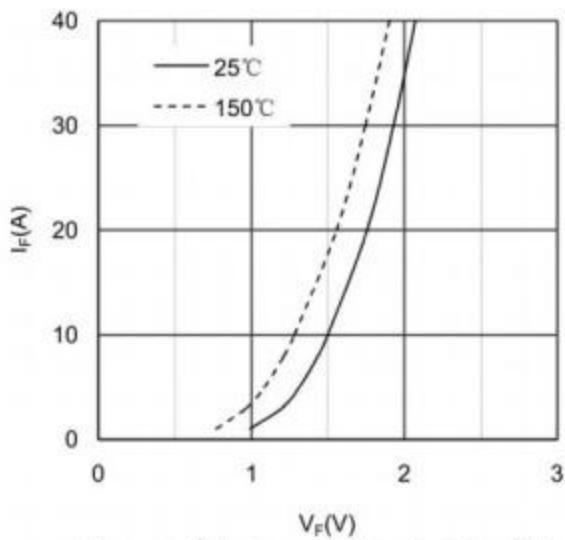


Figure 7. Diode Forward Characteristics Diode

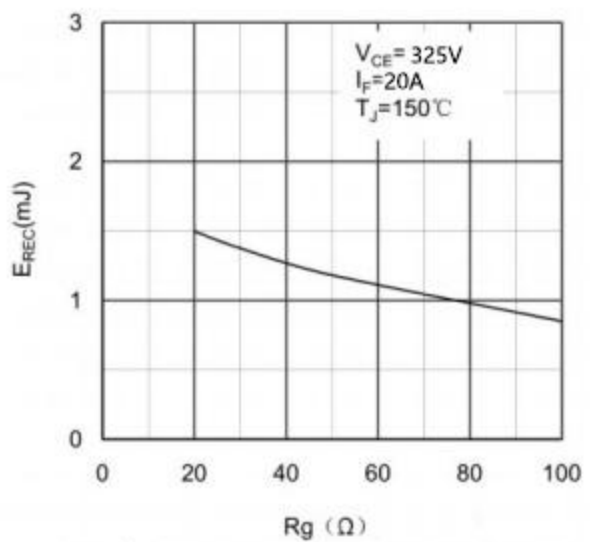


Figure 8 . Switching Energy vs Gate Resistor Diode

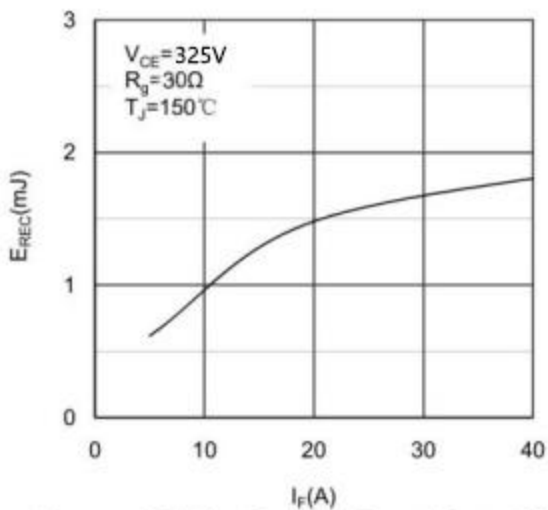


Figure 9 . Switching Energy vs Forward Current Diode

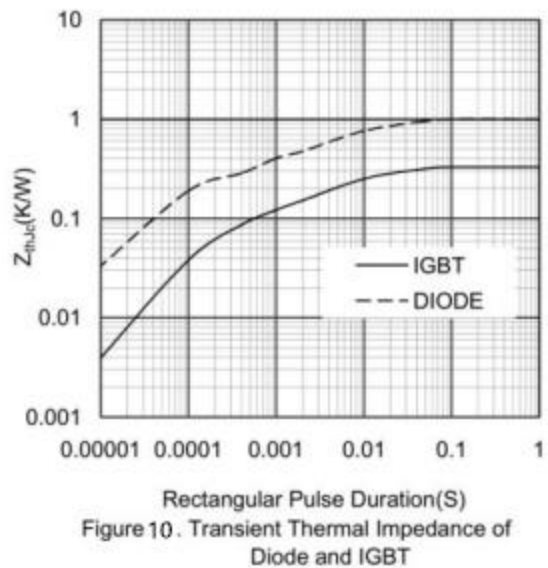
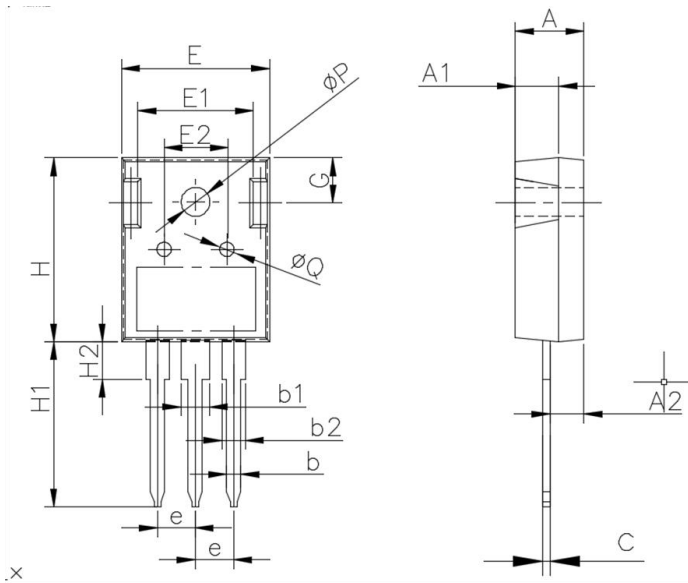


Figure 10. Transient Thermal Impedance of Diode and IGBT

## Package Information

### TO-247H PACKAGE

#### 基本尺寸



Symbol	单位 mm		
	Min	Nom	Max
A	4.80	5.00	5.20
A1	2.80	3.00	3.20
A2	2.20	2.40	2.60
b	1.05	1.20	1.35
b1	2.80	3.00	3.20
b2	1.80	2.00	2.20
c	0.50	0.60	0.70
e	5.35	5.45	5.75
E	15.6	15.80	16.0
E1	12.3	12.50	12.7
E2	6.00	6.20	6.40
H	20.8	21.0	21.2
H1	19.5	20.0	20.5
H2	3.70	4.00	4.30
G	5.70	5.90	6.10
ΦP	3.30	3.50	3.70
ΦQ	2.30	2.50	2.70

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