

## Silicon Field Stop(FS) Planar IGBT

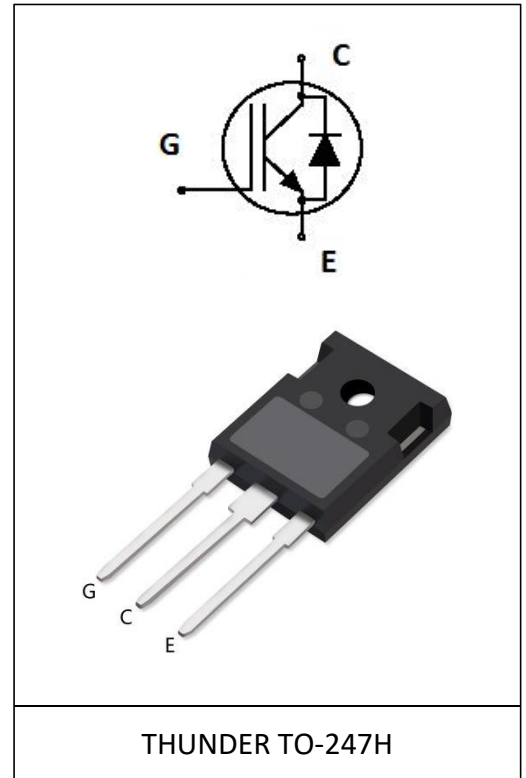
### Description

The THG40N120FQKH is use advanced field stop(FS) technology.

The 1200V FS IGBT offers superior conduction and switching performances.

### General Features

- 1200V Breakdown Voltage
- Low saturation voltage: $V_{CE(sat)}$ ,typ=2.3V@ $I_C=40A$
- FS Planar Technology,Positive temperature coefficient
- High speed switch & Low power loss



### Application

- Solar Converters
- Welding Converters
- UPS

### Product Summary

$V_{CE}$	1200V
$V_{CE(sat)}$	2.3V
$I_C$	40A

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

Parameter		Symbol	Value	Unit
Collector-to-Emitter Voltage		$V_{CE}$	1200	V
Gate-to-Emitter Voltage		$V_{GE}$	$\pm 30$	V
Collector Current	$T_C=25^\circ C$	$I_C$	80	A
	$T_C=100^\circ C$		40	
Power Dissipation	$T_C=25^\circ C$	$P_D$	625	W
	$T_C=100^\circ C$		326	

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 $V_{GE} = 15\text{ V}, V_{CC} = 800\text{ V}, T_C = 150^{\circ}\text{C}$		$T_{SC}$	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	$R_{thJC}$	0.23	$^{\circ}\text{C}/\text{W}$
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	$BV_{CES}$	1200	-	-	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	$V_{CE(sat)}$	-	2.3	2.8	V	$V_{GE}=15\text{ V}, I_C=40\text{ A}, T_J=25^{\circ}\text{C}$

**DYNAMIC CHARACTERISTICS**

Input Capacitance	$C_{IES}$	-	3262	-	pF	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V},$ $f = 1\text{ MHz}$
Output Capacitance	$C_{OES}$	-	249	-		
Reverse Transfer Capacitance	$C_{RES}$	-	67	-		
Total Gate Charge	$Q_G$	-	220	-	nC	$V_{CE} = 600\text{ V}, V_{GE} = 15\text{ V},$ $I_C = 40\text{ A}$

**SWITCHING CHARACTERISTICS**

Turn-On Delay Time	$t_{d(on)}$	-	128	-	ns	$V_{CE} = 600\text{ V}$ $V_{GE} = 0/15\text{ V}$ $I_C = 40\text{ A}$ $R_G = 30\ \Omega$ $T_J = 25^\circ\text{C}$
Turn-Off Delay Time	$t_{d(off)}$	-	233	-		
Rise time	$t_r$	-	35	-		
Fall time	$t_f$	-	190	-		
Turn-On Switching Loss	$E_{on}$	-	5.9	-	mJ	
Turn-Off Switching Loss	$E_{off}$	-	1.4	-		
Total Switching Loss	$E_{ts}$	-	7.3	-		

**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	$V_F$	-	2.2	3.3	-	$I_F = 40\text{ A}, T_J = 25^\circ\text{C}$
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**DIODE SWITCHING CHARACTERISTICS, INDUCTIVE LOAD**

Reverse Recovery Time	$t_{rr}$	-	39	-	ns	$V_R = 600\text{ V}, I_F = 40\text{ A},$ $dI_F/dt = 200\text{ A}/\mu\text{s}$ $T_J = 25^\circ\text{C}$
Reverse Recovery Charge	$Q_{rr}$	-	6920	-	nC	
Reverse Recovery Energy	$E_{rec}$	-	0.07	-	mJ	
Peak Reverse Recovery Current	$I_{RRM}$	-	28	-	A	

### Typical Performance Characteristics

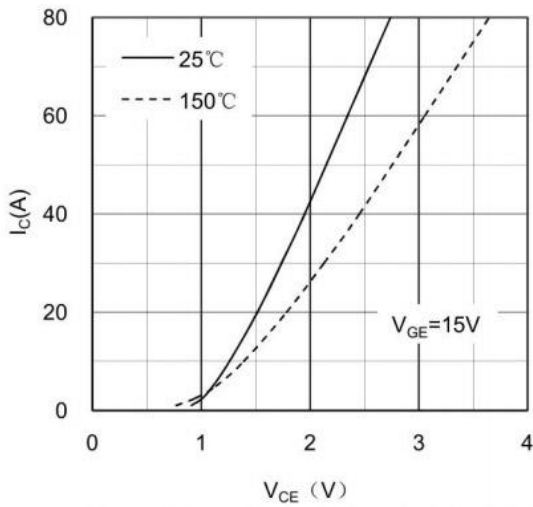


Figure 1. Typical Output Characteristics IGBT

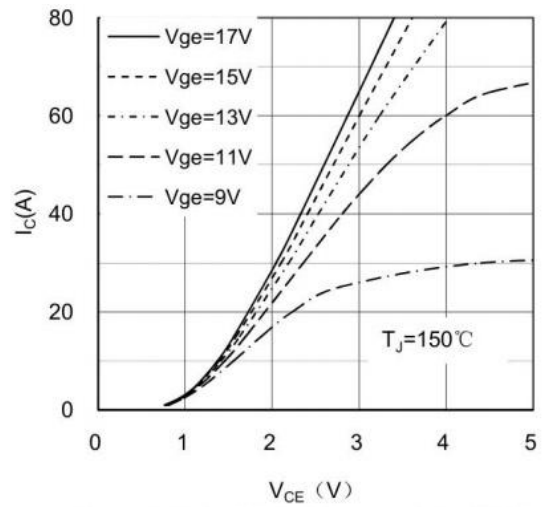


Figure 2. Typical Output Characteristics IGBT

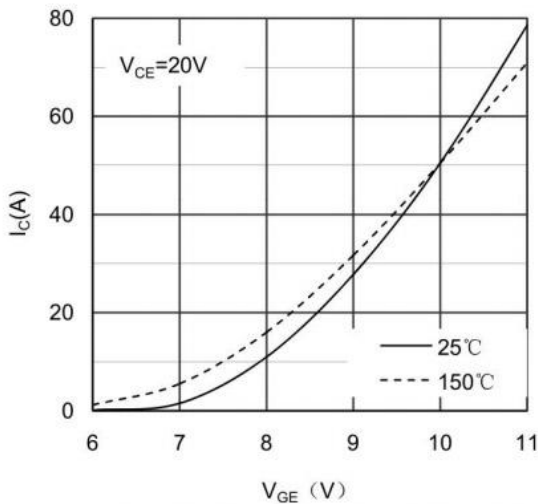


Figure 3. Typical Transfer characteristics IGBT

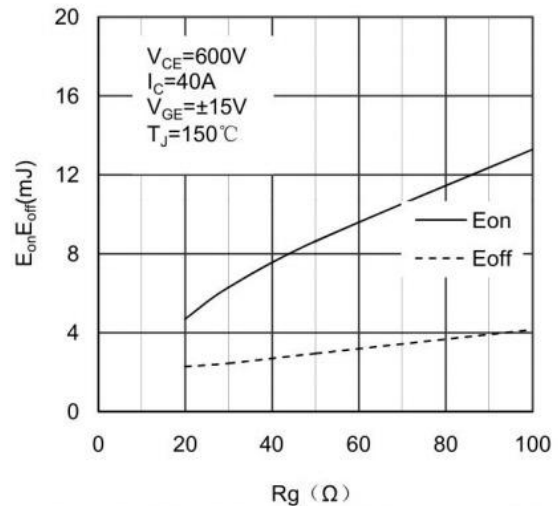


Figure 4. Switching Energy vs Gate Resistor IGBT

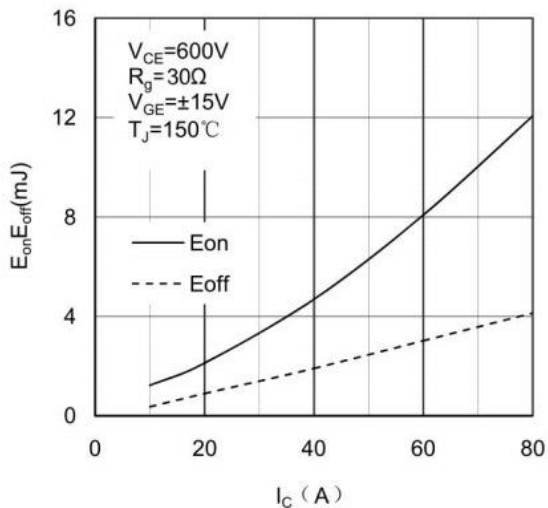


Figure 5. Switching Energy vs Collector Current IGBT

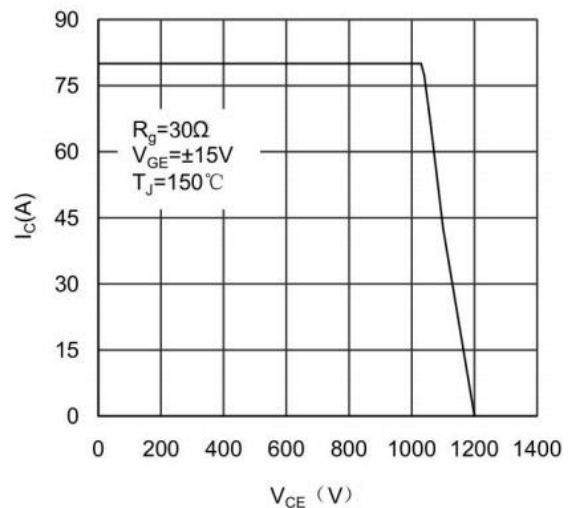


Figure 6. Reverse Biased Safe Operating Area IGBT

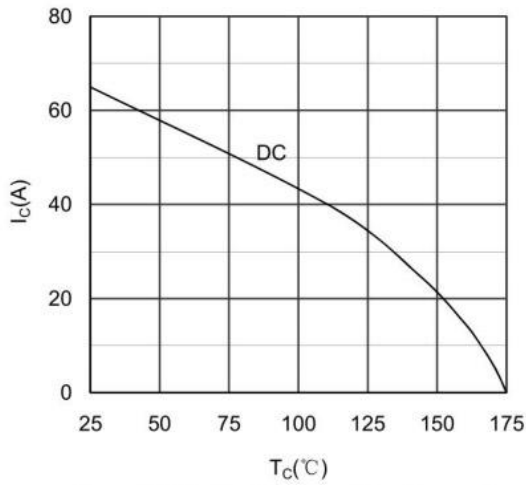


Figure 7. Collector Current vs Case temperature IGBT

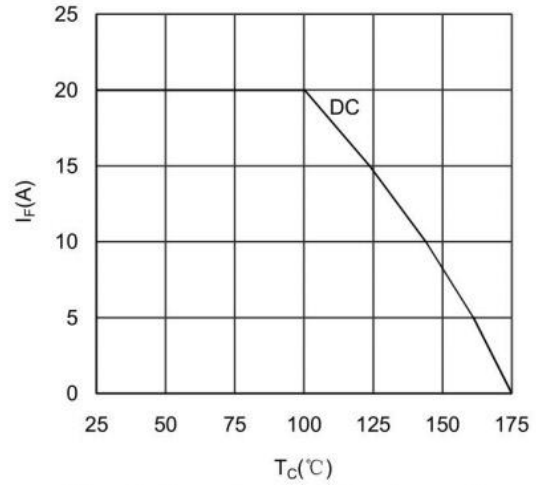


Figure 8. Forward current vs Case temperature Diode

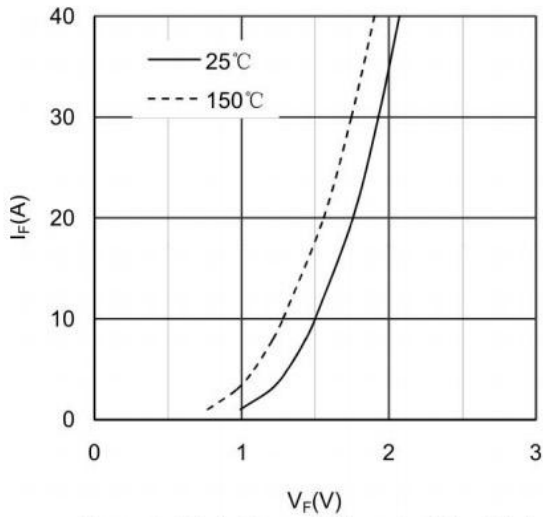


Figure 9. Diode Forward Characteristics Diode

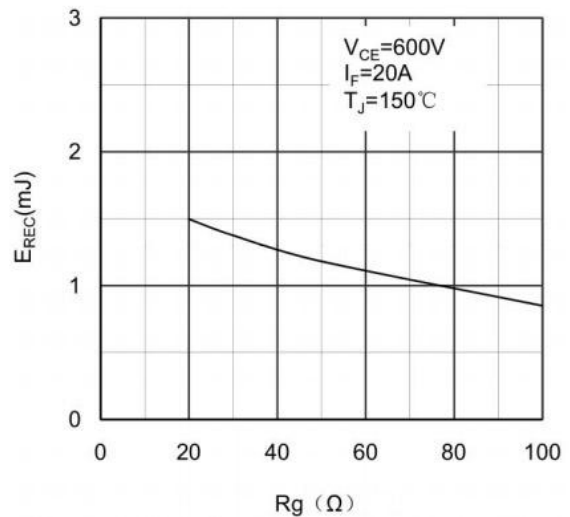


Figure 10. Switching Energy vs Gate Resistor Diode

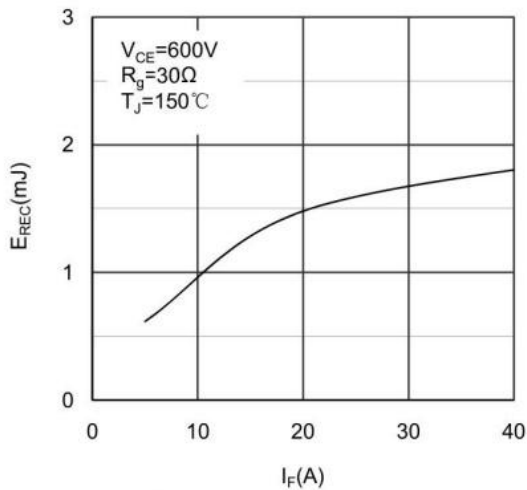


Figure 11. Switching Energy vs Forward Current Diode

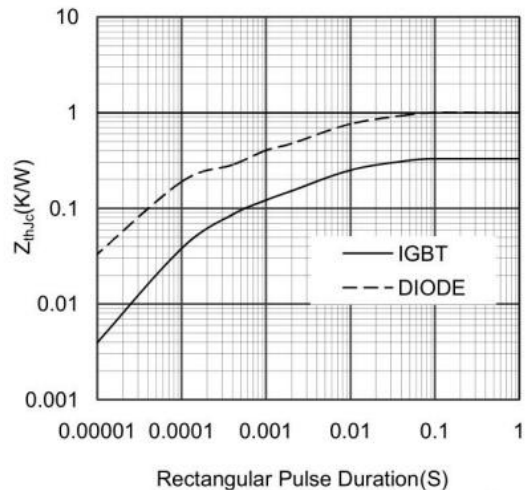
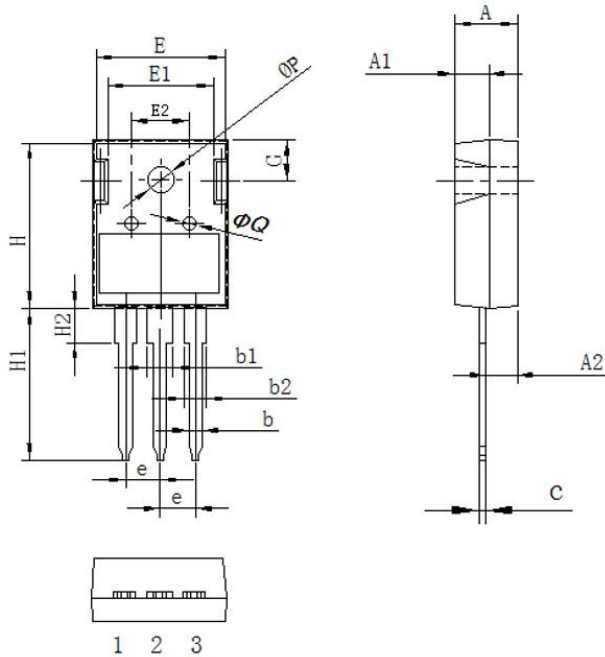


Figure 12. Transient Thermal Impedance of Diode and IGBT

## 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	20.5	21.0	21.5
H1	19.0	20.0	21.0
H2	3.00	4.00	5.00
G	5.70	5.90	6.10
$\Phi P$	3.30	3.50	3.50
$\Phi Q$	2.30	2.50	2.70

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### -Headquarters

WuXi Thunder Microelectronics Incorporated Limited  
 Building E1-901, No.200 LingHu Road, XinWu district,WuXi,China 214135  
 Tel:+86-510-85160109 Fax:+86-510-85160109