

Silicon Field Stop(FS) Planar IGBT

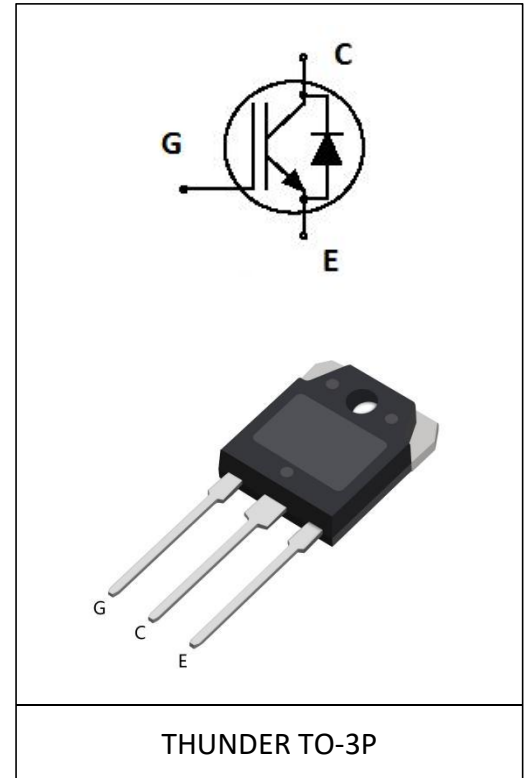
Description

The THG40N65SQU 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: $V_{CE(sat)}$, typ=2.2V@ $I_C=40A$
- FS Planar Technology, Positive temperature coefficient
- High speed switch & Low power loss



Application

- Solar Converters
- Welding Converters
- UPS

Product Summary

V_{CE}	650V
$V_{CE(sat)}$	2.2V
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}	± 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	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	μs
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 To +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	μA	$V_{GE}=0\text{ V}, V_{CE}=V_{CES}$
Gate-to-Emitter leakage Current	I_{GES}	-	-	± 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	$V_{CE(sat)}$	-	2.2	2.7	V	$V_{GE}=15\text{ V}, I_C=40\text{ A}$, $T_J=25^{\circ}\text{C}$

DYNAMIC CHARACTERISTICS

Input Capacitance	C_{IES}	-	1427	-	pF	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V},$ $f = 1\text{ MHz}$
Output Capacitance	C_{OES}	-	205	-		
Reverse Transfer Capacitance	C_{RES}	-	89	-		
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	$t_{d(off)}$	-	125	-		
Rise time	t_r	-	20	-		
Fall time	t_f	-	55	-		
Turn-On Switching Loss	E_{on}	-	3.3	-	mJ	
Turn-Off Switching Loss	E_{off}	-	0.2	-		
Total Switching Loss	E_{ts}	-	3.5	-		

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	-	1.6	2.4	-	$I_F = 40\text{ A}, T_J = 25^\circ\text{C}$
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DIODE SWITCHING CHARACTERISTICS, INDUCTIVE LOAD

Reverse Recovery Time	t_{rr}	-	34	-	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}	-	0.33	-	nC	
Reverse Recovery Energy	E_{rec}	-	0.02	-	mJ	
Peak Reverse Recovery Current	I_{RRM}	-	15	-	A	

Typical Performance Characteristics

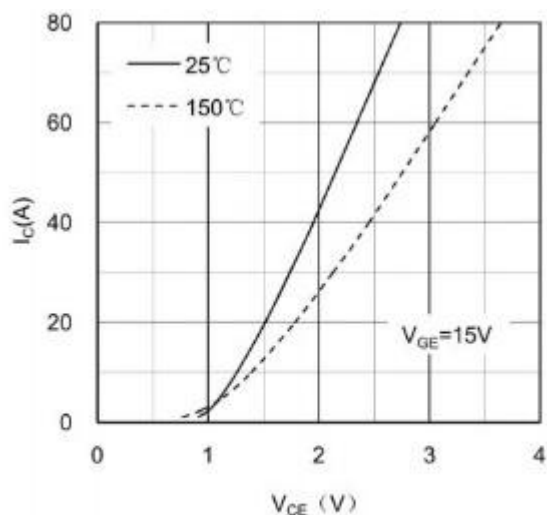


Figure 1. Typical Output Characteristics IGBT

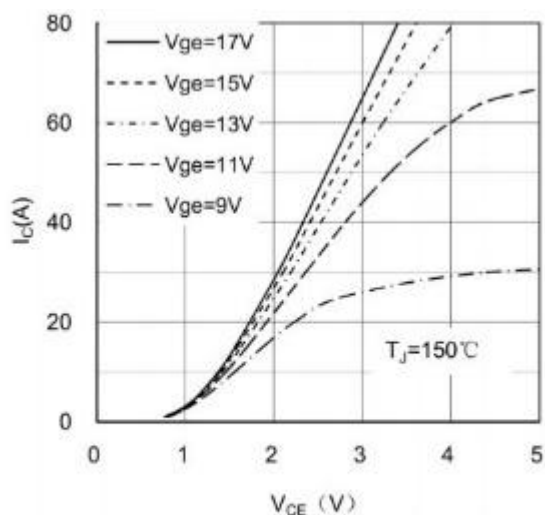


Figure 2. Typical Output Characteristics IGBT

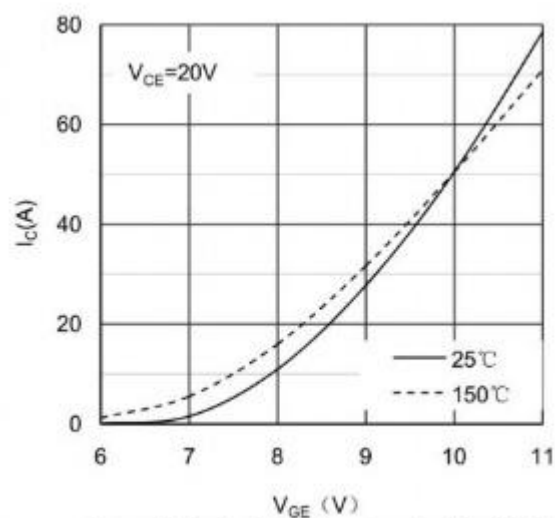


Figure 3. Typical Transfer characteristics IGBT

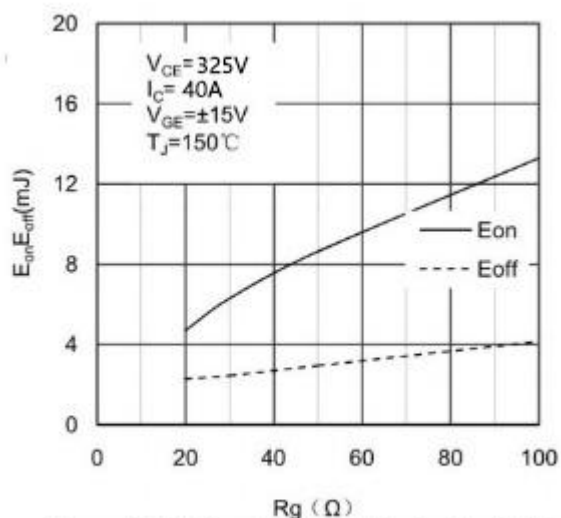


Figure 4. Switching Energy vs Gate Resistor IGBT

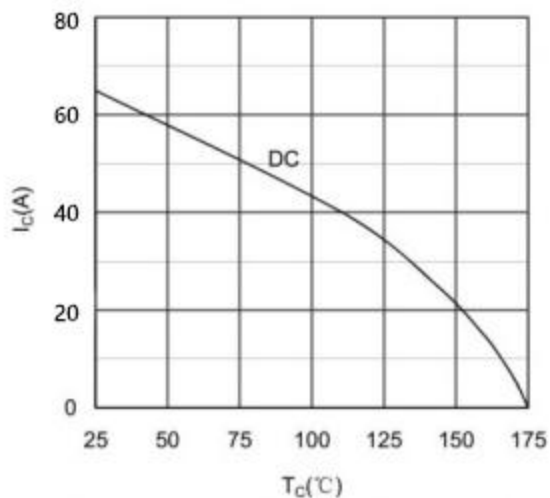


Figure 5. Collector Current vs Case temperature IGBT

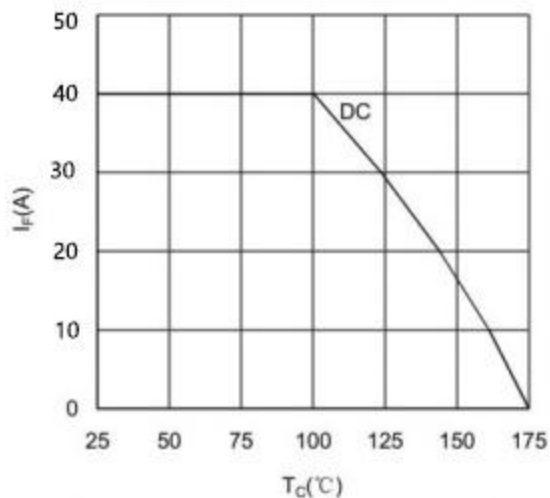


Figure 6. Forward current vs Case temperature Diode

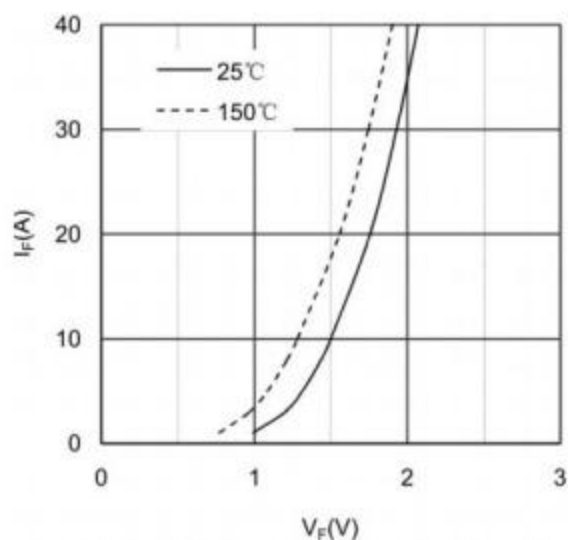


Figure 7. Diode Forward Characteristics Diode

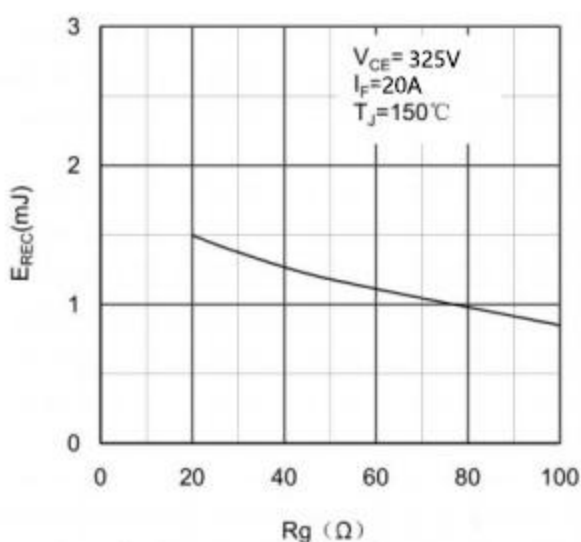


Figure 8. Switching Energy vs Gate Resistor Diode

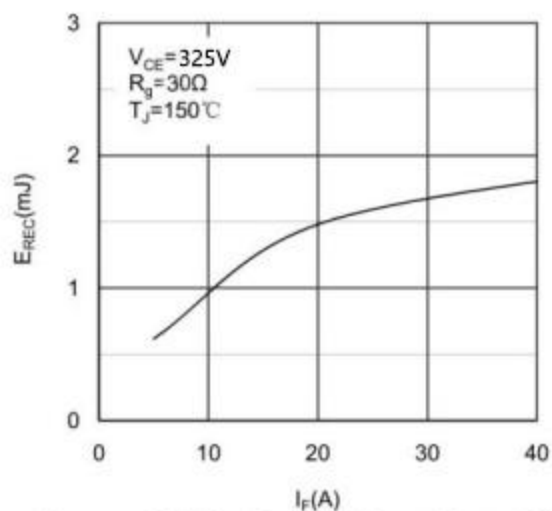


Figure 9. Switching Energy vs Forward Current Diode

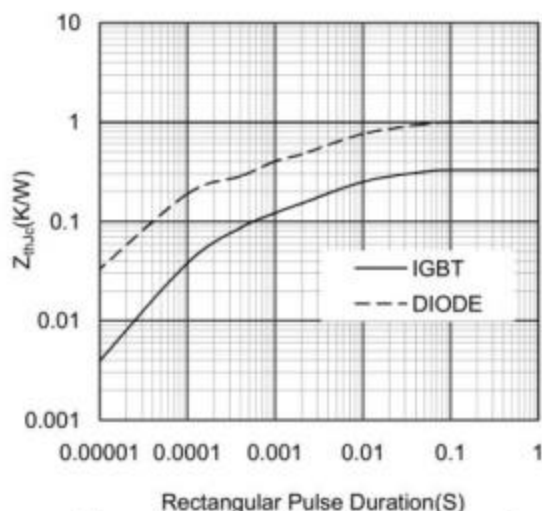
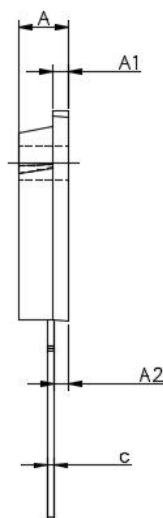
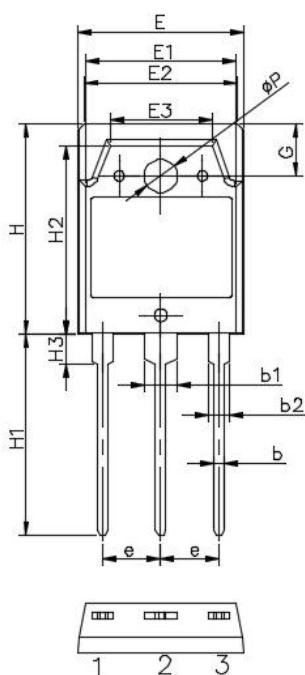


Figure 10. Transient Thermal Impedance of Diode and IGBT

Package Information

TO-3P PACKAGE

基本尺寸



Symbol	单位 mm		
	Min	Nom	Max
A	4.60	4.80	5.00
A1	1.3	1.5	1.7
A2	1.20	1.40	1.60
b	0.80	1.0	1.20
b1	2.90	3.10	3.30
b2	1.90	2.10	2.30
c	0.50	0.60	0.70
e	5.25	5.45	5.65
E	15.2	15.6	16.0
E1	13.2	13.4	13.6
E2	13.1	13.3	13.5
E3	9.1	9.3	9.5
H	19.8	20.0	20.2
H1	20.1	20.3	20.5
H2	18.5	18.7	18.9
H3	3.2	3.5	3.8
G	4.8	5.0	5.2
ΦP	3.00	3.20	3.40

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