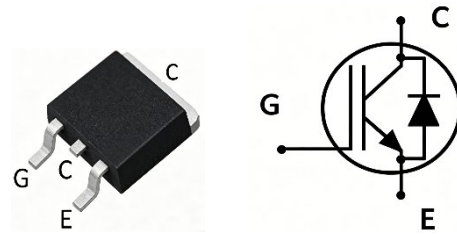


THG6N65FQG

650V 6A Fieldstop Planar IGBT

Advanced field-stop planar technology for low conduction loss, fast switching performance and rugged operation in high-power conversion systems.



Package view and circuit symbol

General Features

- 650 V breakdown voltage
- $V_{CE(sat)}$, typ. = 1.68 V @ $V_{GE}=15V$, $I_C = 6$ A
- Field-stop planar technology with positive temperature coefficient
- High-speed switching with low power loss
- 10 μs short-circuit withstand capability
- 175 °C maximum junction temperature

Applications

- Solar Converters
- Welding Converters
- UPS

Key Performance Parameters

Parameter	Value	Unit
V_{CES} , min @ $T_J = 25^\circ C$	650	V
T_J , maximum junction temperature	175	°C
I_C @ $T_C = 100^\circ C$	6	A
$I_{C,pulse}$ @ $T_C = 25^\circ C$, $t_p = 10 \mu s$	18	A
$V_{CE(sat)}$, typ. @ $V_{GE} = 15$ V	1.68	V
Q_g , typ.	9.1	nC



Marking Information

Product Name	Package	Marking
THG6N65FQG	TO-252	THG6N65FQG

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Maximum Ratings (T_J = 25°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°C	I _C	12	A
	T _C =100°C		6	
Pulsed Collector Current	T _C =25°C tp limited by Tvjmax	I _{CM}	18	A
Diode Forward Current	T _C =25°C	I _F	12	
	T _C =100°C		6	
Pulsed Diode Forward Current	T _C =25°C tp limited by Tvjmax	I _{FM}	18	
Short Circuit Withstand Time V _{GE} = 15 V, V _{CC} = 400 V, T _C = 25°C		T _{SC}	10	μs
Power Dissipation	T _C =25°C	P _D	88	W
	T _C =100°C		30	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55 To +175	°C
Lead Temperature for Soldering Purposes		T _L	270	

Thermal Characteristics

Parameter	Symbol	Max Value	Unit
Thermal Resistance, Junction-to-Case for IGBT	R _{thJC}	1.7	°C/W
Thermal Resistance, Junction-to-Case for FRD	R _{thJC}	3.8	
Thermal Resistance, Junction-to-Ambient	R _{thJA}	100	

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition		Value			Unit
				min.	typ.	max.	
Collector-to-Emitter Breakdown Voltage	B _V CES	V _{GE} =0V, I _C =250μA		650	-	-	V
Zero Gate Voltage Collector Current	I _C ES	V _{GE} =0V, V _{CE} =V _{CES}		-	-	40	μA
Gate-to-Emitter leakage Current	I _{GE} S	V _{GE} =±30V, V _{CE} =0V		-	-	±300	nA
Gate-to-Emitter Threshold Voltage	V _{GE(th)}	V _{GE} =V _{CE} , I _C =1mA	T _J =25°C	5	-	6	V
			T _J =150°C	-	4.5	-	
Collector-to-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V, I _C =6A	T _J =25°C	-	1.68	2	V
			T _J =150°C	-	1.9	-	
Input Capacitance	C _I ES	V _{CE} = 25 V, V _{GE} = 0 V, f = 1 MHz		-	226	-	pF
Output Capacitance	C _O ES			-	37	-	
Reverse Transfer Capacitance	C _R ES			-	6	-	
Total Gate Charge	Q _g	V _{CE} =400 V, V _{GE} = 15 V, I _C = 6 A		-	9.1	-	nC
Gate-emitter charge	Q _{ge}				2.3		
Gate-collector charge	Q _{gc}				4.5		
Turn-On Delay Time	td(on)	V _{CE} = 400 V V _{GE} = -5/15 V I _C = 6 A R _G = 27 Ω		-	25	-	ns
Turn-Off Delay Time	td(off)			-	40	-	
Rise time	tr			-	10	-	
Fall time	tf			-	30	-	
Turn-On Switching Loss	E _{on}	T _J = 25°C		-	0.82	-	mJ
Turn-Off Switching Loss	E _{off}			-	0.26	-	
Turn-On Delay Time	td(on)	V _{CE} = 400 V V _{GE} = -5/15 V I _C = 6 A R _G = 27 Ω		-	30	-	ns
Turn-Off Delay Time	td(off)			-	43	-	
Rise time	tr			-	14	-	
Fall time	tf			-	45	-	
Turn-On Switching Loss	E _{on}	T _J = 150°C		-	1.2	-	mJ
Turn-Off Switching Loss	E _{off}			-	0.4	-	

Diode Characteristics

Parameter	Symbol	Test Condition		Value			Unit
				min.	typ.	max.	
Diode Forward Voltage	V_F	$I_F = 6\text{ A}$	$T_J = 25^\circ\text{C}$	-	1.4	1.6	V
			$T_J = 150^\circ\text{C}$	-	1.25	-	
Reverse Recovery Time	t_{rr}	$V_R = 400\text{ V}, I_F = 6\text{ A},$ $dI_F/dt = 200\text{ A}/\mu\text{s}$ $T_J = 25^\circ\text{C}$		-	40	-	ns
Reverse Recovery Charge	Q_{rr}			-	80	-	nC
Reverse Recovery Energy	E_{rec}			-	0.01	-	mJ
Peak Reverse Recovery Current	I_{RRM}			-	3.6	-	A
Reverse Recovery Time	t_{rr}	$V_R = 400\text{ V}, I_F = 6\text{ A},$ $dI_F/dt = 200\text{ A}/\mu\text{s}$ $T_J = 150^\circ\text{C}$			65		ns
Reverse Recovery Charge	Q_{rr}				170		nC
Reverse Recovery Energy	E_{rec}				0.02		mJ
Peak Reverse Recovery Current	I_{RRM}				6.5		A

Typical Performance Characteristics

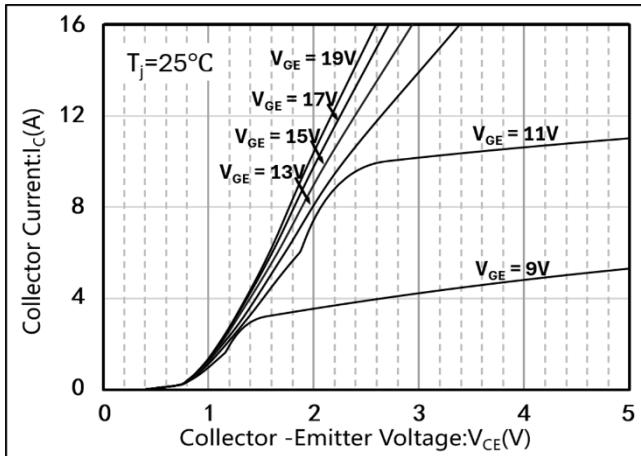


Fig 1. Typical output characteristic

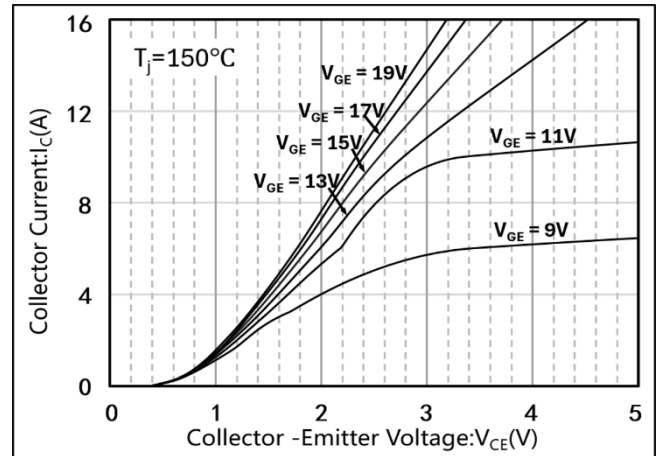


Fig 2. Typical output characteristic

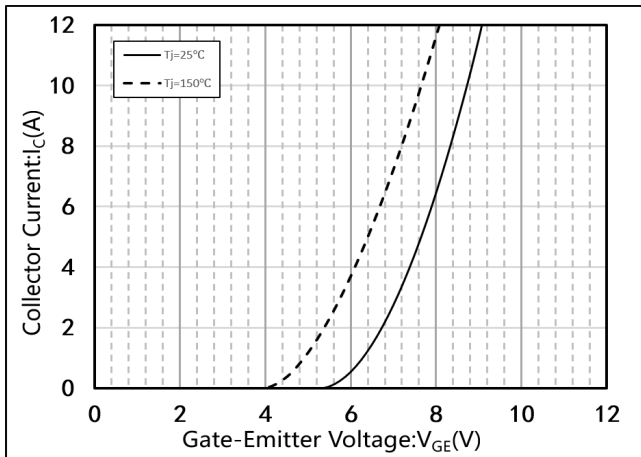


Fig 3. Typical transfer characteristic

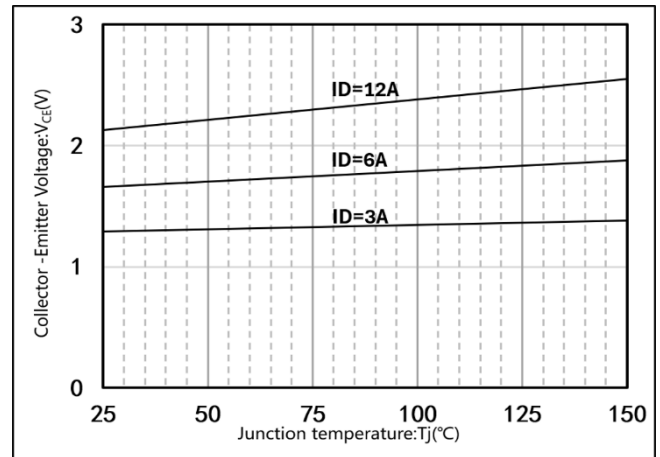


Fig 4. Typical collector-emitter saturation voltage as a function of junction temperature

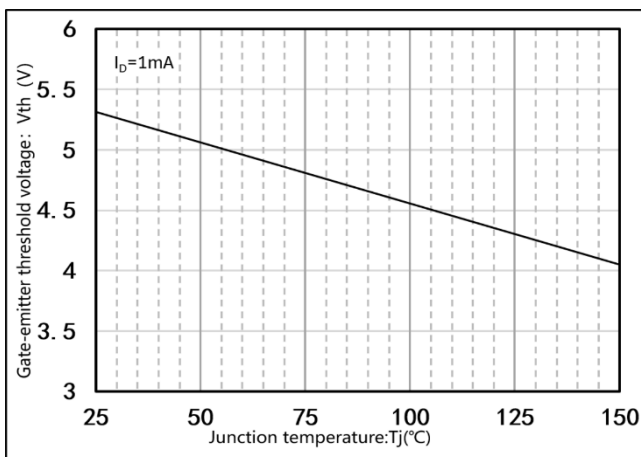


Fig 5. Gate-emitter threshold voltage as a function of junction temperature

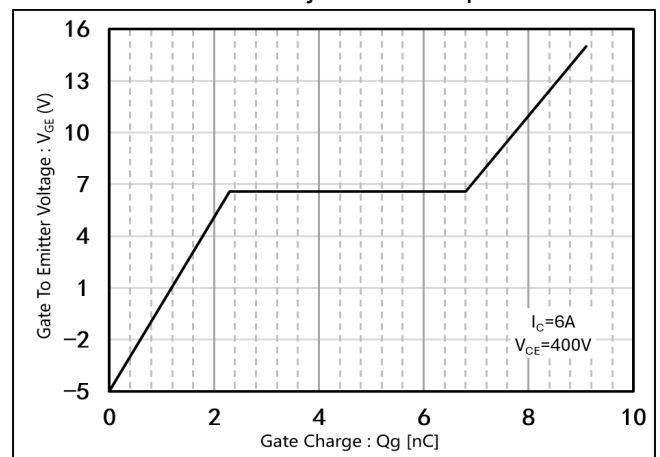


Fig 6. Typical gate charge

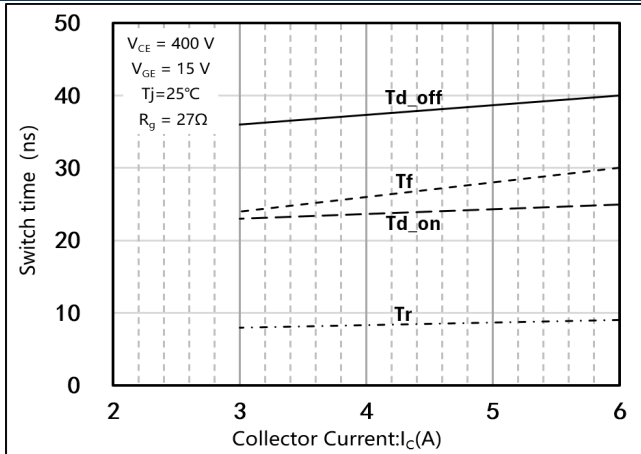


Fig 7. Typical switching times as a function of collector current

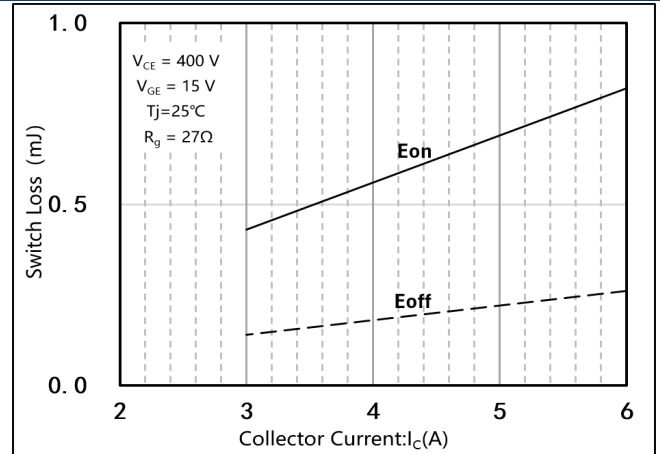


Fig 8. Typical switching energy losses as a function of collector current

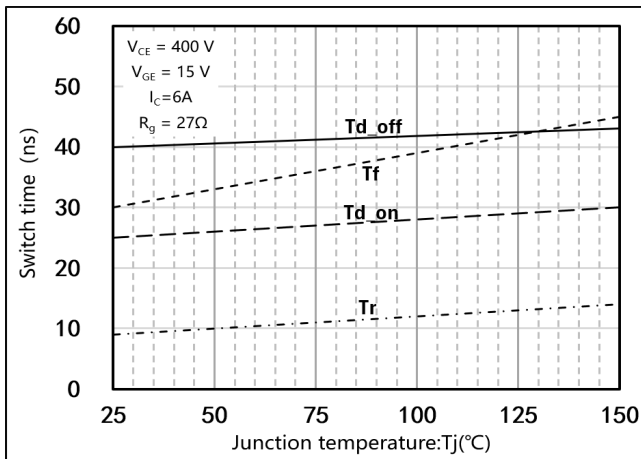


Fig 9. Typical switching times as a function of junction temperature

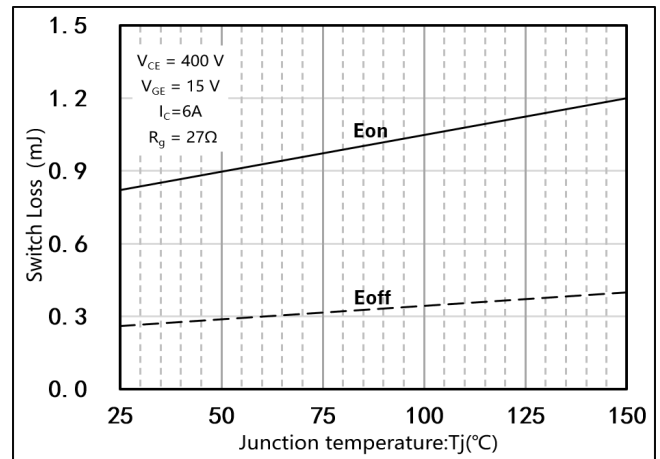


Fig 10. Typical switching energy losses as a function of junction temperature

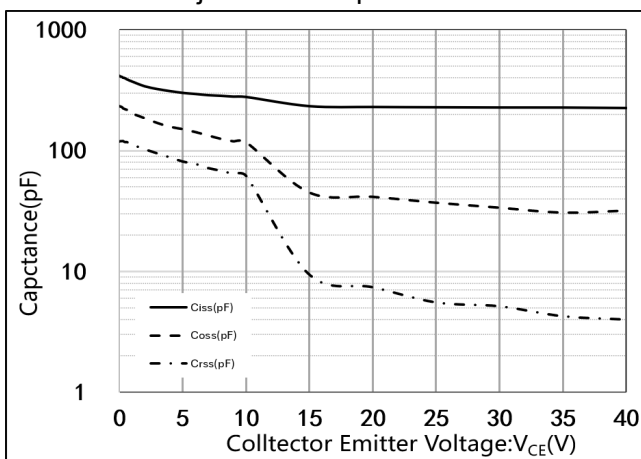


Fig 11. Typical capacitance as a function of collector-emitter voltage

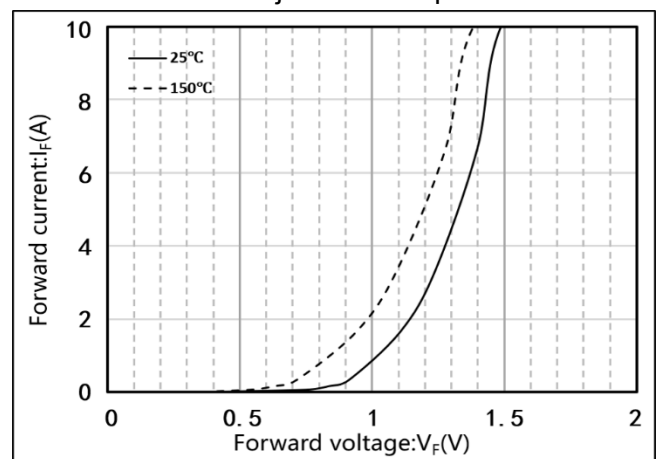


Fig 12. Typical diode forward current as a function of forward voltage

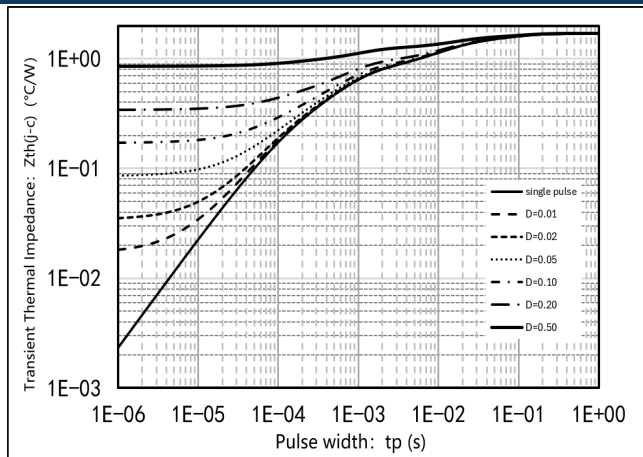


Fig 13. IGBT transient thermal impedance

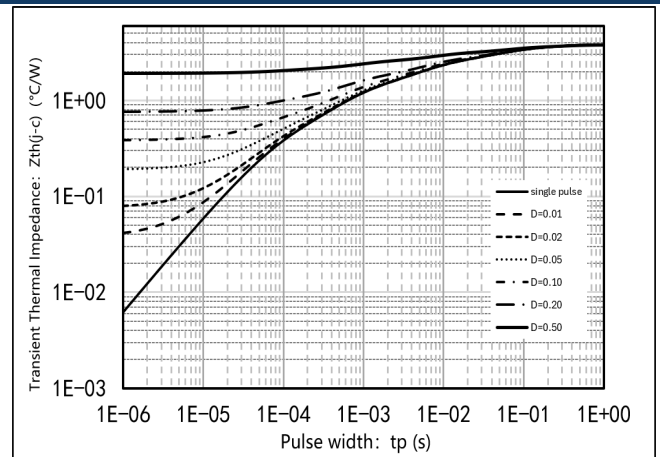
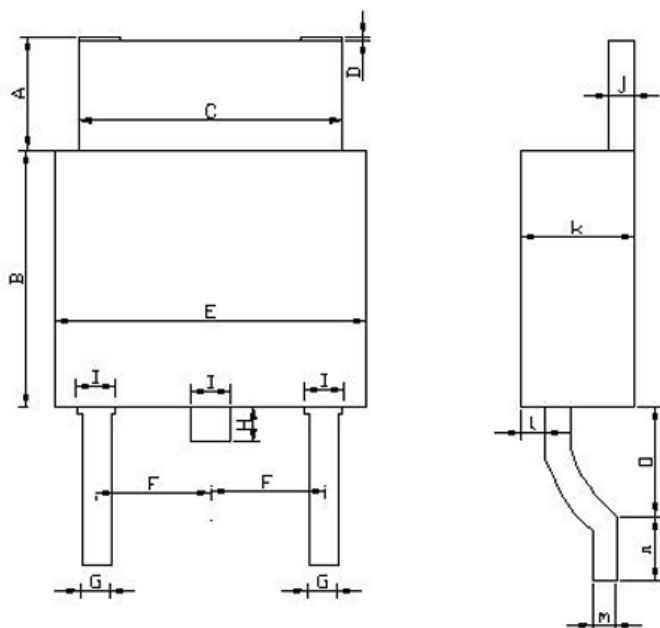


Fig 14. Diode transient thermal impedance

Package Information



Symbol	Dimensions (millimeters)	
	Min.	Max.
A	0.40	1.40
B	5.35	6.35
C	4.80	5.80
D	0.08	0.12
E	5.80	6.80
F	2.20	2.40
G	0.50	0.70
H	0.20	1.2
I	0.70	0.9
J	0.41	0.61
K	2.05	2.55
L	0.55	1.05
M	0.41	0.61
N	1.05	1.55
O	1.25	1.75

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