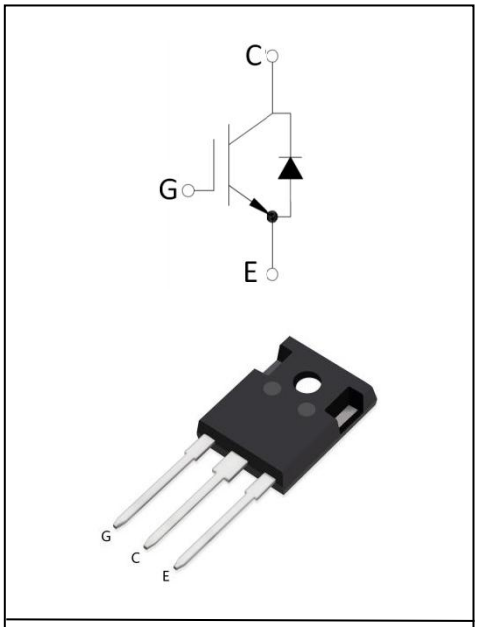
Silicon Field Stop(FS) Trench IGBT

Description

The THG40T65FQK is use advanced field stop(FS) trench technology. The 650V FS Trench IGBT offers superior conduction and switching performances.



THUNDER TO-247

General Features

- High Speed Switching & Low Power Loss
- Low saturation voltage: $V_{CE(sat)}$ = 1.8V @ I_C = 40A
- E_{off} = 0.3mJ @ T_C = 25°C
- Maximum junction temperature 175°C

Application

- Solar Converters
- Welding Converters
- UPS
- PFC
- PV Inverter

Absolute Maximum Ratings @ Tc=25°C (unless otherwise specified)

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current	80	A
	Collector Current @Tc=100°C	40	A
I_{CM}	Pulsed Collector Current	160	A
I_F	Diode Continuous Forward Current @Tc=100°C	40	A
I_{FM}	Diode Maximum Forward Current	160	A
P_D	Total Dissipation at @Tc = 25°C	280	W
	Total Dissipation at @Tc = 100°C	140	
T_j	Operating Junction and Storage Temperature Range	-55 to +175	°C
T_L	Max Temperature For Soldering	260	°C
T_{SC}	Short circuit withstand time VGE=15V, VCC≤400V, Allowed number of short circuits<1000Time between short circuits:≥1.0s,Tj≤150°C	5	us

Electrical Characteristics @ Tc=25°C (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Static Characteristics						
V_{CES}	Collector-Emitter Voltage	V_{GE}=0V, I_{CE}=250μA	650	—	—	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE}=15V, I_C=40A	—	2	2.30	V
$V_{GE(th)}$	Gated Threshold Voltage	V_{CE}= V_{GE}, I_C=1mA	3.5	4.5	6.5	V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V, V_{CE} =650V	—	—	10	uA
$I_{GES(F)}$	Gate to Emitter Forward Leakage	V_{GE} = +20V, V_{CE} = 0V	—	—	200	nA
$I_{GES(R)}$	Gate to Emitter Reverse Leakage	V_{GE} = -20V, V_{CE} = 0V	—	—	-200	nA
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{GE} =0V, V_{CE}=25V, f=1.0MHZ	—	1828	—	pF
C_{oes}	Output Capacitance		—	140	—	pF
C_{res}	Reverse Transfer Capacitance		—	48	—	pF
Q_g	Total Gate Charge	V_{CE}=480V,I_C=40A,V_{GE}=15V	—	186	—	nC
Q_{ge}	Gate to Emitter Charge		—	42	—	
Q_{gc}	Gate to Collector Charge		—	76	—	
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{CE}=400V,I_C=40A V_{GE}=15V,R_G=10Ω	—	79	—	nS
t_r	Rise Time		—	68	—	
$t_{d(off)}$	Turn-off Delay Time		—	114	—	
t_f	Fall Time		—	59	—	
E_{on}	Turn-on Energy		—	3.4	—	mJ
E_{off}	Turn-off Energy		—	0.2	—	
E_{tot}	Total Switching Energy		—	3.6	—	

Electrical Characteristics of the Diode @T_C= 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
I_F	Diode Continuous Forward Current	T_C = 100°C	40	—	—	A
I_{FM}	Diode Maximum Forward Current	T_C = 100°C	200	—	—	A
V_F	Diode Forward Voltage	I_F = 40A	—	1.85	2.25	V
t_{rr}	Reverse Recovery Time	T_J=25°C, I_F=40A di/dt=200A/us	—	41	—	nS
Q_{rr}	Reverse Recovery Charge		—	350	—	nC
*Pulse Test: Pulse Width <= 300μs, Duty Cycle< =2%						

Thermal Characteristic

Symbol	Paramter	Typ	Max	Unit
$R_{\theta JC}$	Themal Resistance,Junction to case for IGBT	--	0.52	°C/W
$R_{\theta JC}$	Themal Resistance,Junction to case for Diode	--	0.79	°C/W
$R_{\theta JA}$	Themal Resistance,Junction to Ambient	--	40	°C/W

Typical Performance Characteristics

Figure 1 Output Characteristics

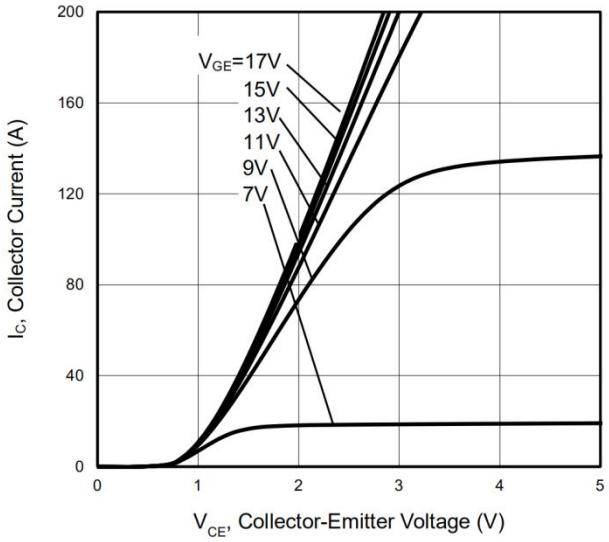


Figure 2 Transfer Characteristics

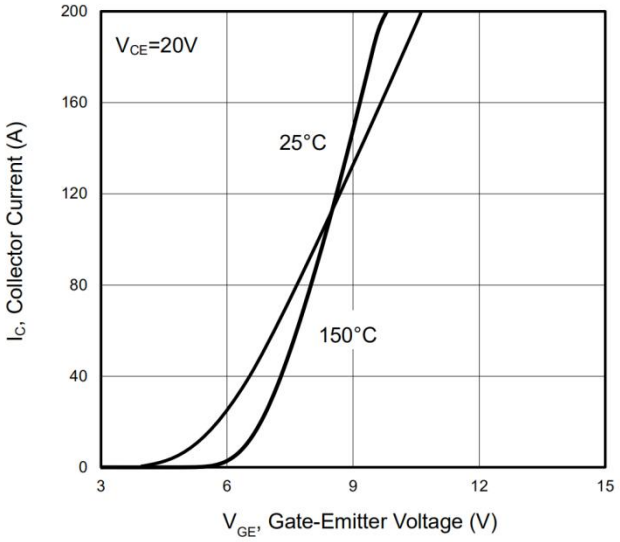


Figure 3 $V_{CE(sat)}$ vs. Temperature

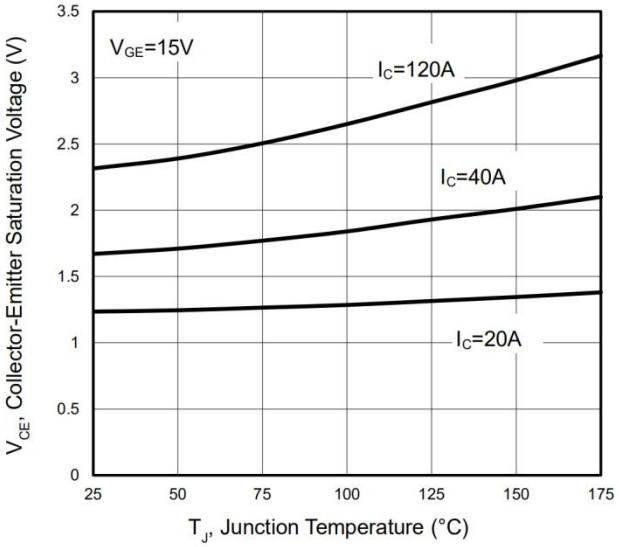


Figure 4 Saturation Voltage vs. V_{GE}

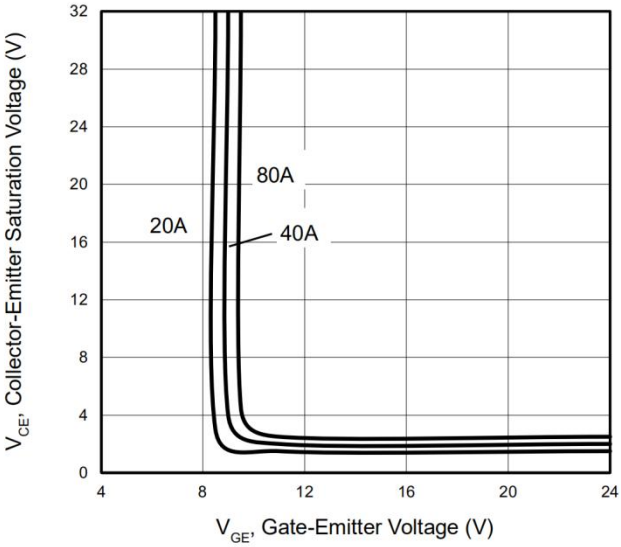


Figure 5 Capacitance Characteristics

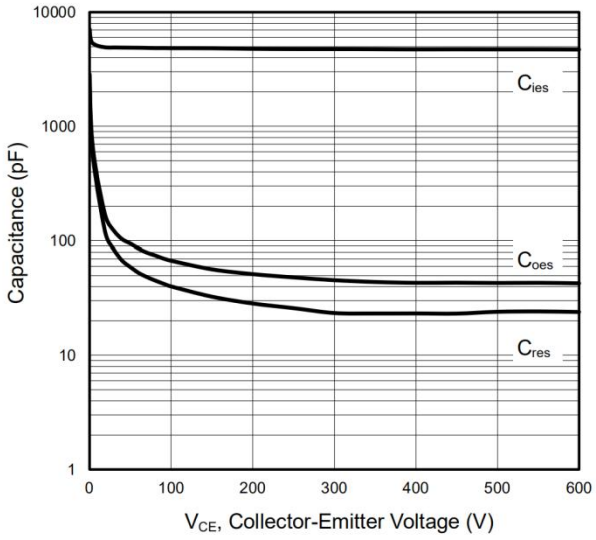


Figure 6 Gate Charge Wave Form

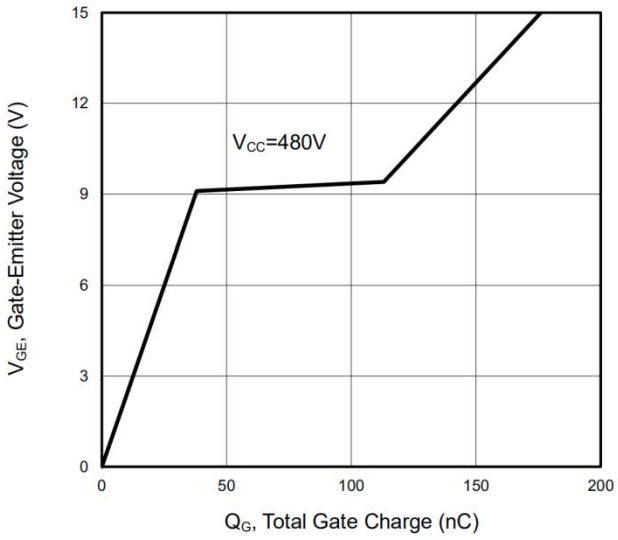


Figure 7 Forward Characteristics

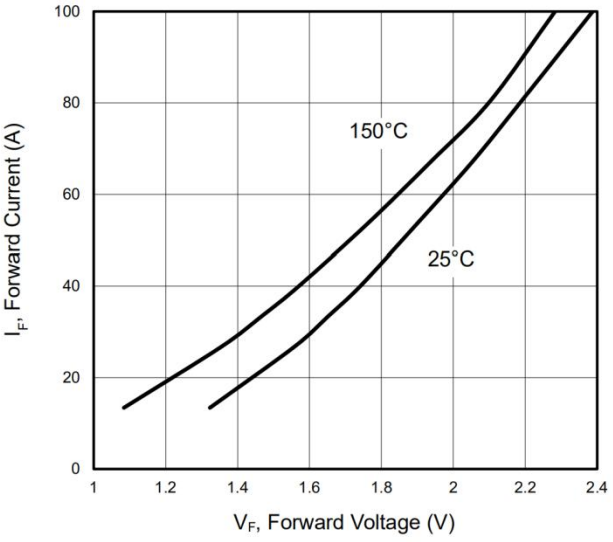


Figure 8 V_F vs. Temperature

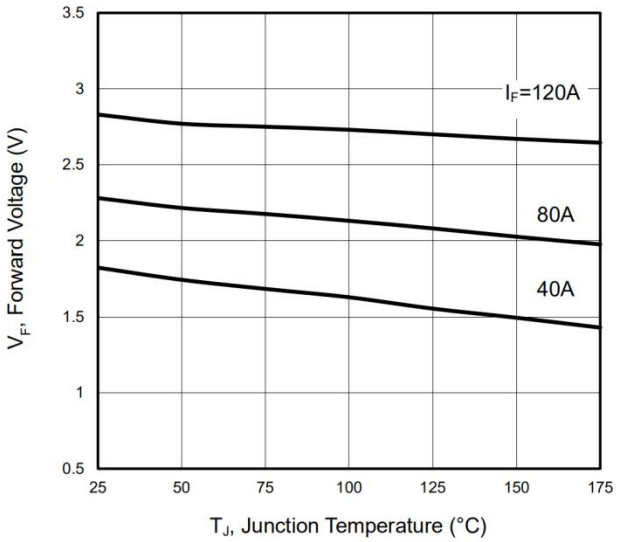


Figure 9 Switching Loss vs. R_G

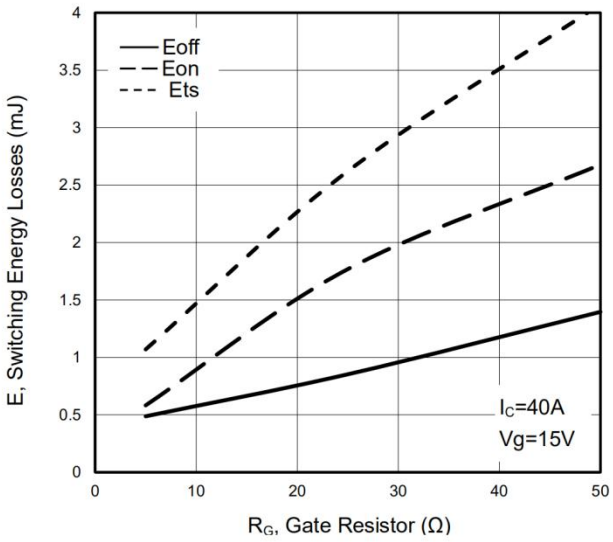


Figure 10 Switching Energy vs. Temperature

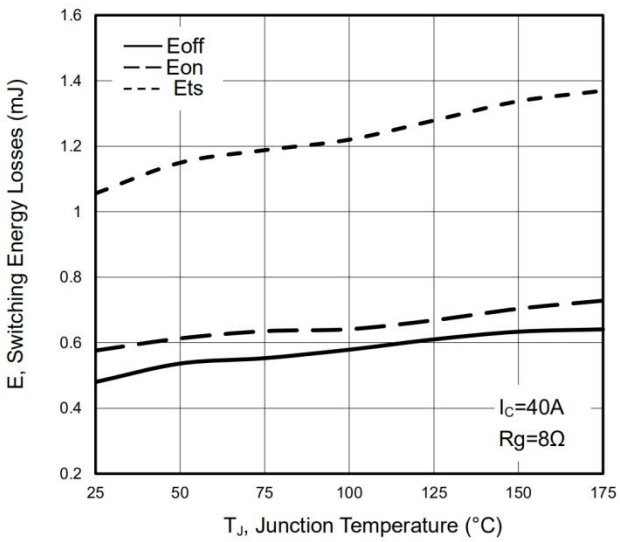


Figure 11 Switching Loss vs. Collector Current

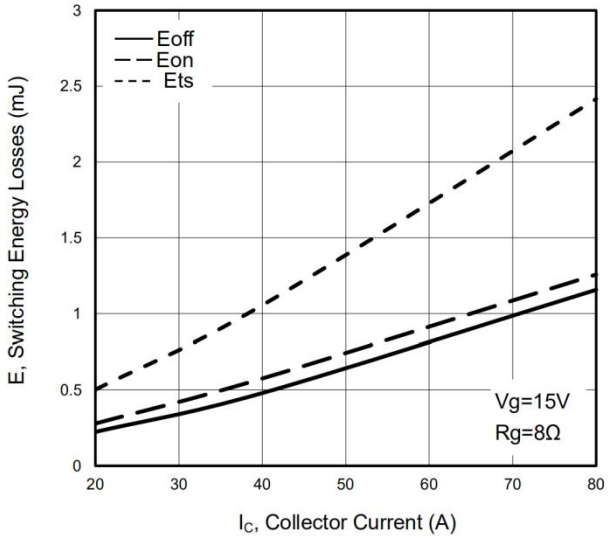


Figure 12 Switching Loss vs. Collector Current

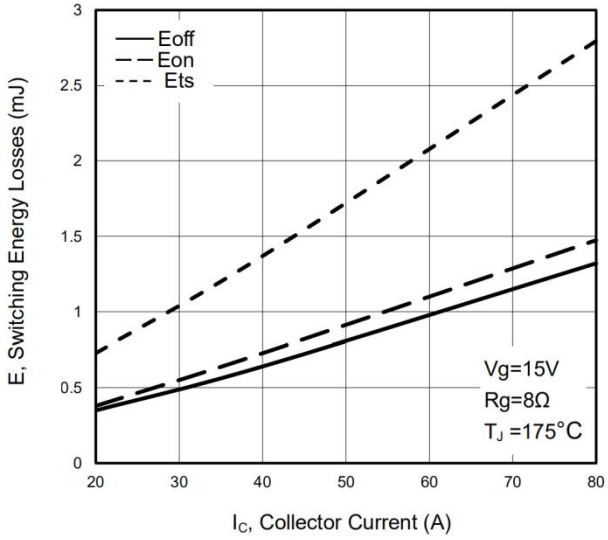


Figure 13 $V_{GE(th)}$ vs. Junction Temperature

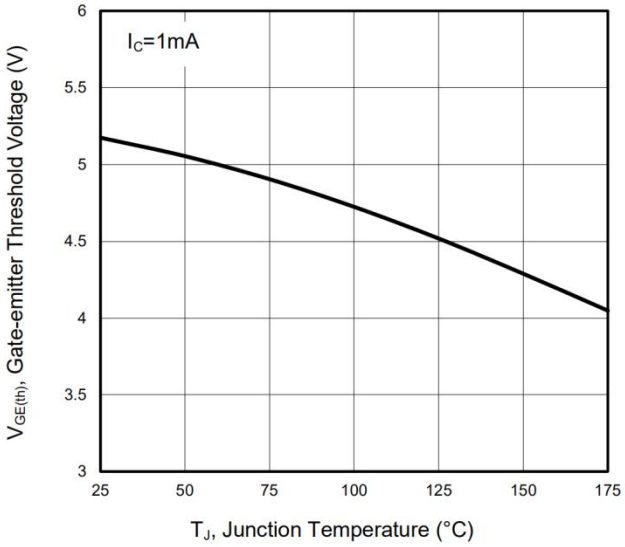


Figure 14 $V_{CE(SAT)}$ vs. Collector Current

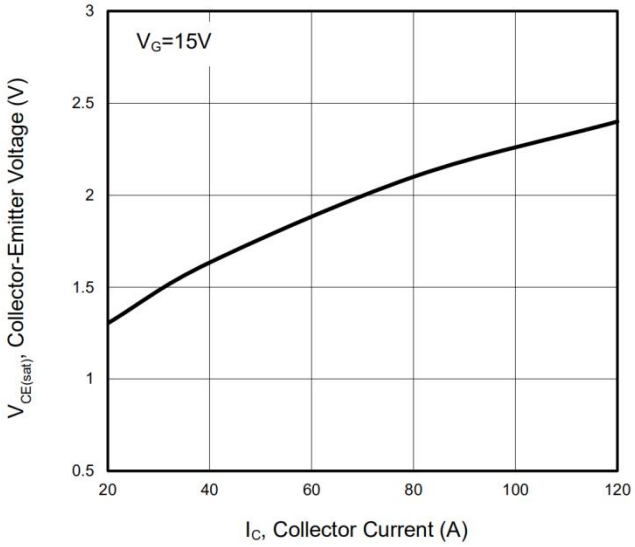


Figure 15 Forward Bias Safe Operating Area

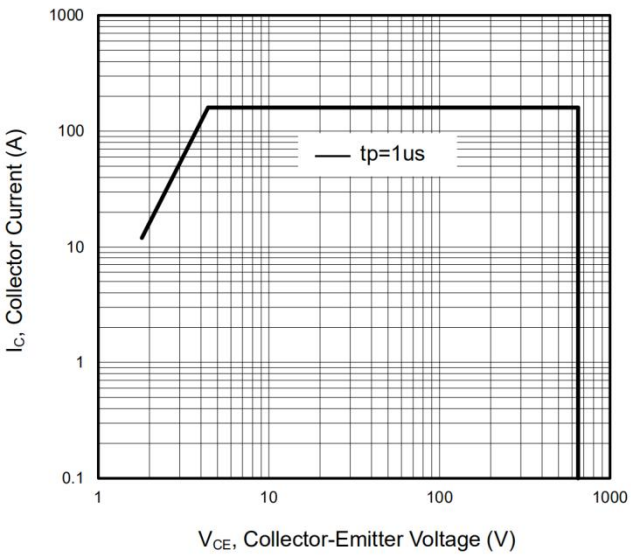


Figure 16 P_{tot} vs. Case Temperature

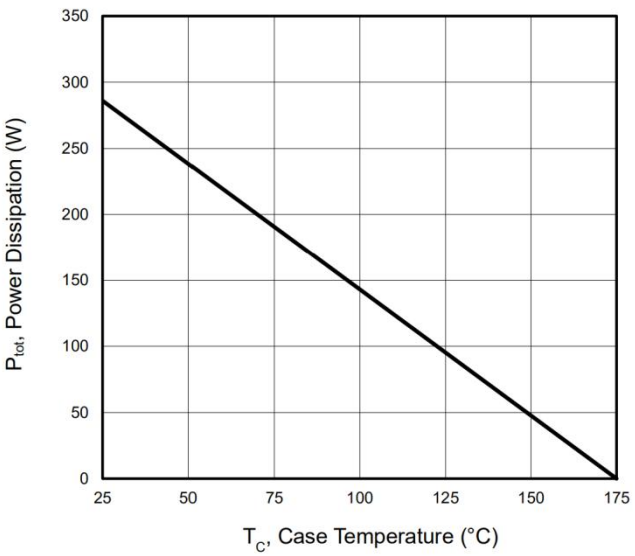


Figure 17 V_{CES} vs. Temperature

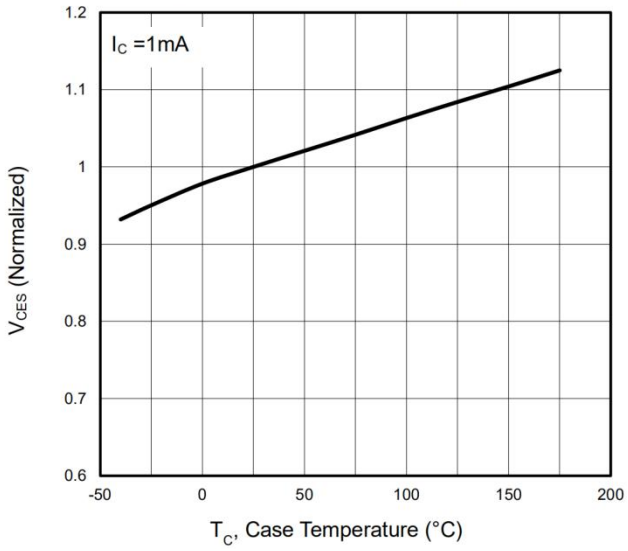


Figure 18 I_C vs. Temperature

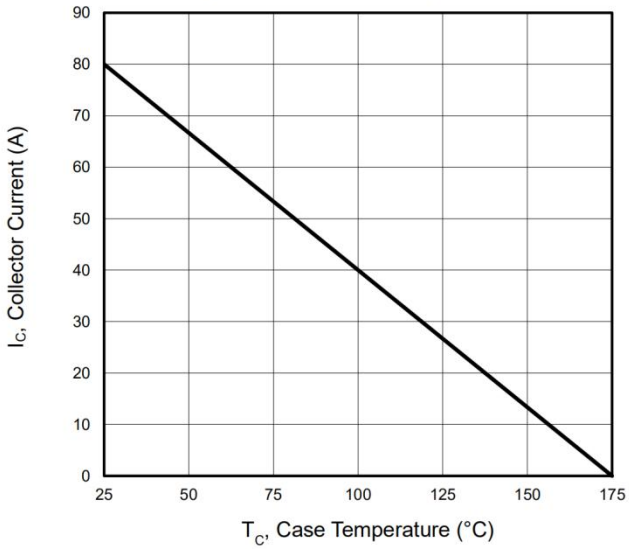


Figure 19 Switching Time vs. I_C

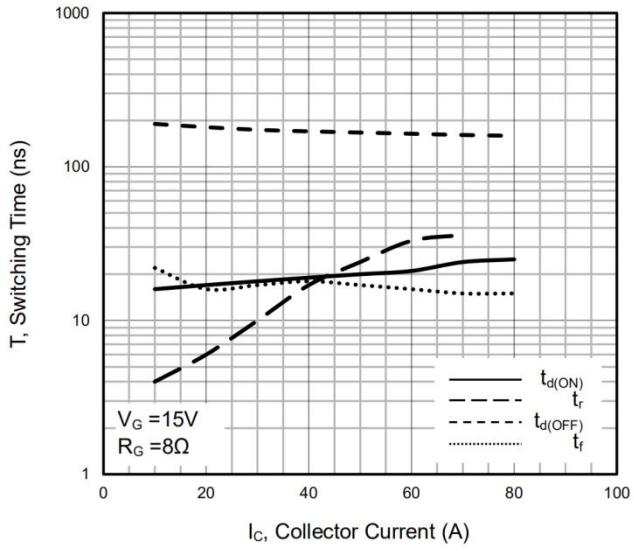


Figure 20 Switching Time vs. R_G

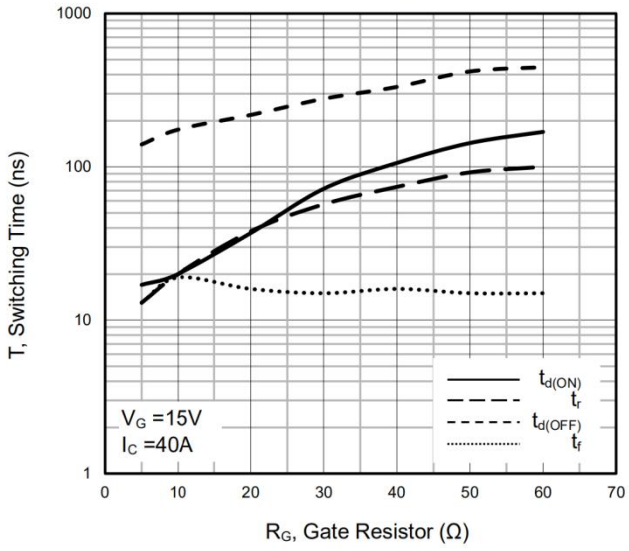


Figure 21 Switching Time vs. IC

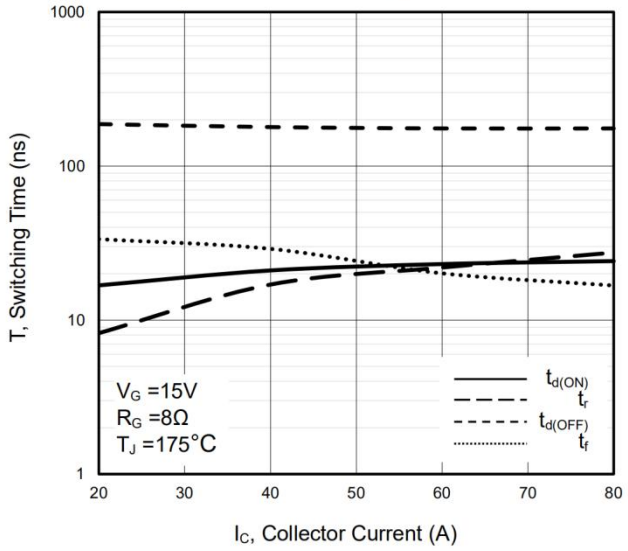
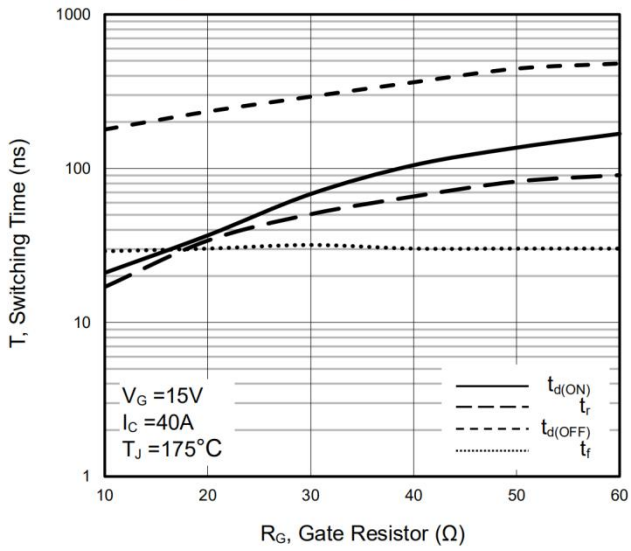
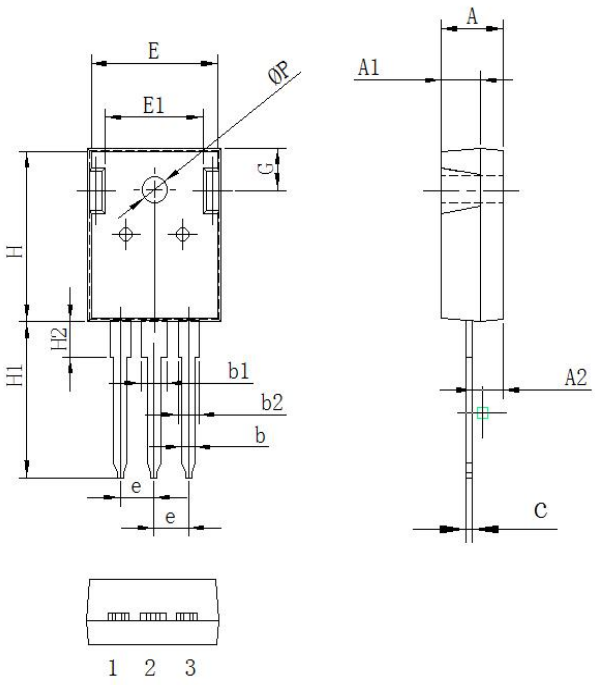


Figure 22 Switching Time vs. R_G



Package Information

TO-247 PACKAGE



基本尺寸

Symbol	单位 mm		
	Min	Nom	Max
A	4.8	5.00	5.20
A1	3.3	3.5	3.7
A2	2.20	2.40	2.60
b	1.00	1.2	1.40
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	15.7	16.2
E1	10.2	10.7	11.2
H	20.8	21	21.2
H1	19.5	20.0	20.5
H2	4.00	4.20	4.40
G	5.60	5.80	600
ΦP	3.50	3.70	3.90

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