

Silicon Field Stop(FS) Trench IGBT

Description

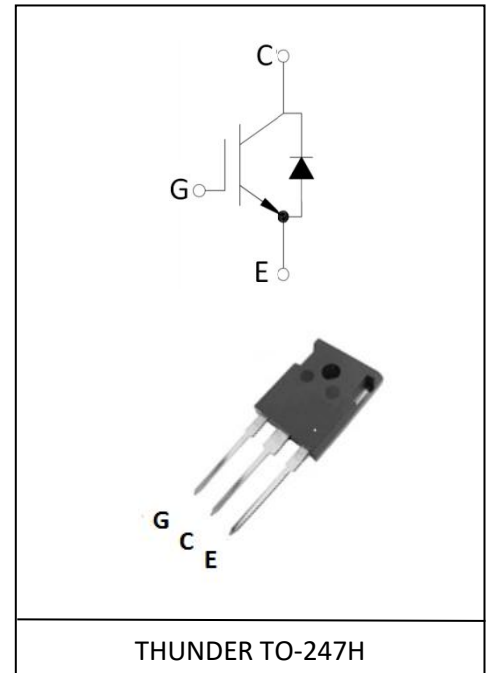
The THG40T65FBK is use advanced field stop(FS) trench technology. The 650V FS Trench IGBT offers superior conduction and switching performances.

General Features

- High Speed Switching & Low Power Loss
- Low saturation voltage: $V_{CE(sat)} = 1.95V @ I_c = 40A$
- $E_{off} = 0.3mJ @ T_c = 25^{\circ}C$
- Maximum junction temperature $175^{\circ}C$

Application

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



Absolute Maximum Ratings @ $T_c=25^{\circ}C$ (unless otherwise specified)

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_c	Collector Current	80	A
	Collector Current @ $T_c=100^{\circ}C$	40	A
I_{CM}	Pulsed Collector Current	160	A
I_F	Diode Continuous Forward Current @ $T_c=100^{\circ}C$	20	A
I_{FM}	Diode Maximum Forward Current	80	A
	Total Dissipation at @ $T_c = 25^{\circ}C$	280	W
	Total Dissipation at @ $T_c = 100^{\circ}C$	140	
T_j	Operating Junction and Storage Temperature Range	-55 to +175	$^{\circ}C$
T_L	Max Temperature For Soldering	260	$^{\circ}C$
T_{SC}	Short circuit withstand time $V_{GE}=15V, V_{CC} \leq 400V$, Allowed number of short circuits<1000Time between short circuits: $\geq 1.0s, T_j \leq 150^{\circ}C$	5	us

Electrical Characteristics @ T_c=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	T _J = 25°C	—	1.95	2.40	V
			T _J = 175°C	—	2.15	—	V
V _{GE(th)}	Gated Threshold Voltage	V _{CE} =V _{GE} , I _C =0.5mA	4.0	5.0	6.0	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	—	3600	—	pF	
C _{oes}	Output Capacitance		—	210	—	pF	
C _{res}	Reverse Transfer Capacitance		—	139	—	pF	
Q _g	Total Gate Charge	V _{CE} =480V, I _C =40A, V _{GE} =15V	—	186	—	nC	
Q _{ge}			—	42	—		
Q _{gc}			—	76	—		
Switching Characteristics							
t _{d(on)}	Turn-on Delay Time	V _{CE} =400V, I _C =40A V _{GE} =15V, R _G =10 Ω	—	30	—	nS	
t _r	Rise Time		—	24	—		
t _{d(off)}	Turn-off Delay Time		—	170	—		
t _f	Fall Time		—	22	—		

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	20	—	—	A
I _{FM}	Diode Maximum Forward Current	T _C = 100°C	100	—	—	A
V _F	Diode Forward Voltage	I _F = 20A	—	1.75	2.15	V
t _{rr}	Reverse Recovery Time	T _J =25°C, I _F =20A	—	240	—	nS
Q _{rr}	Reverse Recovery Charge	di/dt=200A/us	—	4.9	—	nC
*Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%						

Thermal Characteristic

Symbol	Paramter	Typ	MAX	Units
$R_{\theta JC}$	Themal Resistance,Junction to case for IGBT	--	0.52	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$	Themal Resistance,Junction to case for Diode	--	0.79	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Themal Resistance,Junction to Ambient	--	40	$^{\circ}\text{C}/\text{W}$

Typical Performance Characteristics

Figure 1 Output Characteristics

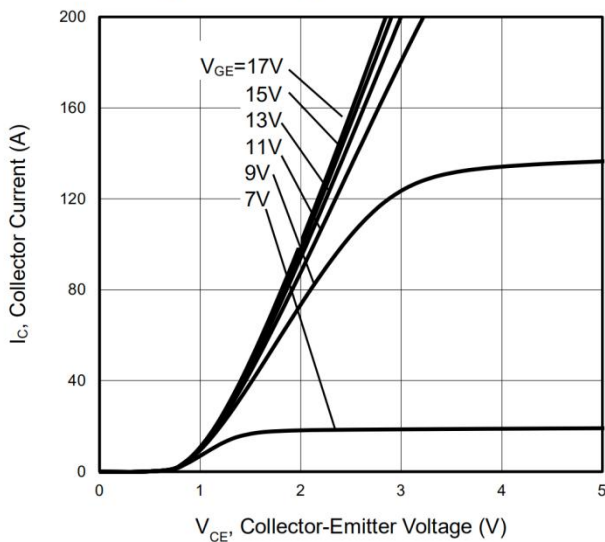


Figure 2 Transfer Characteristics

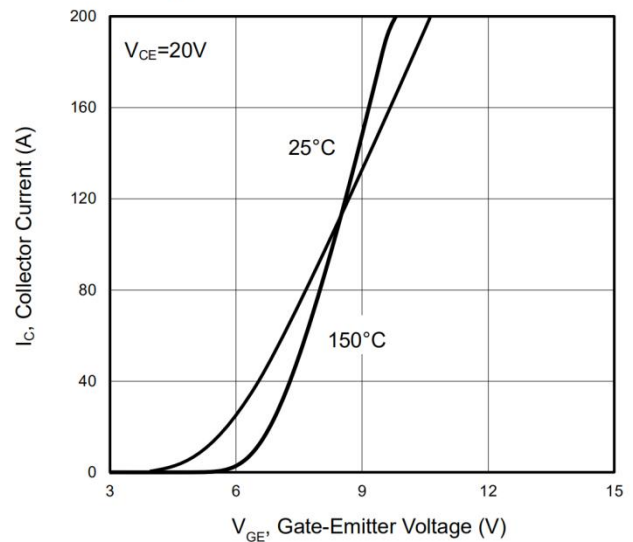


Figure 3 $V_{CE(sat)}$ vs. Temperature

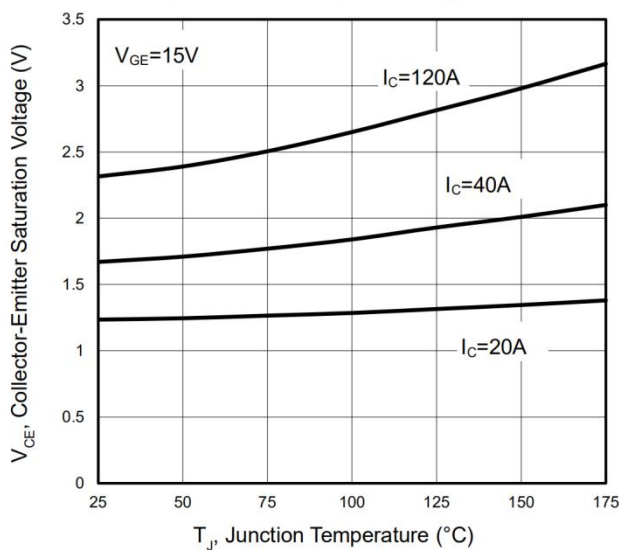


Figure 4 Saturation Voltage vs. V_{GE}

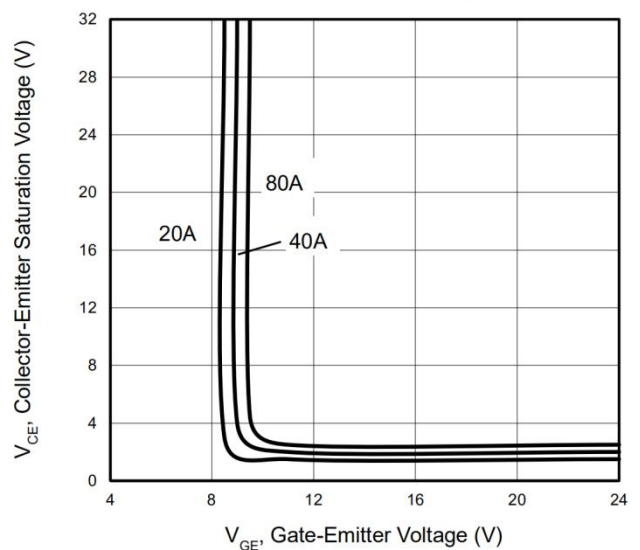


Figure 5 Capacitance Characteristics

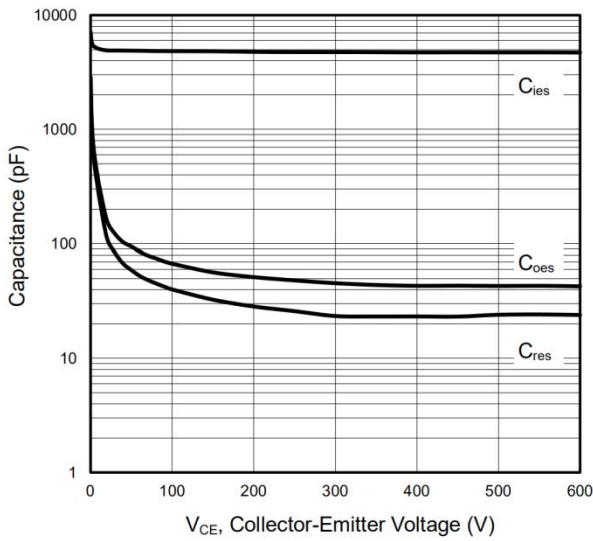


Figure 6 Gate Charge Wave Form

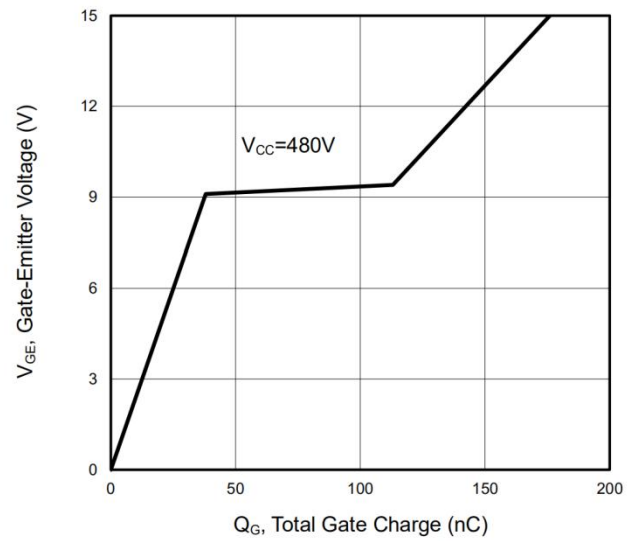


Figure 7 Forward Characteristics

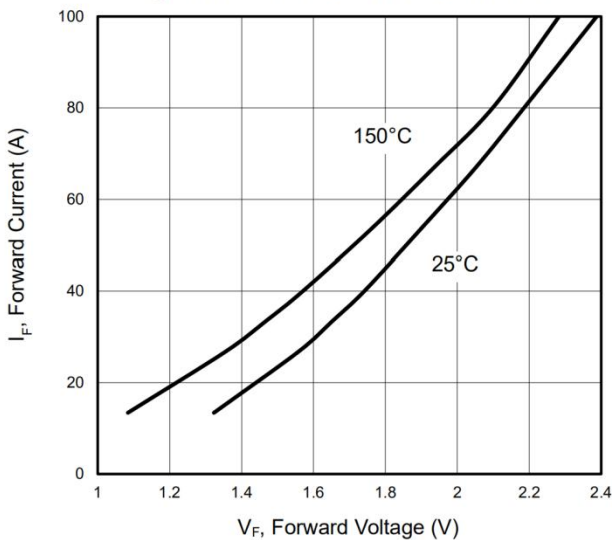


Figure 8 V_F vs. Temperature

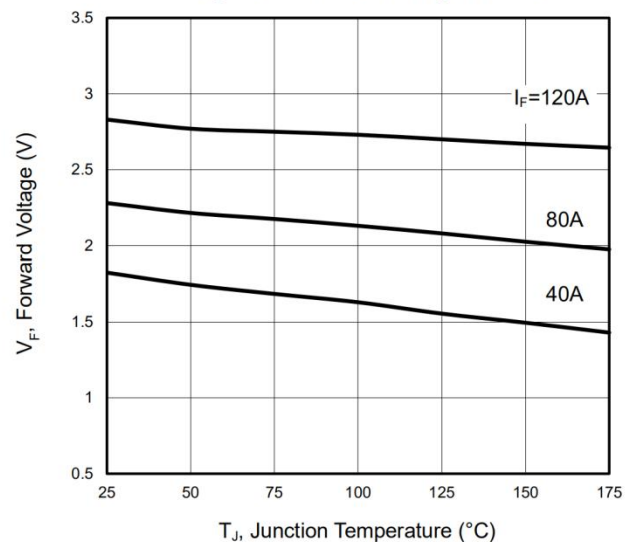


Figure 9 Switching Loss vs. R_G

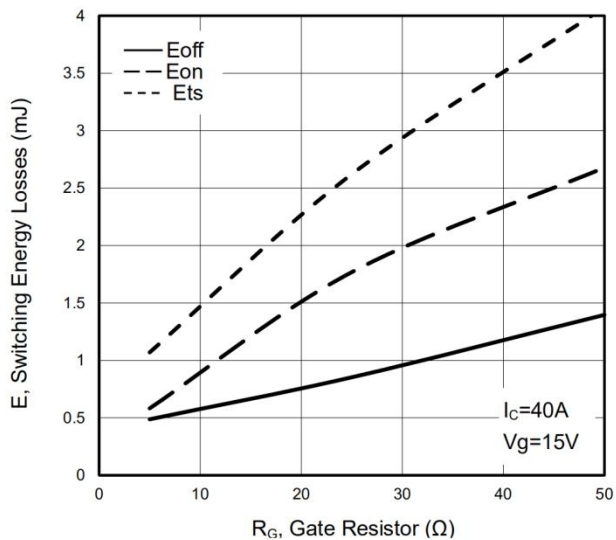


Figure 10 Switching Energy vs. Temperature

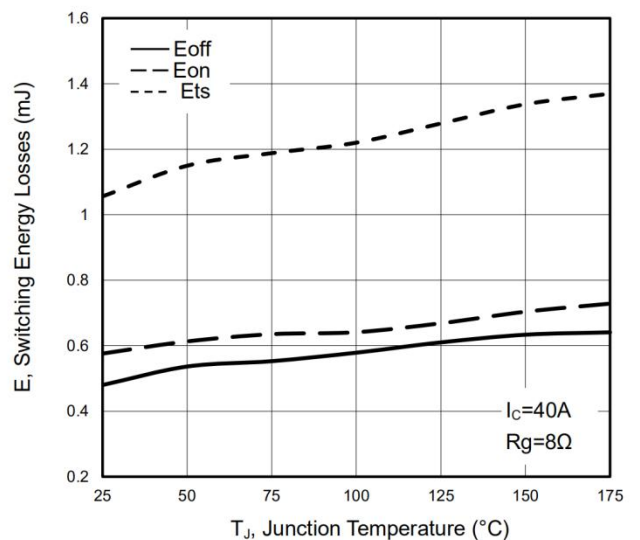


Figure 11 Switching Loss vs. Collector Current

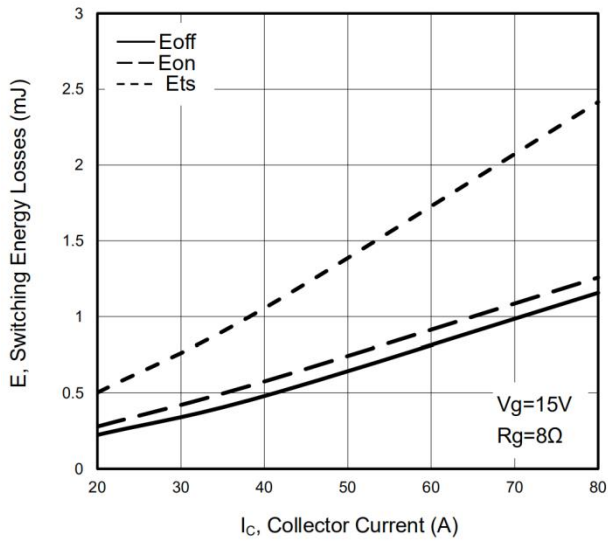


Figure 12 Switching Loss vs. Collector Current

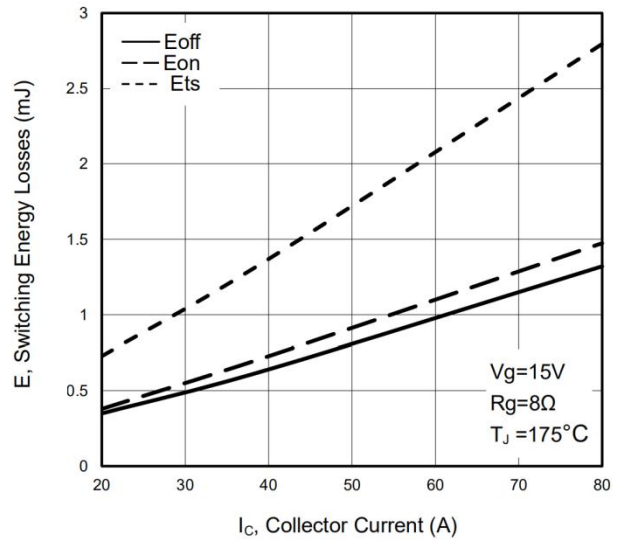


Figure 13 $V_{GE(th)}$ vs. Junction Temperature

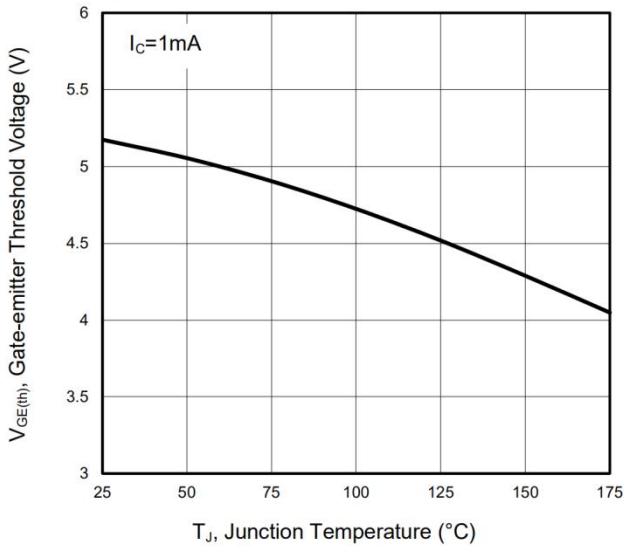


Figure 14 $V_{CE(sat)}$ vs. Collector Current

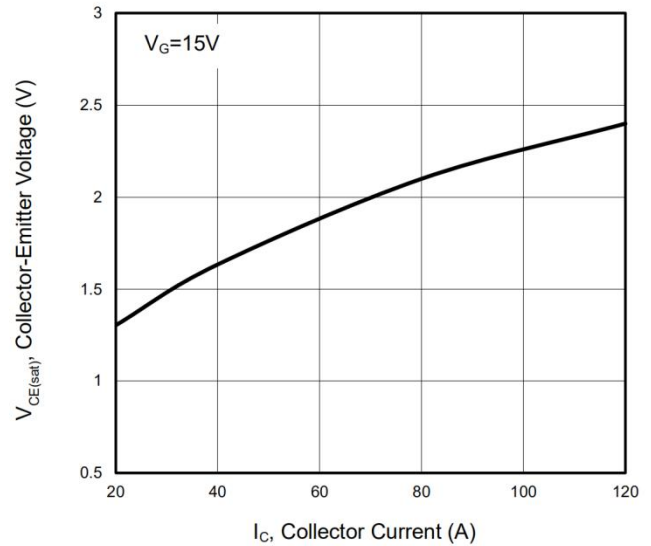


Figure 15 Forward Bias Safe Operating Area

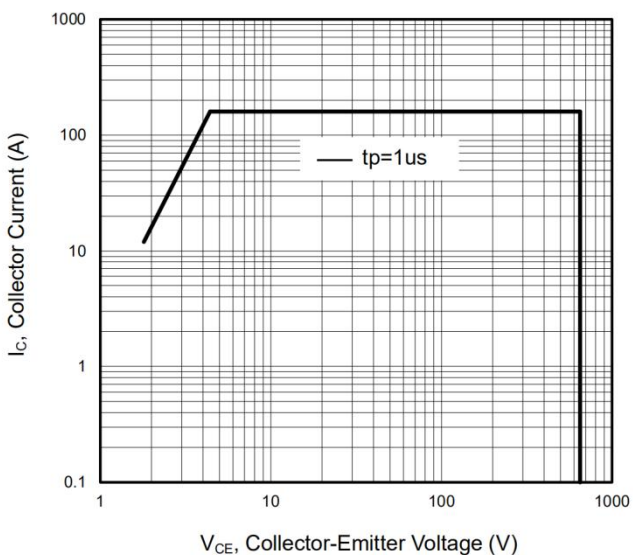


Figure 16 P_{tot} vs. Case Temperature

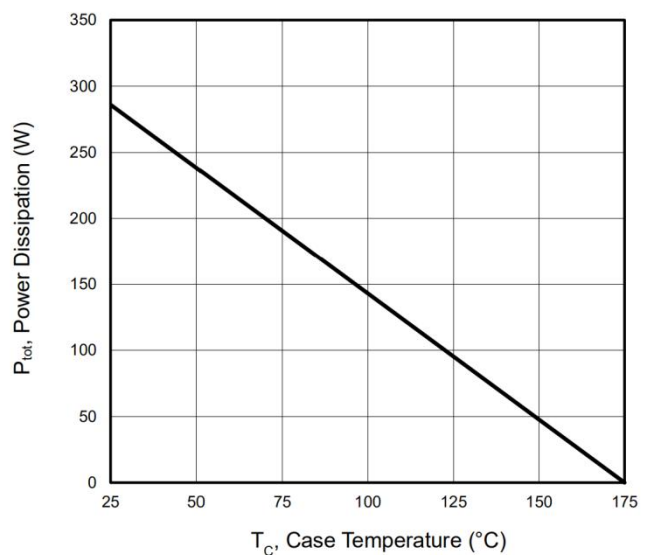


Figure 17 V_{CES} vs. Temperature

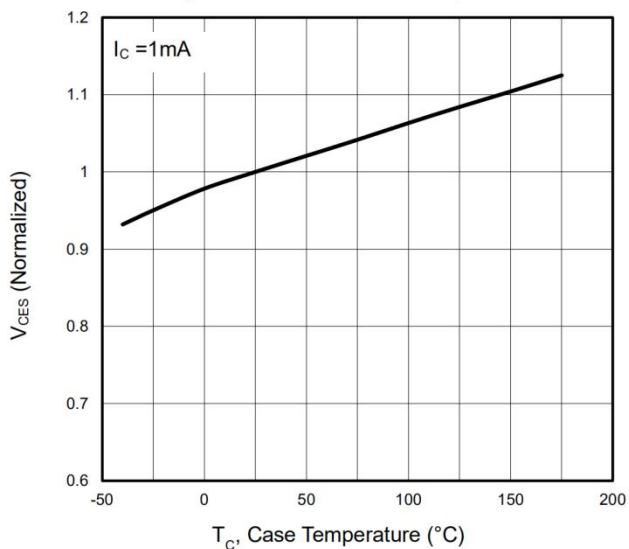


Figure 18 I_C vs. Temperature

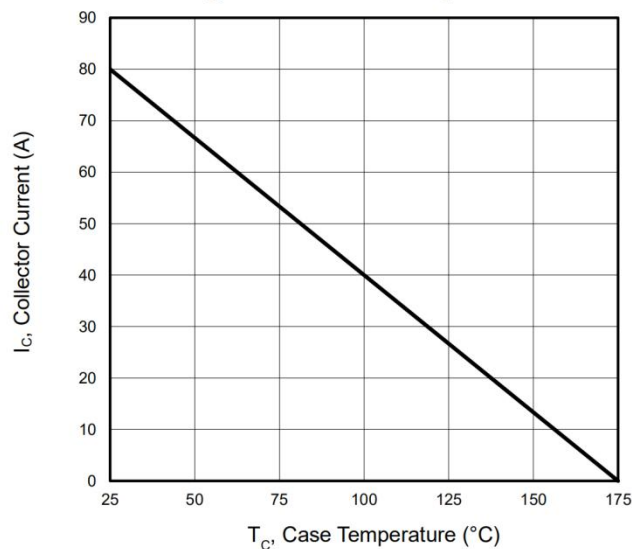


Figure 19 Switching Time vs. I_C

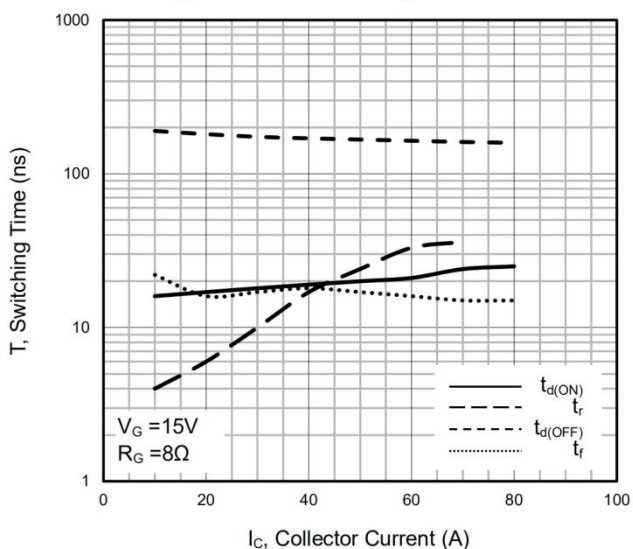


Figure 20 Switching Time vs. R_G

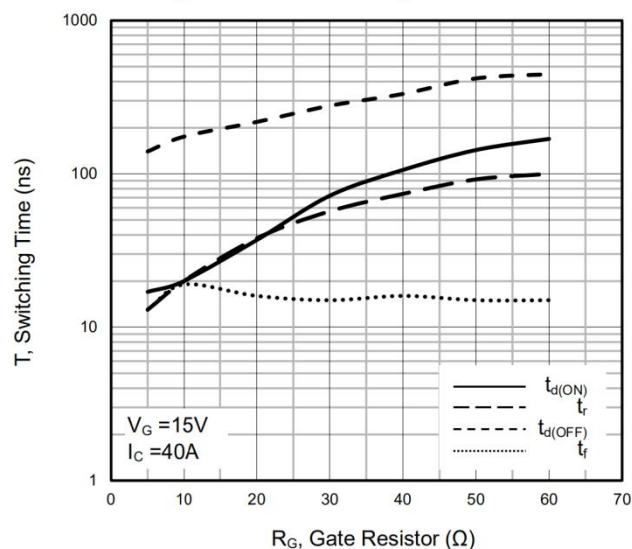


Figure 21 Switching Time vs. I_C

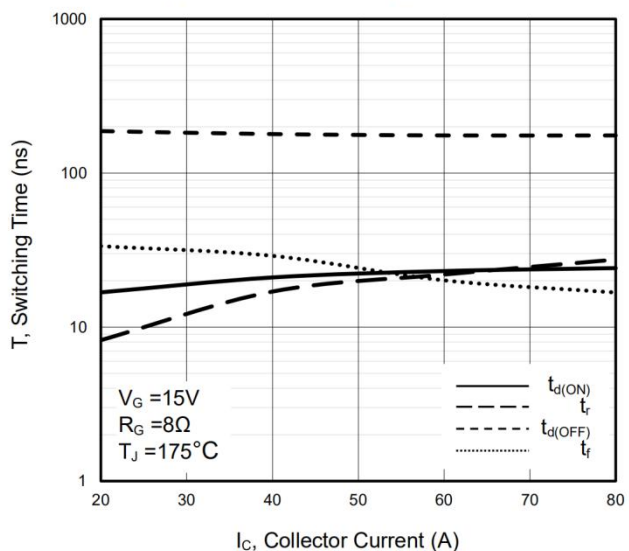
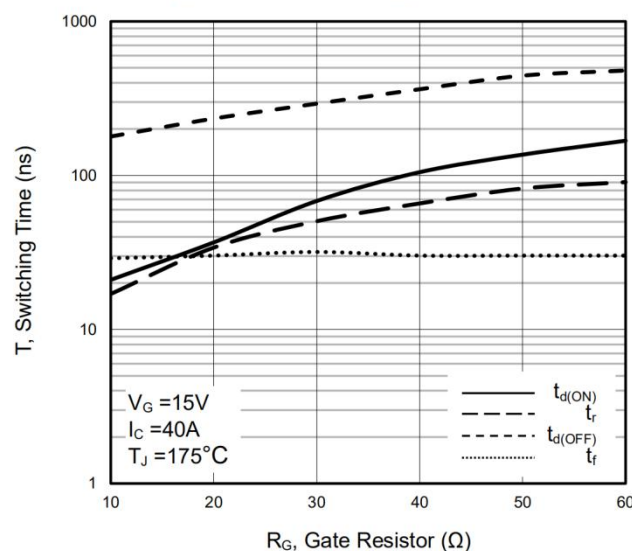
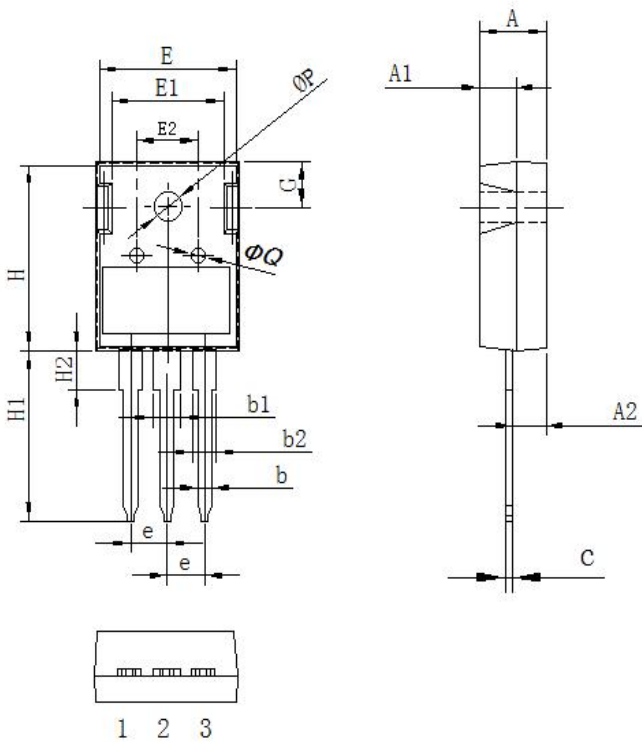


Figure 22 Switching Time vs. R_G



Package Information

TO-247H PACKAGE



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
ΦP	3.30	3.50	3.50
ΦQ	2.30	2.50	2.70

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