

Trenchstop Insulated Gate Bipolar Transistor

Description:

Using Trench design and advance FS technology, the 650V FS IGBT offers superior and switching performances, high avalanche ruggedness easy parallel operation



Features:

- FS Trench Technology, Positive temperature coefficient
- Low saturation voltage: $V_{CE(sat)}(typ.) = 1.8V @ I_C = 40A, T_j = 25^{\circ}C$
- Extremely enhanced avalanche capability
- Maximum Junction Temperature $175^{\circ}C$

Mechanical Data

- Case: TO-247 Package

Application

- Uninterrupted Power Supply
- Welding Converters
- Solar Converters
- PFC

E_{on} : 0.5mJ; E_{off} : 0.4mJ; E_{ts} : 0.9mJ

Product Summary		
$V_{CES}(V)$	$V_{CESAT}(V) Typ$	$I_C(A)$
650	1.8 @ 15V, 40A	40



Block Diagram

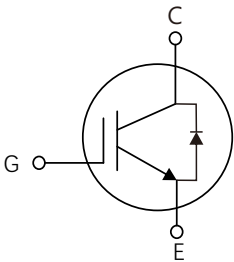


Table1 Absolute Maximum Ratings ($T_c = 25^{\circ}C$, unless otherwise specified)

Parameters	Symbol	Value	Unit
Collector-Emmitter Voltage	V_{CES}	650	V
Gate-Emmitter Voltage	V_{GES}	± 20	V
Collector Current-continuous	I_C	80	A
		40	
Collector Current – pulse (Note 1)	I_{CM}	160	A
Power Dissipation	P_D	280	W
		140	
Operating Junction Temperature	T_J	$-55 \sim +175$	$^{\circ}C$
Storage Temperature Range	T_{STG}	$-55 \sim +150$	

Table 2. Thermal Characteristics

Parameters	Symbol	Value	Unit
IGBT Thermal resistance Junction to Ambient	$R_{\theta JA}$	40	$^{\circ}\text{C}/\text{W}$
IGBT Thermal resistance Junction to Case	$R_{\theta JC}$	0.52	$^{\circ}\text{C}/\text{W}$
Diode Thermal resistance Junction to Case	$R_{\theta JC}$	0.79	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

Parameters		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Collector-Emmitter Voltage		BV _{CES}	V _{GE} =0V,I _C =250μA	650			V
Zero Gate Voltage Collector Current		I _{CES}	V _{CE} =650V,V _{GE} =0V			10	μA
Gate-body Leakage Current	Forward	I _{GES}	V _{GS} =20V,V _{DS} =0V			200	nA
	Reverse		V _{GS} = -20V,V _{DS} =0V			-200	nA
On Characteristics							
Gate Threshold Voltage		V _{GE(TH)}	V _{CE} =V _{GE} ,I _C =0.5mA	3.5	5.0	6.5	V
Collector-Emmitter saturation Voltage		V _{CESAT}	V _{GE} =15V,I _C =40A	T _J =25°C		1.8	2.3
				T _J =175°C		2.3	
Dynamic Characteristics							
Input Capacitance		C _{IES}	V _{CE} =25V,V _{GE} =0V,f=1MHz		1565		pF
Output Capacitance		C _{OES}			37		pF
Reverse Transfer Capacitance		C _{RES}			120		pF
Switching Characteristics							
Turn-On Delay Time		td(on)	V _{CE} =400V,I _C =40A, V _{GE} =15V,R _G =10Ω,		30		ns
Turn-On Rise Time		tr			24		ns
Turn-Off Delay Time		td(off)			170		ns
Turn-Off Fall Time		tf			22		ns
Total Gate Charge		Q _G	V _{CE} =480V,I _C =40A, V _{GE} =15V		186		nC
Gate to emitter charge		Q _{GE}			42		nC
Gate to collector charge		Q _{GC}			76		nC
Diode Characteristics							
Diode Continuous Forward Current		I _F	T _C =100°C	40			
Diode Continuous Forward Current		I _{FM}	T _C =100°C	200			
Diode Forward Voltage		V _F	I _F =40A		1.85	2.25	V
Reverse Recovery Time		T _{rr}	I _F =40A,T _J =25°C di/dt=200A/μS		80		ns
Reverse Recovery Charge		Q _{rr}			4.9		nC

Notes: 1 Repetitive Rating: Pulse width limited by maximum junction temperature

Typical Characteristics Diagrams

Figure 1 Output Characteristics

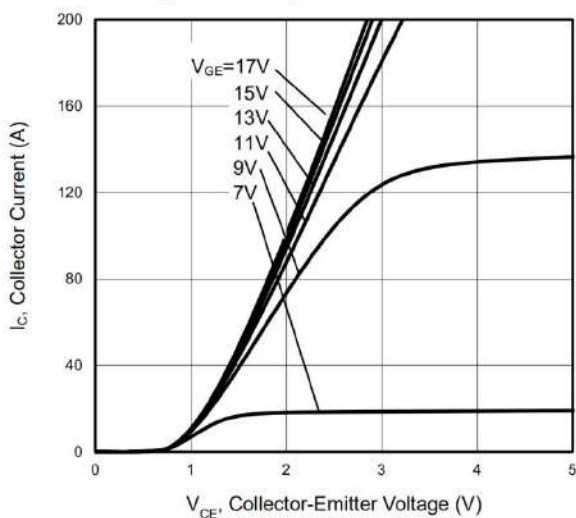


Figure 2 Transfer Characteristics

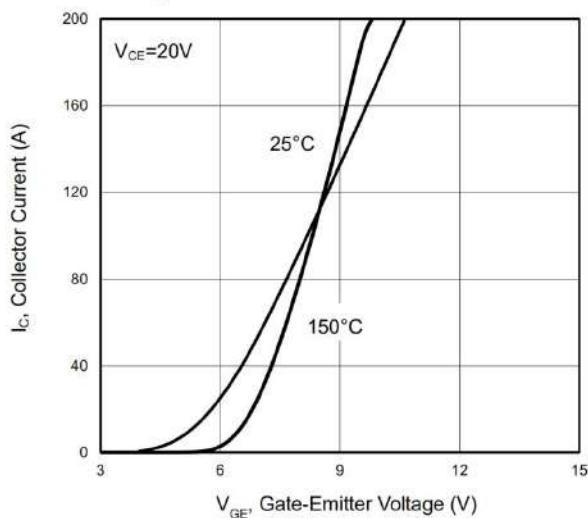


Figure 3 $V_{CE(sat)}$ vs. Temperature

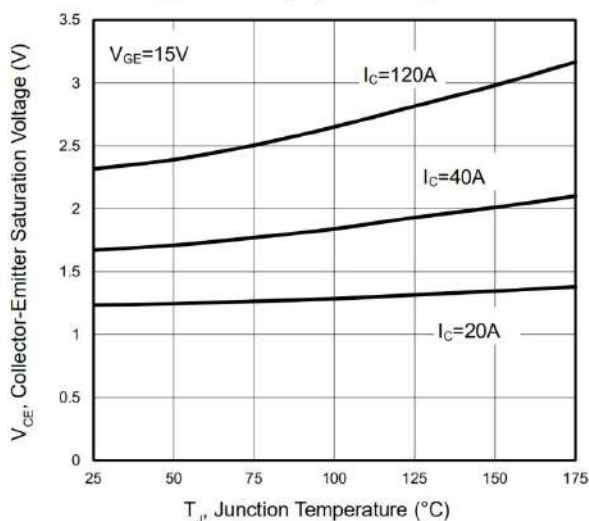


Figure 4 Saturation Voltage vs. V_{GE}

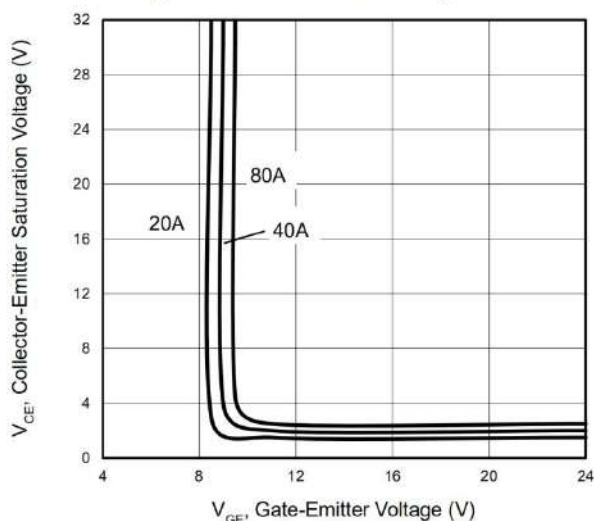


Figure 5 Capacitance Characteristics

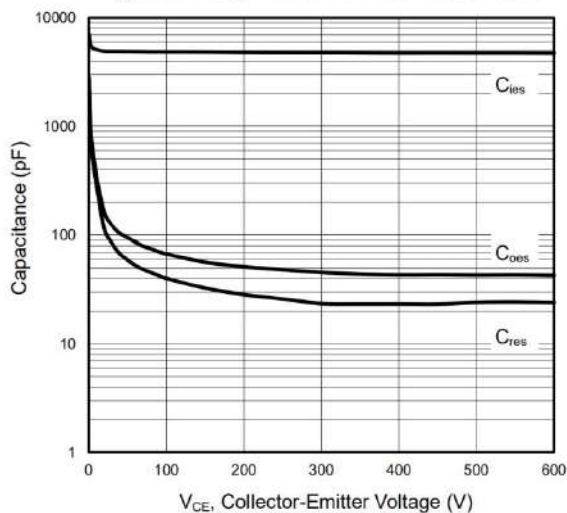


Figure 6 Gate Charge Wave Form

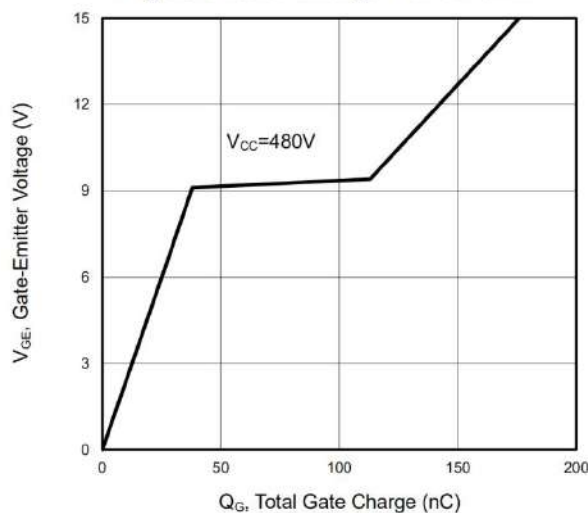


Figure 7 Forward Characteristics

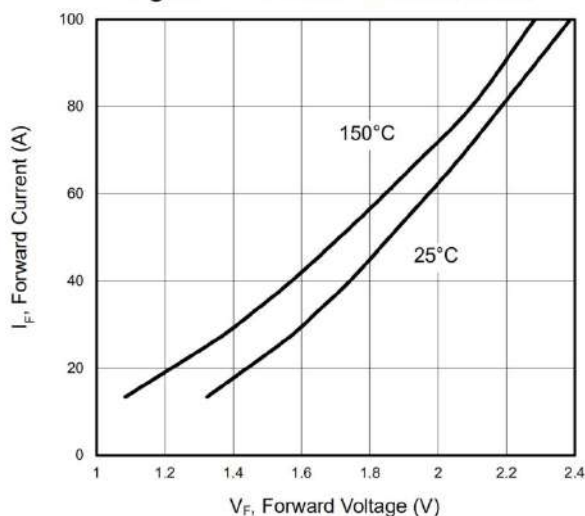


Figure 8 V_F vs. Temperature

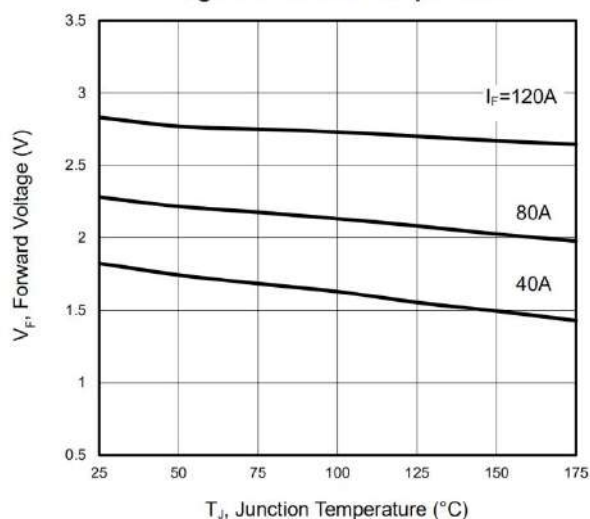


Figure 9 Switching Loss vs. R_G

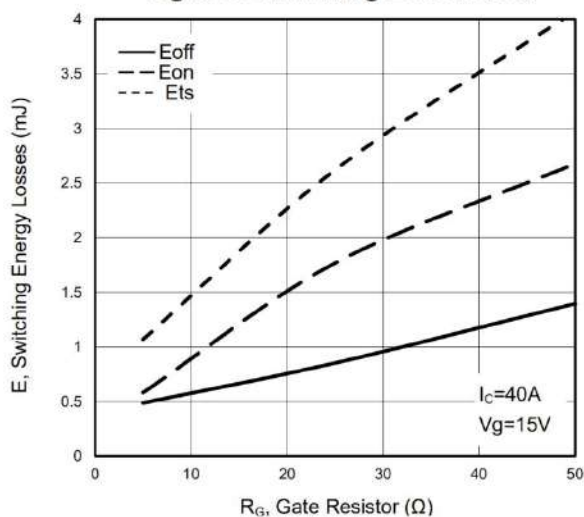


Figure 10 Switching Energy vs. Temperature

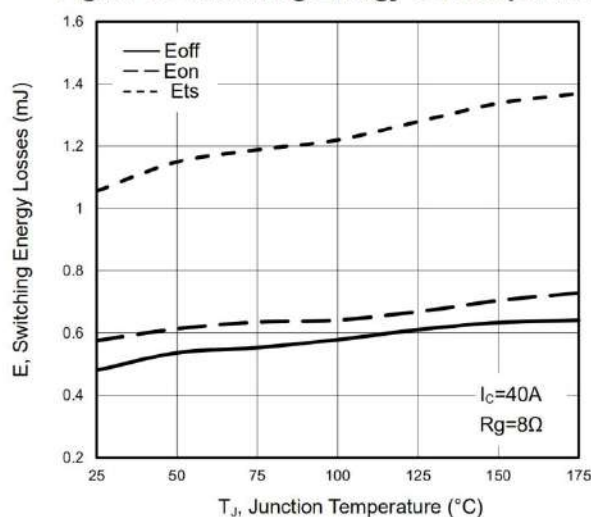


Figure 11 Switching Loss vs. Collector Current

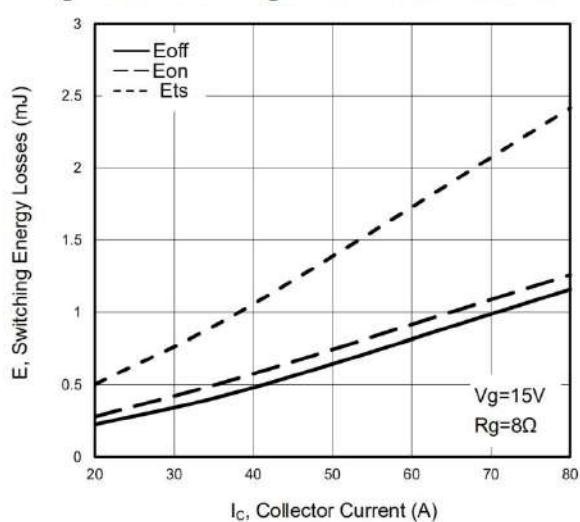


Figure 12 Switching Loss vs. Collector Current

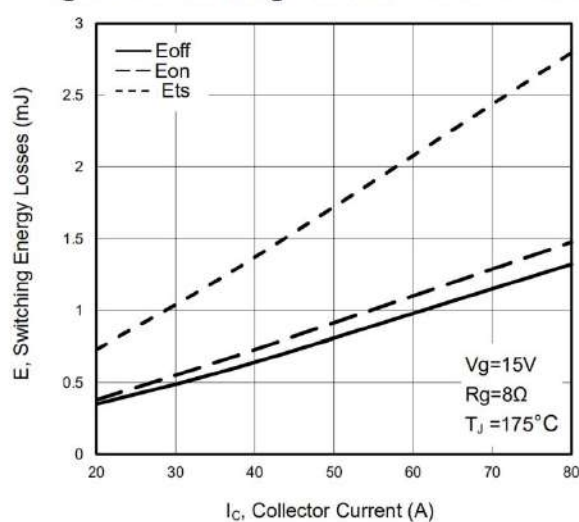


Figure 13 $V_{GE(th)}$ vs. Junction Temperature

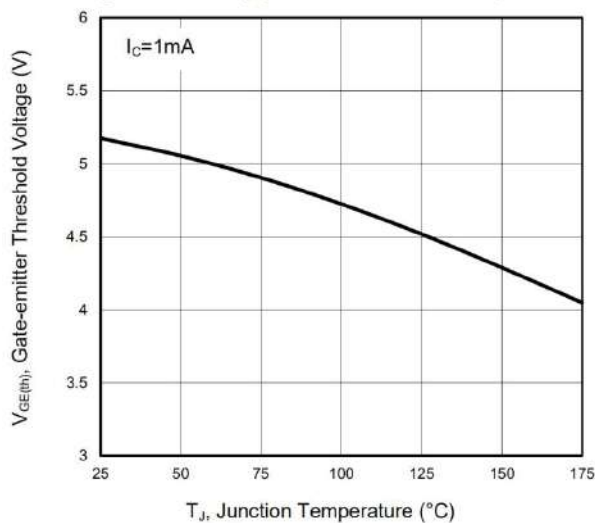


Figure 14 $V_{CE(sat)}$ vs. Collector Current

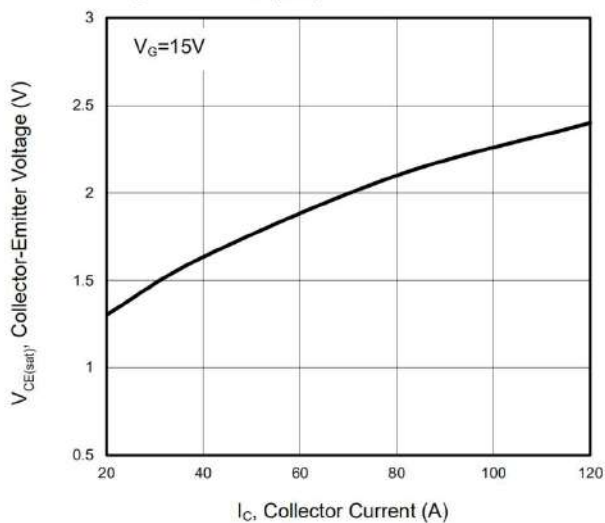


Figure 15 Forward Bias Safe Operating Area

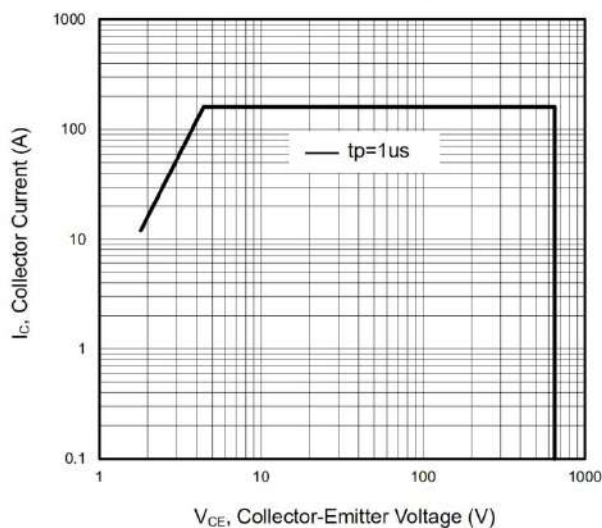


Figure 16 P_{tot} vs. Case Temperature

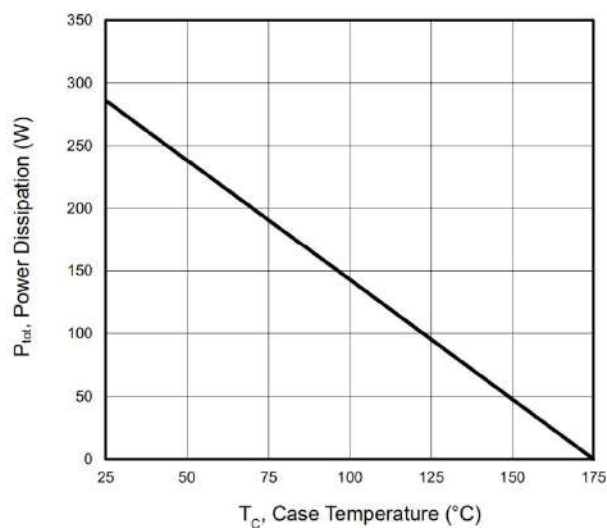


Figure 17 V_{CES} vs. Temperature

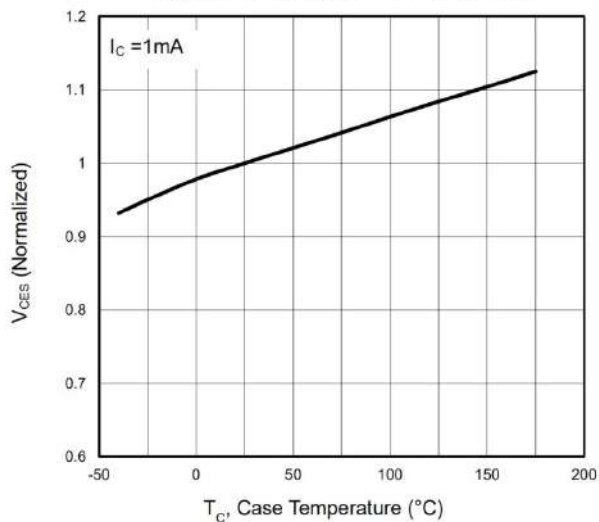


Figure 18 I_C vs. Temperature

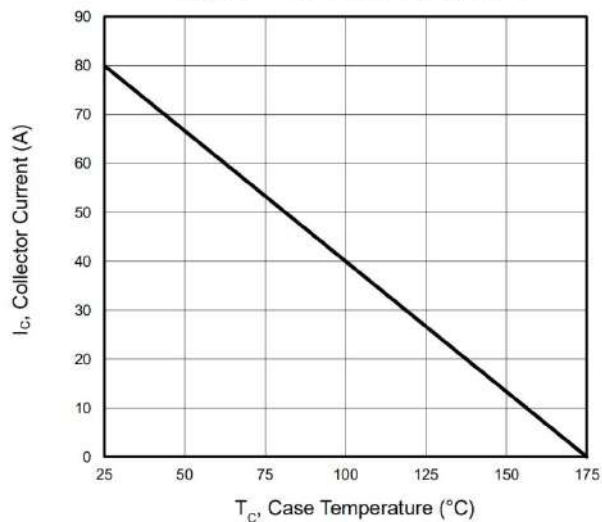


Figure 19 Switching Time vs. I_C

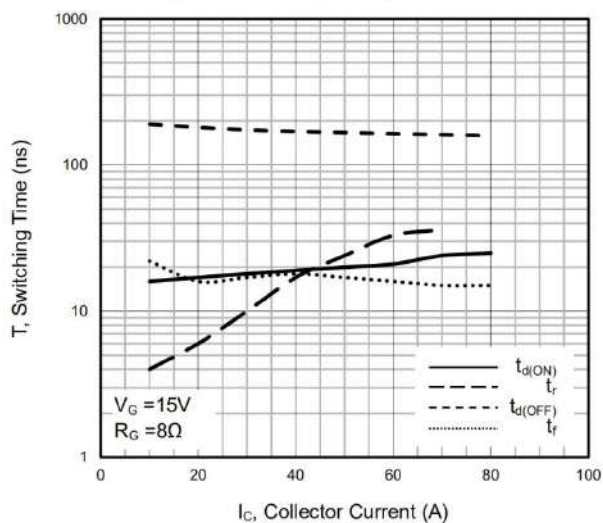


Figure 20 Switching Time vs. R_G

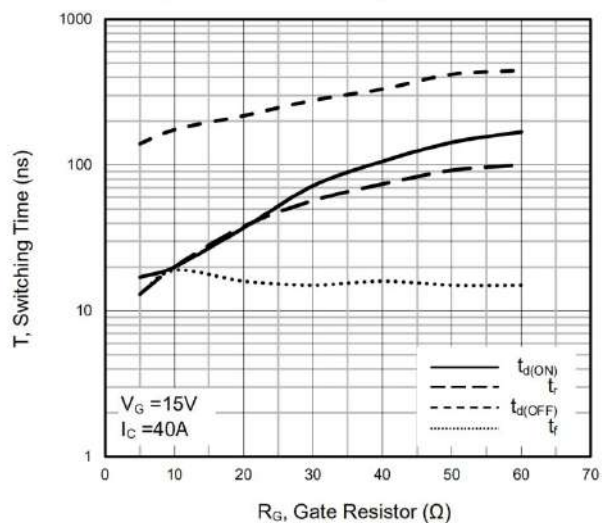


Figure 21 Switching Time vs. I_C

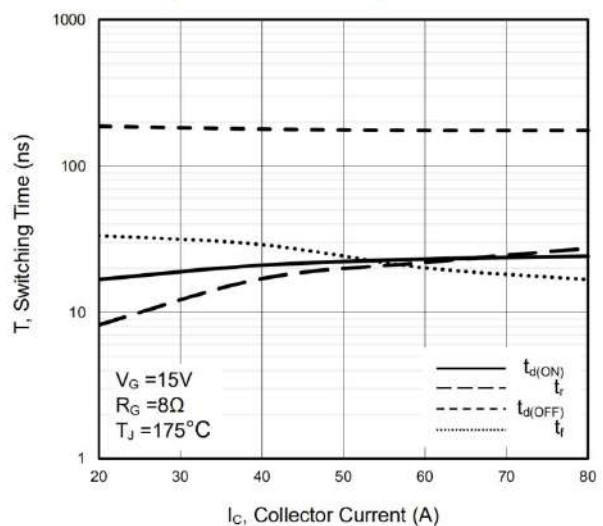
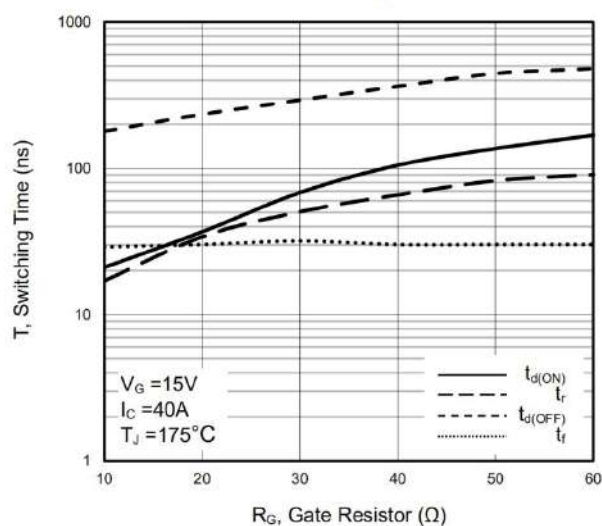


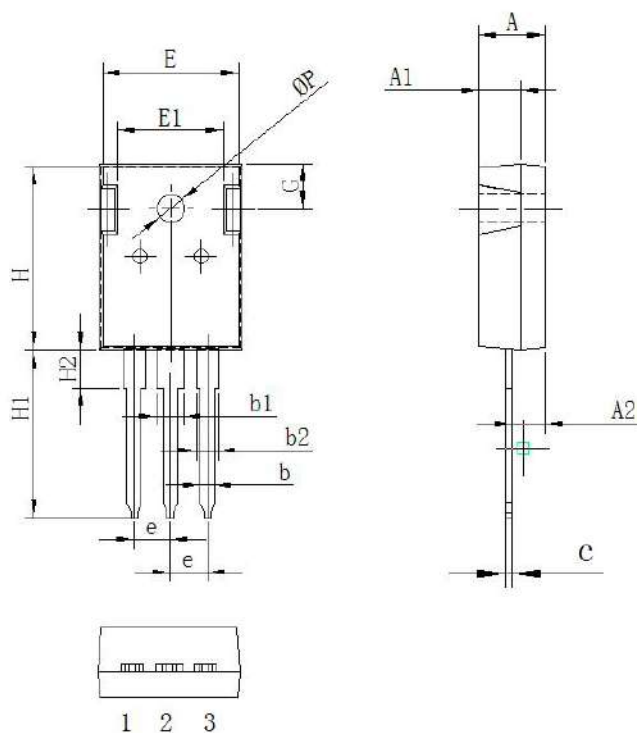
Figure 22 Switching Time vs. R_G



Dimensions

TO-247 PACKAGE OUTLINE DIMENSIONS

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