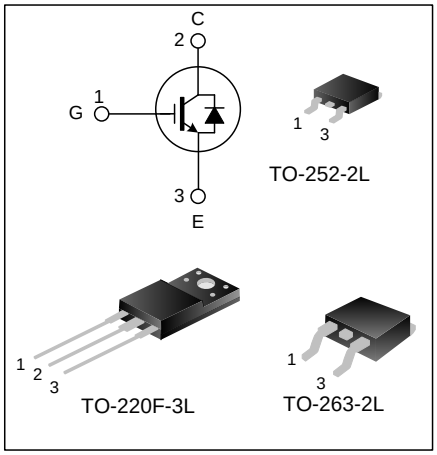
5A, 600V FIELD STOP IGBT

DESCRIPTION

The SGTP5T60SD1D/F/S field stop IGBT features low conduction loss and switching loss, is applicable to UPS, SMPS, and PFC fields.



FEATURES

- 5A, 600V, $V_{CE(sat)(typ.)}$=1.5V@I_C=5A
- Low conduction loss
- Fast switching
- High input impedance

NOMENCLATURE

SGT P 5 T 60 S D X 1 D

IGBT series

Technical grade

Current, 70: 70A

N : N Channel
NE : N-channel planar gate with ESD
T : Field Stop 3/4
U : Field Stop 4+
V : Field Stop 5
W: Field Stop 6
X : Field Stop 7

Voltage, 65: 650V
120: 1200V

Package
D : TO-252

1,2,3⋯ : Version No.

Blank: Standard diode
M : Standard Diode, full range
R : Rapid Diode
B : Rapid Diode, full range
S : Soft Diode, full range

D : Packaged with fast recovery diode
R : RC IGBT

L : Ultra low switching，recommended frequency ~2KHz
Q : Low switching，recommended frequency2~20K
S : Standard frequency，recommended frequency5~40K
F : Fast switching，recommended frequency10~60K
UF : Ultra fast switching，recommended frequency 40K~

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SGTP5T60SD1DTR	TO-252-2L	P5T60SD1	Halogen free	Tape&Reel
SGTP5T60SD1F	TO-220F-3L	P5T60SD1	Pb free	Tube
SGTP5T60SD1S	TO-263-2L	P5T60SD1S	Halogen free	Tube
SGTP5T60SD1STR	TO-263-2L	P5T60SD1S	Halogen free	Tape&Reel

ABSOLUTE MAXIMUM RATINGS (T_C=25°C UNLESS OTHERWISE NOTED)

Parameter		Symbol	Ratings			Units
			SGTP5T60SD1D	SGTP5T60SD1F	SGTP5T60SD1S	
Collector to Emitter Voltage		V_{CE}	600			V
Gate to Emitter Voltage		V_{GE}	±30			V
Collector Current	T_C=25°C	I_C	10			A
	T_C=100°C		5			
Pulsed Collector Current		I_{CM}	15			A
Diode current		I_F	10			A
Short-circuit time (V_{GE}=15V, V_{CC}=300V)		Tsc	10			μs
Power Dissipation		P_D	82	35	83	W
Operating Junction Temperature		T_J	-55～+150			°C
Storage Temperature Range		T_{stg}	-55～+150			°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Ratings			Units
		SGTP5T60SD1D	SGTP5T60SD1F	SGTP5T60SD1S	
Thermal Resistance, Junction to Case (IGBT)	$R_{\theta JC}$	1.51	3.6	1.5	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{\theta JC}$	2.14	3.7	2.6	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	72	63	51	°C/W

ELECTRICAL CHARACTERISTICS OF IGBT (T_C = 25°C, UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Collector to Emitter Breakdown Voltage	BV_{CE}	V_{GE}=0V, I_C=250μA	600	--	--	V
C-E Leakage Current	I_{CES}	V_{CE}=600V, V_{GE}=0V	--	--	200	μA
G-E Leakage Current	I_{GES}	V_{GE}=20V, V_{CE}=0V	--	--	±400	nA
G-E Threshold Voltage	$V_{GE(th)}$	I_C=250μA, V_{CE}=V_{GE}	3.5	5.5	6.5	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=5A, V_{GE}=15V	--	1.5	2.0	V
		I_C=5A, V_{GE}=15V, T_C=125°C	--	1.7	--	V
Input Capacitance	C_{ies}	V_{CE}=30V, V_{GE}=0V, f=1MHz	--	340	--	pF
Output Capacitance	C_{oes}		--	26	--	
Reverse Transfer Capacitance	C_{res}		--	7.6	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V I_C=5A R_g=10Ω V_{GE}=15V Inductive Load	--	7	--	ns
Rise Time	T_r		--	14	--	
Turn-Off Delay Time	$T_{d(off)}$		--	18	--	
Fall Time	T_f		--	145	--	
Turn-On Switching Loss	E_{on}		--	0.2	--	mJ
Turn-Off Switching Loss	E_{off}		--	0.07	--	
Total Switching Loss	E_{st}		--	0.27	--	
Total Gate Charge	Q_g	V_{CE}=400V, I_C=5A, V_{GE}=15V	--	18.5	--	nC
Gate to Emitter Charge	Q_{ge}		--	5.1	--	
Gate to Collector Charge	Q_{gc}		--	8.6	--	

ELECTRICAL CHARACTERISTICS OF FRD (T_C=25°C, UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Diode Forward Voltage	V_{FM}	I_F=5A, T_C=25°C	--	1.3	1.8	V
		I_F=5A, T_C=125°C	--	1.1	--	
Diode Reverse Recovery Time	T_{rr}	I_{ES}=5A, dI_{ES}/dt=200A/μs	--	40	--	ns
Diode Reverse Recovery Charge	Q_{rr}	I_{ES}=5A, dI_{ES}/dt=200A/μs	--	80	--	nC

TYPICAL CHARACTERISTICS CURVE

Figure 1. Typical output characteristics

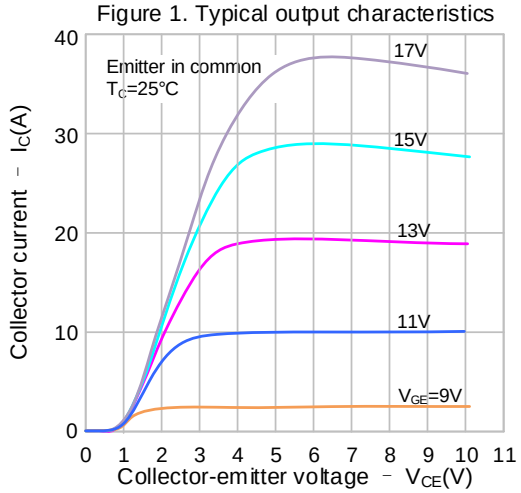


Figure 2. Typical saturation voltage characteristics

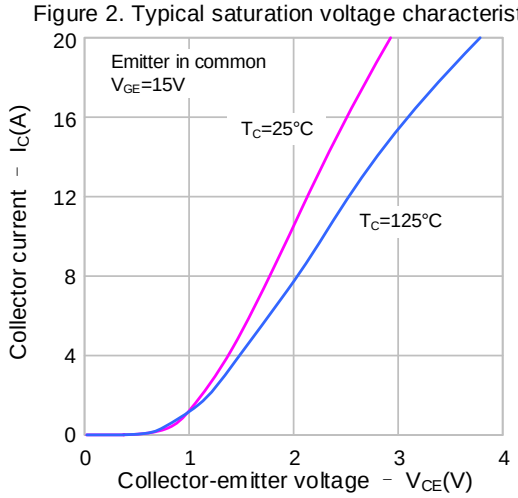


Figure 3. Transmission characteristics

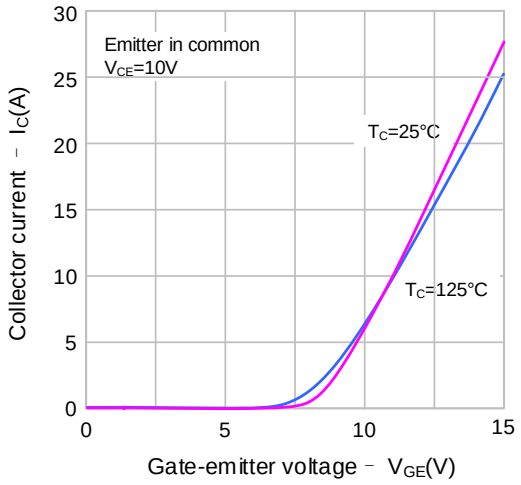


Figure 4. Saturation voltage vs. V_{GE}

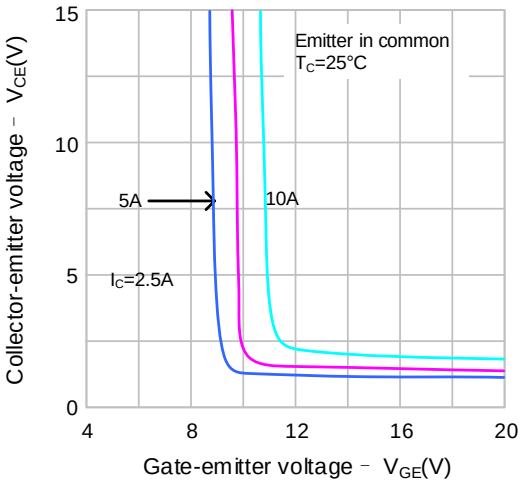


Figure 5. Saturation voltage vs. V_{GE}

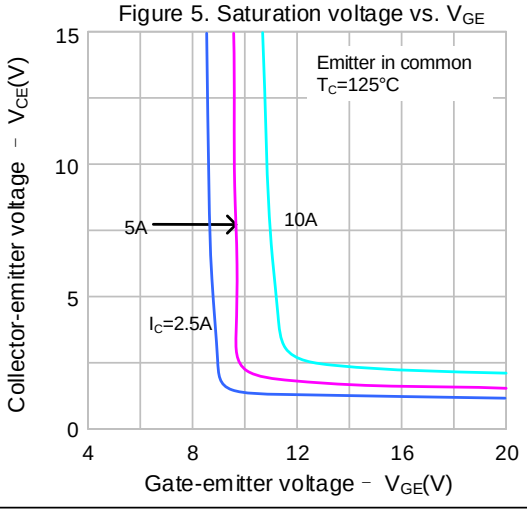
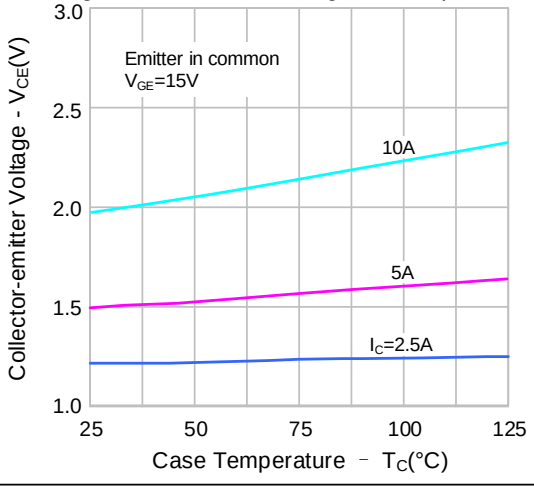


Figure 6. Saturation Voltage vs. Temperature



TYPICAL CHARACTERISTICS CURVE (CONTINUED)

Figure 7. Capacitance Characteristics

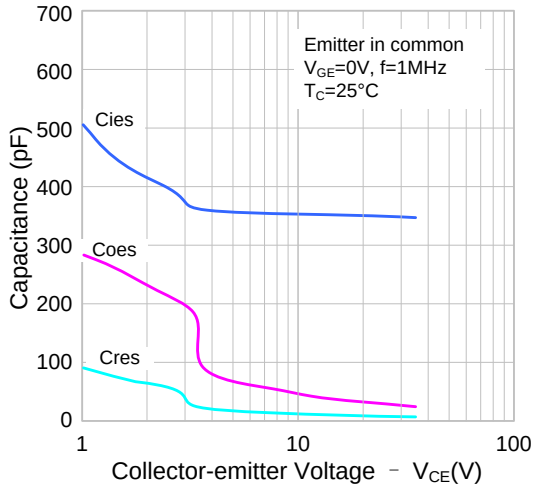


Figure 8. Gate Charge Characteristics

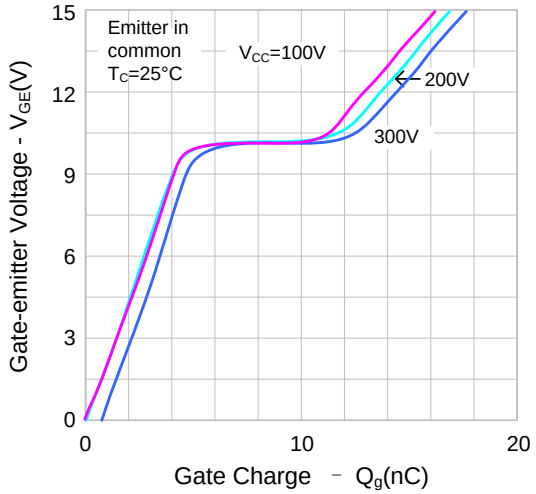


Figure 9. Turn-on Characteristics vs. Gate Resistance

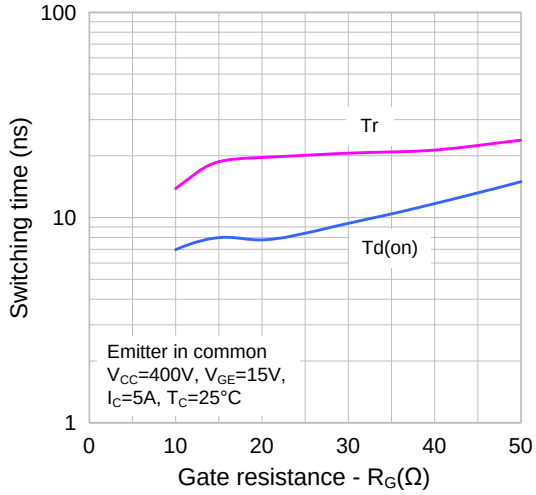


Figure 10. Turn-off characteristics vs. Gate resistance

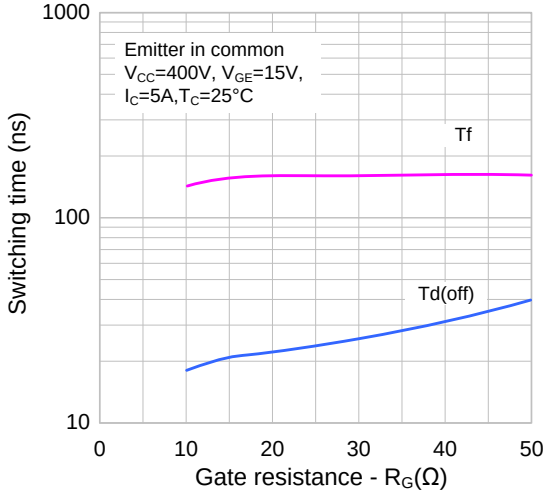


Figure 11. Switching Loss vs. Gate Resistance

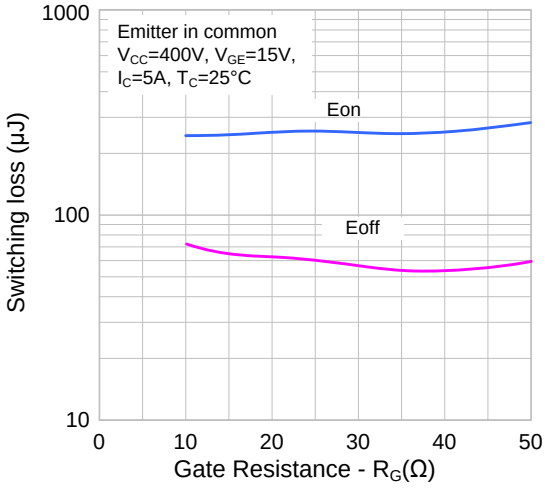
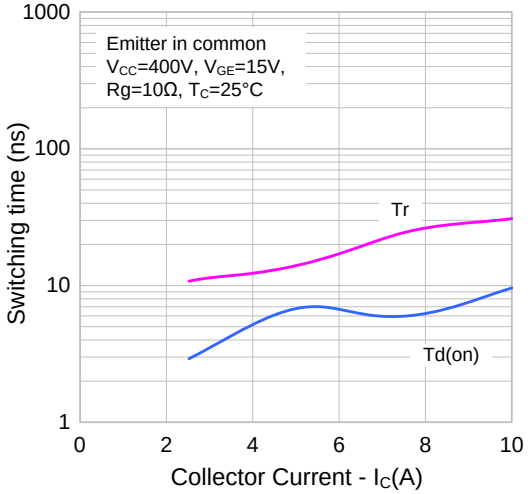


Figure 12. Turn-on Characteristics vs. Collector Current



TYPICAL CHARACTERISTICS CURVE (CONTINUED)

Figure 13. Turn-off characteristics vs. Collector current

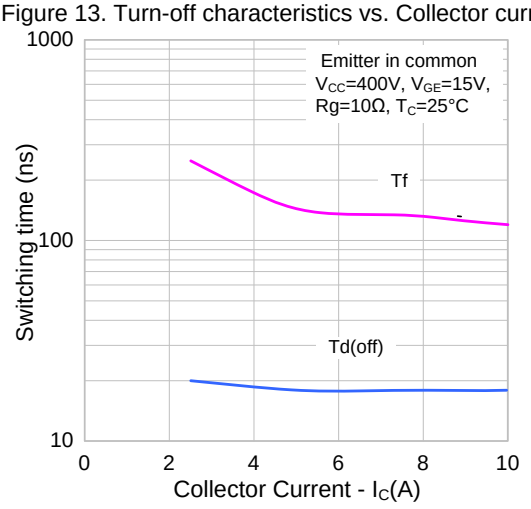


Figure 14. Switching Loss vs. Collector Current

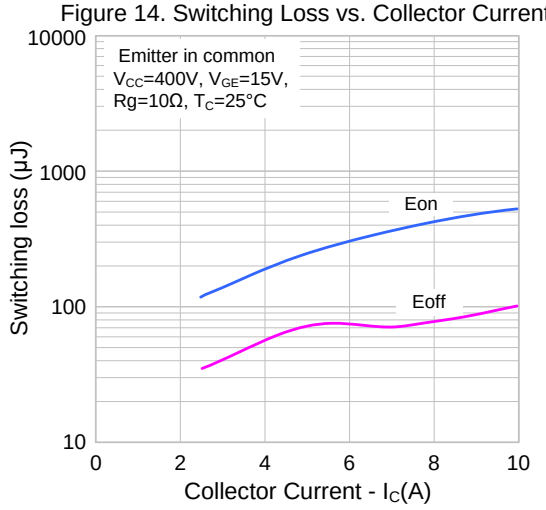


Figure 15. Forward characteristics

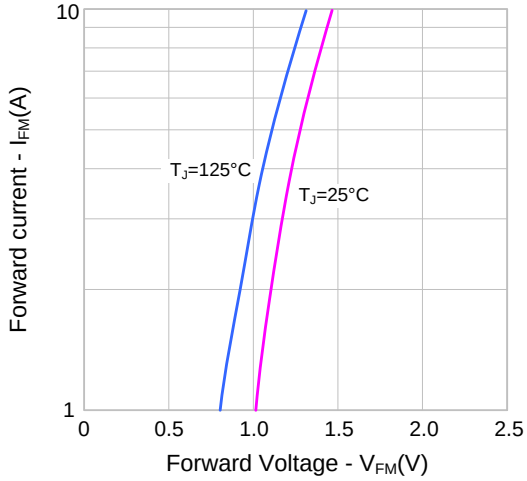


Figure 16. Reverse recovery time vs. Forward current

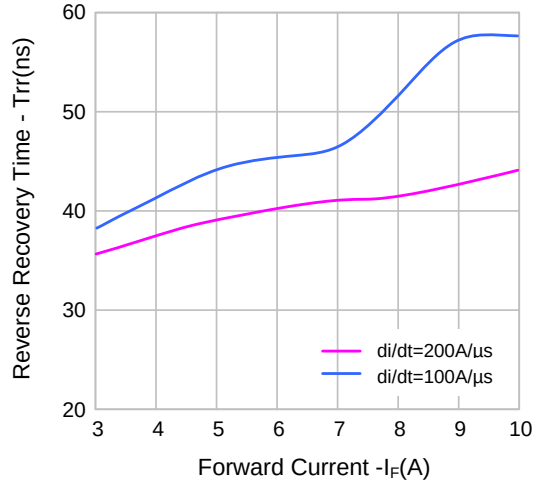


Figure 17. Reverse Recovery Charge vs. Forward Current

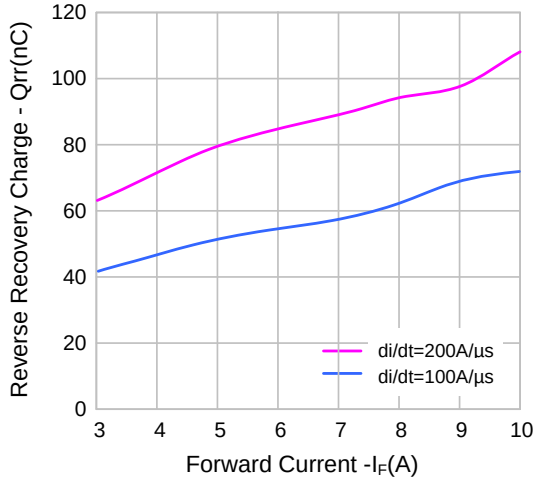
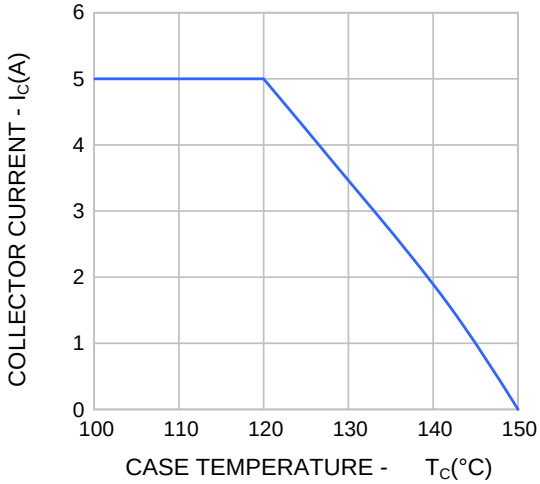


Figure 18. Current Derating,Case



TYPICAL CHARACTERISTICS CURVE (CONTINUED)

Figure 19. Max. Safe Operating Area(SGTP5T60SD1D)

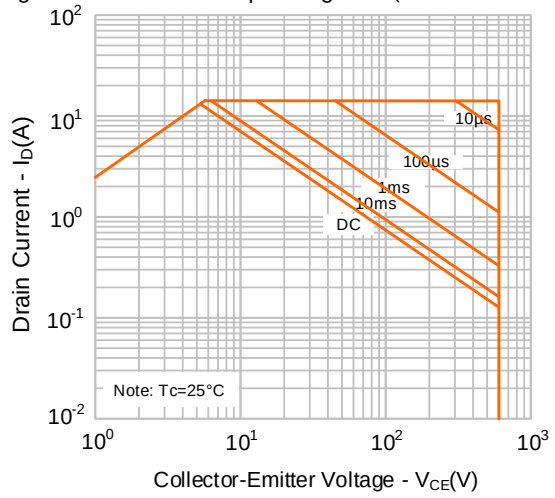


Figure 20. Max. Safe Operating (SGTP5T60SD1F)

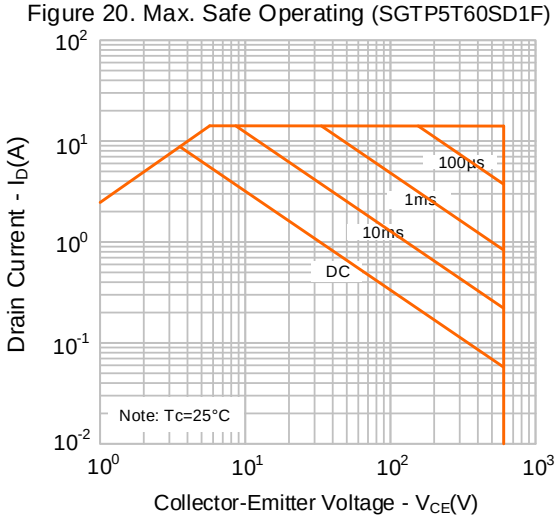
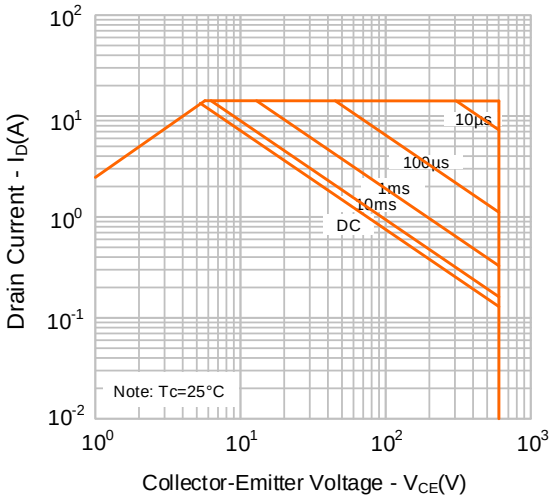


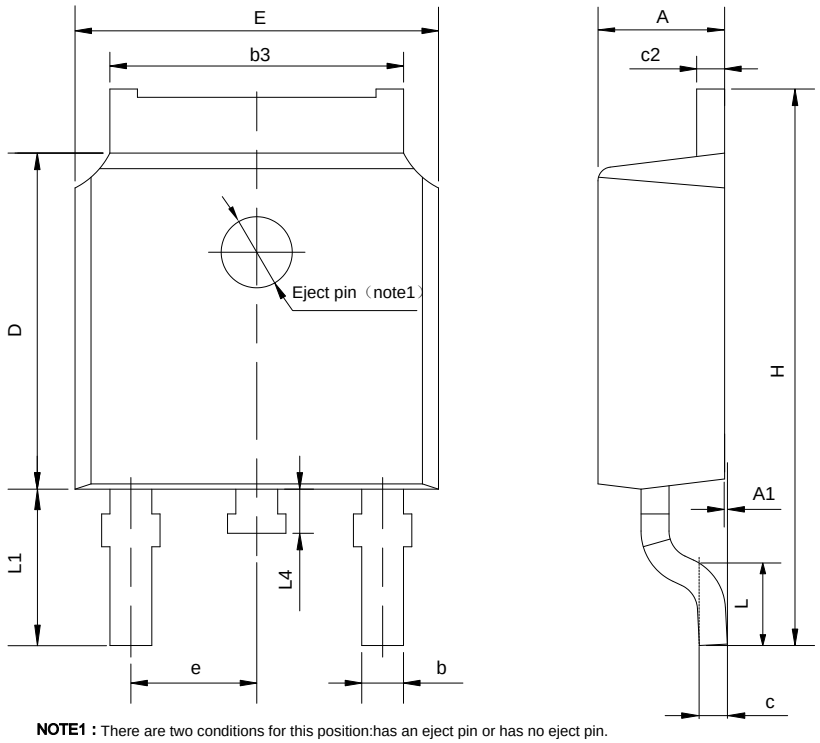
Figure 21. Max. Safe Operating(SGTP5T60SD1S)



PACKAGE OUTLINE

TO-252-2L

UNIT: mm

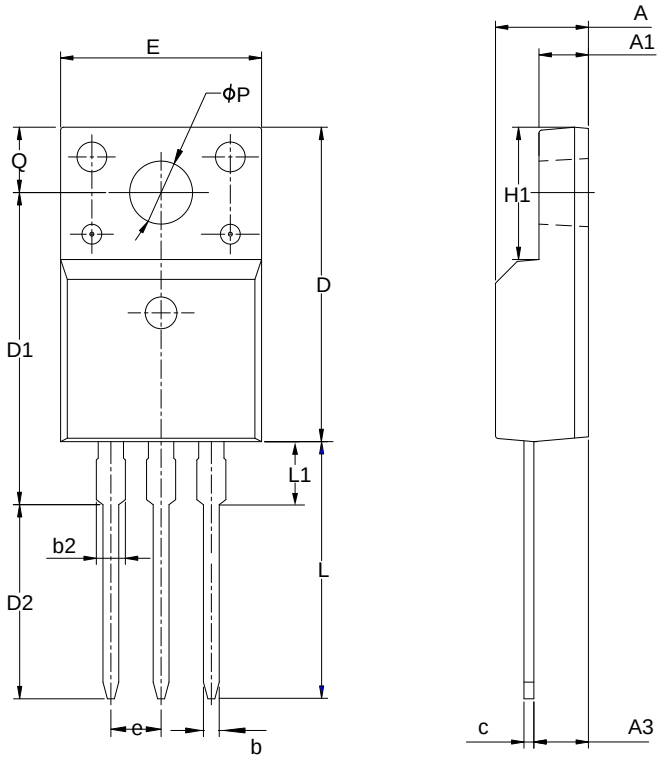


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	2.10	2.30	2.50
A1	0	—	0.127
b	0.66	0.76	0.89
b3	5.10	5.33	5.46
c	0.45	—	0.65
c2	0.45	—	0.65
D	5.80	6.10	6.40
E	6.30	6.60	6.90
e	2.30TYP		
H	9.60	10.10	10.60
L	1.40	1.50	1.70
L1	2.90REF		
L4	0.60	0.80	1.00

NOTE1 : There are two conditions for this position:has an eject pin or has no eject pin.

TO-220F-3L

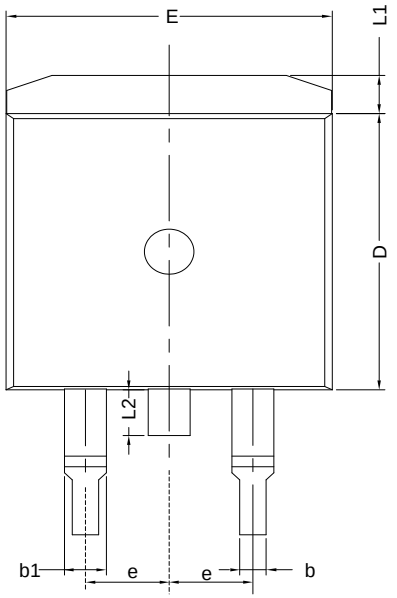
UNIT: mm

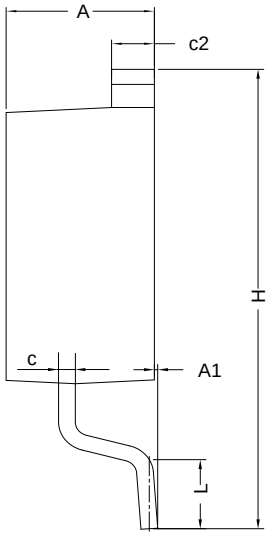


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.42	4.70	5.02
A1	2.30	2.54	2.80
A3	2.50	2.76	3.10
b	0.70	0.80	0.90
b2	–	–	1.47
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	15.30	15.75	16.30
D2	9.30	9.80	10.30
E	9.73	10.16	10.36
e	2.54BSC		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	–	–	3.50
ϕP	3.00	3.18	3.40
Q	3.05	3.30	3.55

PACKAGE OUTLINE (CONTINUED)

TO-263-2L **UNIT: mm**





SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.30	4.57	4.72
A1	0	0.10	0.25
b	0.71	0.81	0.91
b1	1.17	—	1.50
c	0.30	—	0.60
c2	1.17	1.27	1.37
D	8.50	—	9.35
E	9.80	—	10.45
e	2.54BSC		
H	14.70	—	15.75
L	2.00	2.30	2.74
L1	1.12	1.27	1.42
L2	—	—	1.75

Important notice :

1. **The instructions are subject to change without notice!**
2. **Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current. Please read the instructions carefully before using our products, including the circuit operation precautions.**
3. **Our products are consumer electronic products or the other civil electronic products.**
4. **When using our products, please do not exceed the maximum rating of the products, otherwise the reliability of the whole machine will be affected. There is a certain possibility of failure or malfunction of any semiconductor product under specific conditions. The buyer is responsible for complying with safety standards and taking safety measures when using our products for system design, sample and whole machine manufacturing, so as to avoid potential failure risk that may cause personal injury or property loss.**
5. **It is strongly recommended to identify the trademark when buying our products. Please contact us if there is any question.**
6. **Product promotion is endless, our company will wholeheartedly provide customers with better products!**
7. **Website: http: //www.silan.com.cn**

Part No.:	SGTP5T60SD1D(F)(S)	Document Type:	Datasheet
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Rev.: 1.7

Revision History:

1. Update SOA

Rev.: 1.6

Revision History:

1. Modify figure 10,I_C=5A

Rev.: 1.5

Revision History:

1. Add short circuit protection time
2. Update the template of datasheet

Rev.: 1.4

Revision History:

1. Increases ambient thermal resistance

Rev.: 1.3

Revision History:

1. Update NOMENCLATURE

Rev.: 1.2

Revision History:

1. Add Fig 18
2. Add TO-263-2L and TO-220F-3L

Rev.: 1.1

Revision History:

1. Modify the value of V_{GE}

Rev.: 1.0

Revision History:

1. First release