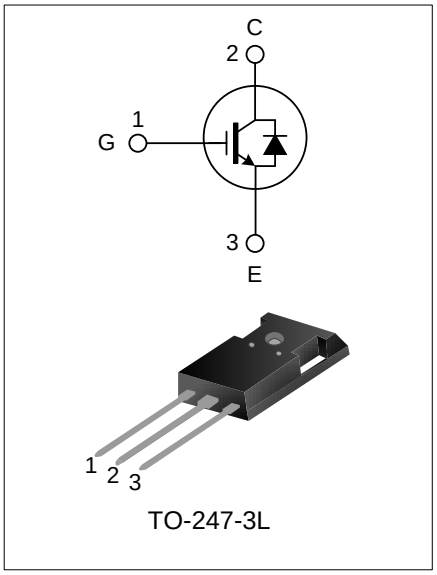
40A, 1200V FIELD STOP IGBT

DESCRIPTION

The SGTP40V120FDB2P7 field stop IGBT adopts Silan Field Stop V technology, features low conduction loss and switching loss. This device is applicable to photovoltaic, UPS, SMPS, and PFC fields.



FEATURES

- 40A, 1200V, $V_{CE(sat)(typ.)}$=1.9V@I_C=40A
- Low conduction loss
- Ultra-fast switching
- High input impedance
- T_{Jmax}=175°C

NOMENCLATURE

SGT P 40 V 120 F D B 2 P7

- IGBT series
- Industrial grade
- Current, 40: 40A
- N : N-channel
  NE : N-channel planner gate with ESD
  T : Field Stop 3/4
  U : Field Stop 4+
  V : Field Stop 5
  W: Field Stop 5+
  Y : Field Stop5++
  A : Field Stop 6
- Voltage, 75:750V 120: 1200V
- Package PW: TO-247-3L
- 1,2,3⋯ : Version No.
- Blank: Standard diode
  M : Standard diode, full range
  R : Rapid diode
  B : Rapid diode, full range
  S : Ultra soft diode, full range
- D : packaged with fast recovery diode
  R : RC IGBT
  Blank: single IGBT
  C : Sic
- L : Ultra low switching，recommended frequency ~2KHz
  Q : Low switching，recommended frequency 2~20KHz
  S : Standard frequency ，recommended frequency 5~40KHz
  F : Fast switching，recommended frequency 10~60KHz
  UF : Ultra fast switching，recommended frequency 40KHz~
  I: Igniter

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SGTP40V120FDB2P7	TO-247-3L	P40V120FDB2	Halogen free	Tube

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

Characteristics		Symbol	Ratings	Unit
Collector - Emitter Voltage		V_{CE}	1200	V
Gate - Emitter Voltage		V_{GE}	±20	V
Transient Gate - Emitter Voltage (t_p≤10μs, D<0.010)		V_{GE}	±30	V
Collector Current	T_C=25°C	I_C	80	A
	T_C=100°C		40	
Pulsed Collector Current		I_{CM}	160	A
Diode Current	T_C=25°C	I_F	80	A
	T_C=100°C		40	A
Diode Pulsed Current		I_{FM}	160	A
Power Dissipation (T_C=25°C)		P_{tot}	375	W
Operating Junction Temperature		T_J	-40～+175	°C
Storage Temperature Range		T_{stg}	-55～+150	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction to Case (IGBT)	$R_{th(j-C)}$	--	--	--	0.4	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{th(j-C)}$	--	--	--	0.9	°C/W
Thermal Resistance, Junction to Ambient (IGBT)	$R_{th(j-a)}$	--	--	--	40	°C/W
Soldering temperature (in line)	T_{sold}	15^{+2}_{-0} sec, 1time	--	--	260	°C

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

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Collector - Emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=250μA	1200	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE}=1200V, V_{GE}=0V	--	--	250	μA
Gate-emitter Leakage Current	I_{GES}	V_{GE}=20V, V_{CE}=0V	--	--	±600	nA
Gate-emitter Threshold Voltage	$V_{GE(th)}$	I_C=250μA, V_{CE}=V_{GE}	4.4	5.6	6.4	V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=40A, V_{GE}=15V, T_J=25°C	--	1.9	2.5	V
		I_C=40A, V_{GE}=15V, T_J=175°C	--	2.32	--	V
Input Capacitance	C_{ies}	V_{CE}=30V V_{GE}=0V f=1MHz	--	3806	--	pF
Output Capacitance	C_{oes}		--	100	--	
Reverse Transfer Capacitance	C_{res}		--	13	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=600V I_C=40A R_g=10Ω V_{GE}=15V inductive load T_J=25°C	--	62	--	ns
Rise Time	T_r		--	41	--	
Turn-Off Delay Time	$T_{d(off)}$		--	197	--	
Fall Time	T_f		--	76	--	
Turn-on Energy	E_{on}		--	1.11	--	mJ
Turn-off Energy	E_{off}		--	1.85	--	
Total Switching Energy	E_{st}		--	2.96	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=600V I_C=20A R_g=10Ω V_{GE}=15V inductive load T_J=25°C	--	58	--	ns
Rise Time	T_r		--	29	--	
Turn-Off Delay Time	$T_{d(off)}$		--	222	--	
Fall Time	T_f		--	76	--	
Turn-on Energy	E_{on}		--	0.34	--	mJ
Turn-off Energy	E_{off}		--	0.95	--	
Total Switching Energy	E_{st}		--	1.29	--	
Total Gate Charge	Q_g	V_{CE}=600V, I_C=40A, V_{GE}=15V	--	130	--	nC
Gate to Emitter Charge	Q_{ge}		--	39	--	
Gate to Collector Charge	Q_{gc}		--	36	--	

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

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	I_F=40A, T_J=25°C	--	2.7	3.8	V
		I_F=40A, T_J=175°C	--	2.1	--	
Diode Reverse Recovery Time	T_{rr}	I_{ES}=40A, V_R=50V, dI$_{ES}$/dt=100A/μs, T_J=25°C	--	65	--	ns
Diode Reverse Recovery Charge	Q_{rr}		--	114	--	nC
Diode Reverse Recovery Current	Irrm		--	3.4	--	A

ELECTRICAL CHARACTERISTICS OF IGBT (UNLESS OTHERWISE NOTED, T_J=150°C)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=600V, I_C=40A, R_g=10Ω, V_{GE}=15V, inductive load, T_J=150°C	--	60	--	ns
Rise Time	T_r		--	42	--	
Turn-Off Delay Time	$T_{d(off)}$		--	257	--	
Fall Time	T_f		--	96	--	
Turn-on Energy	E_{on}		--	1.56	--	mJ
Turn-off Energy	E_{off}		--	2.63	--	
Total Switching Energy	E_{st}		--	4.19	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=600V, I_C=20A, R_g=10Ω, V_{GE}=15V, inductive load, T_J=150°C	--	58	--	ns
Rise Time	T_r		--	14	--	
Turn-Off Delay Time	$T_{d(off)}$		--	292	--	
Fall Time	T_f		--	82	--	
Turn-on Energy	E_{on}		--	0.55	--	mJ
Turn-off Energy	E_{off}		--	1.38	--	
Total Switching Energy	E_{st}		--	1.93	--	

TYPICAL CHARACTERISTICS

Figure 1. Typical Output Characteristics

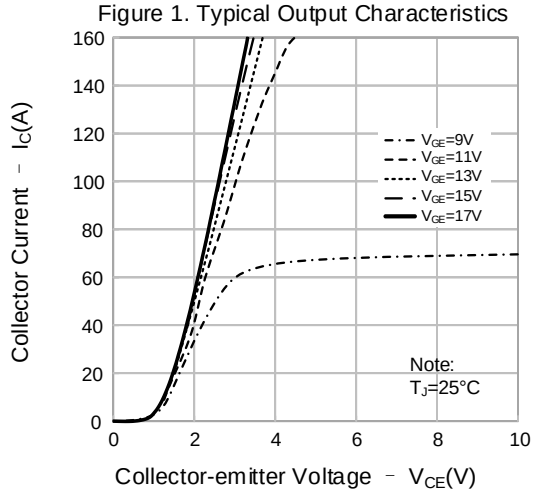


Figure 2. Typical Output Characteristics

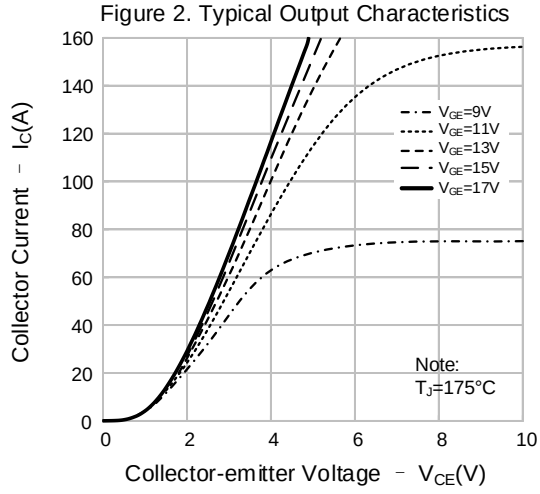


Figure 3. Typical Saturation Voltage Characteristics

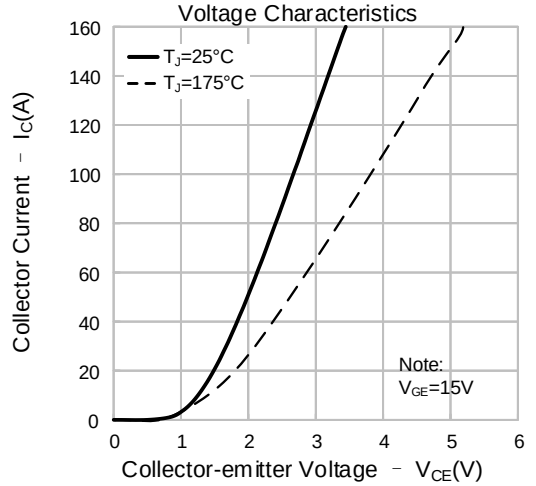


Figure 4. Transmission Characteristics

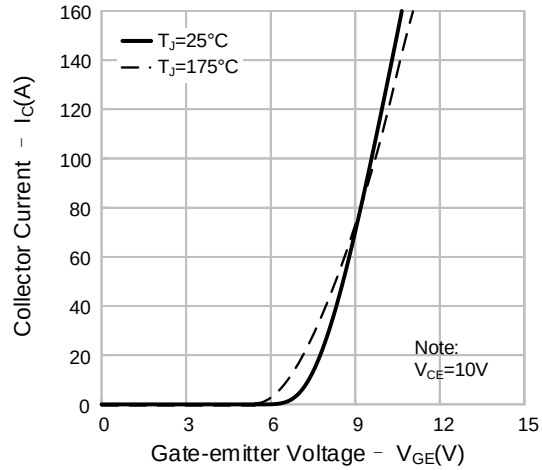


Figure 5. Saturation Voltage Drop vs. V_{GE}

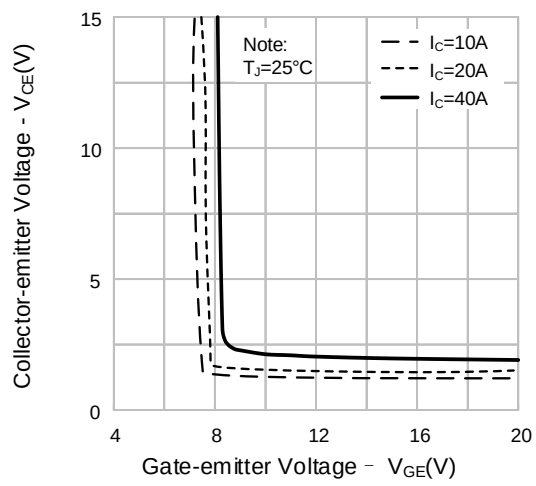
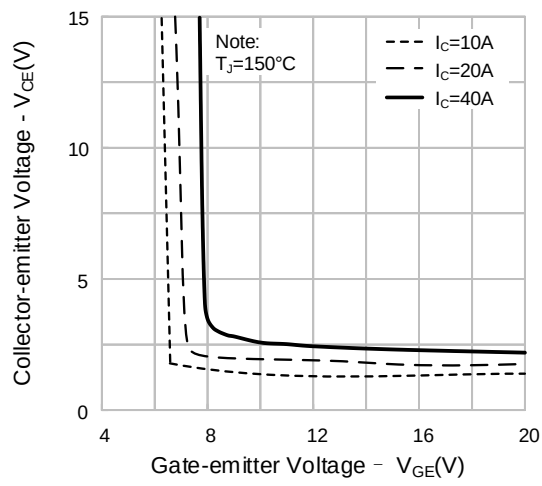


Figure 6. Saturation Voltage Drop vs. V_{GE}



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Saturation Voltage Drop vs. Temperature

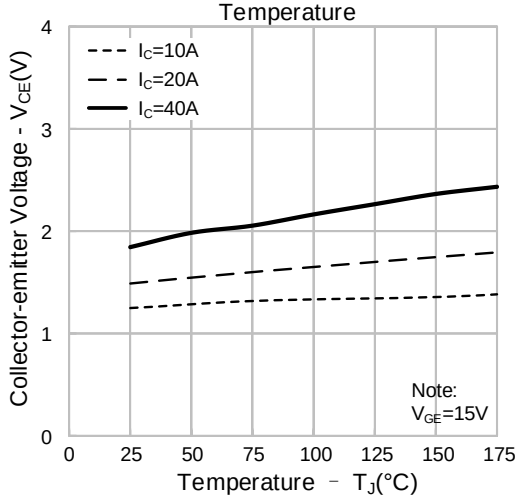


Figure 8. Capacitance Characteristics

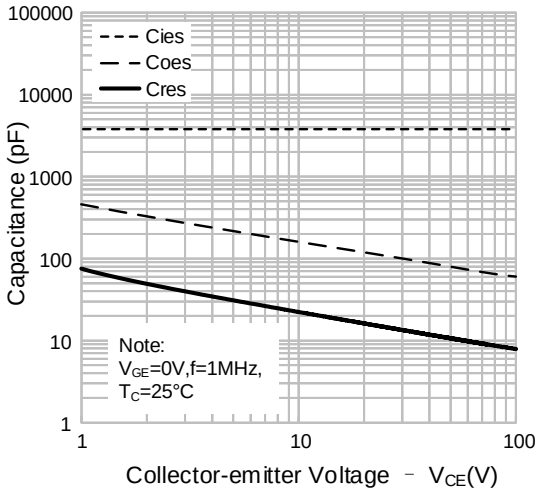


Figure 9. Gate Charge Characteristics

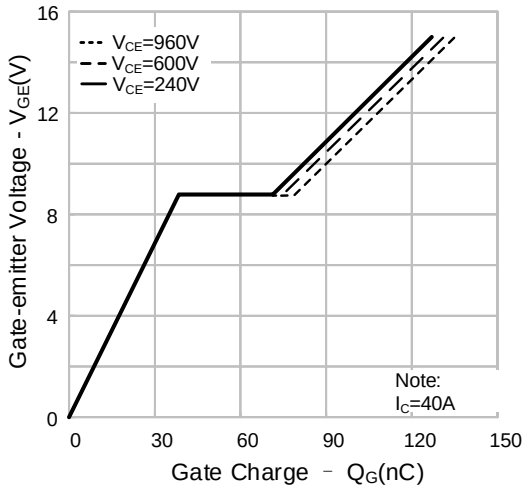


Figure 10. Forward Characteristics

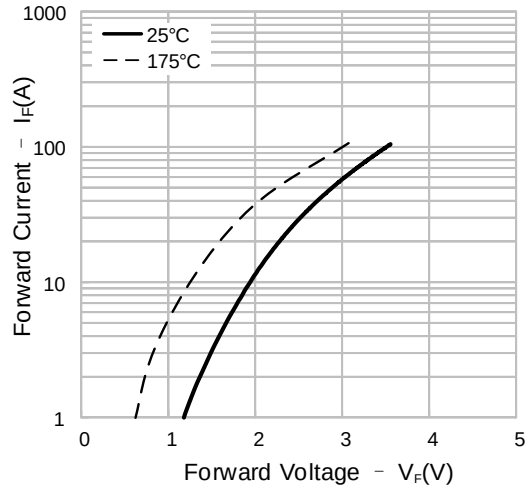


Figure 11. Turn-on Characteristics vs. Gate Resistance

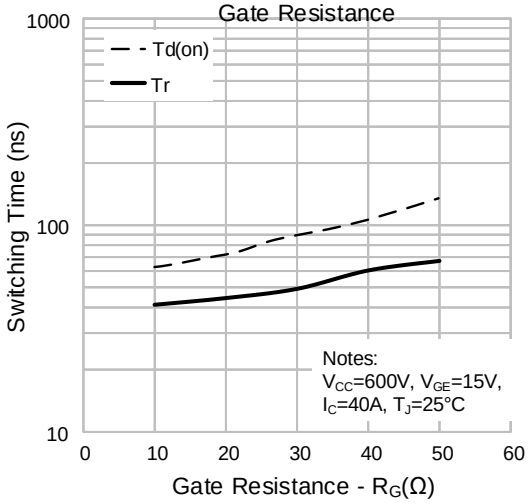
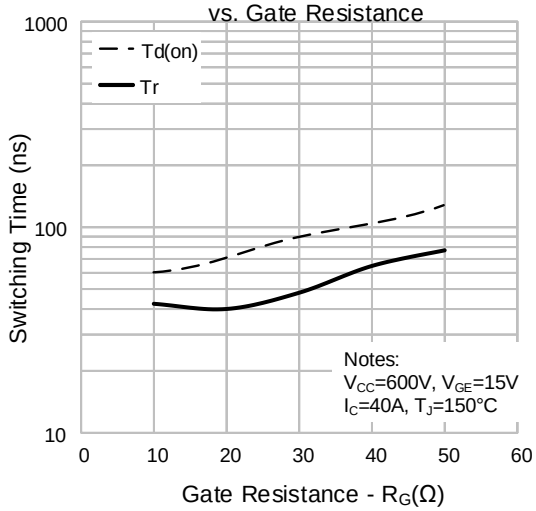


Figure 12. Turn-on Characteristics vs. Gate Resistance



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 13. Turn-off Characteristics vs. Gate Resistance

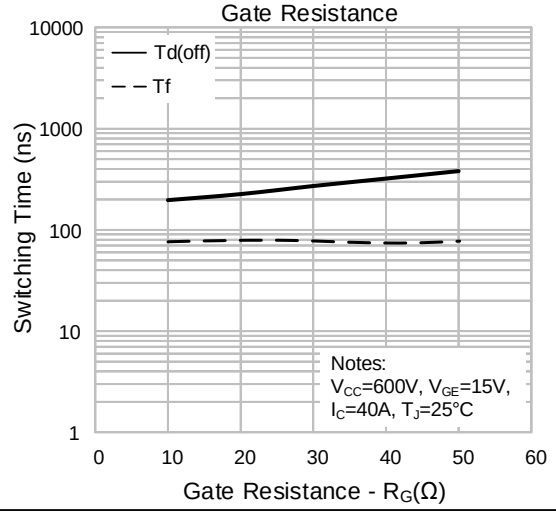


Figure 14. Turn-off Characteristics vs. Gate Resistance

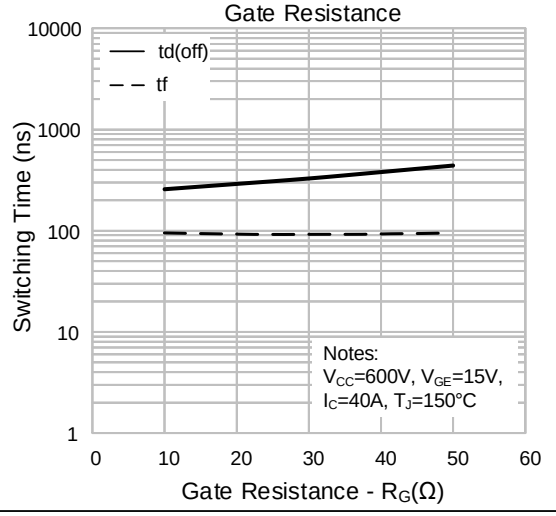


Figure 15. Switching Loss vs. Gate Resistance

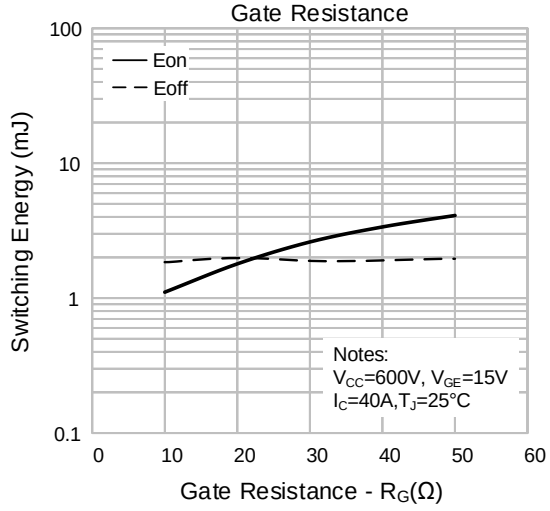


Figure 16. Switching Loss vs. Gate Resistance

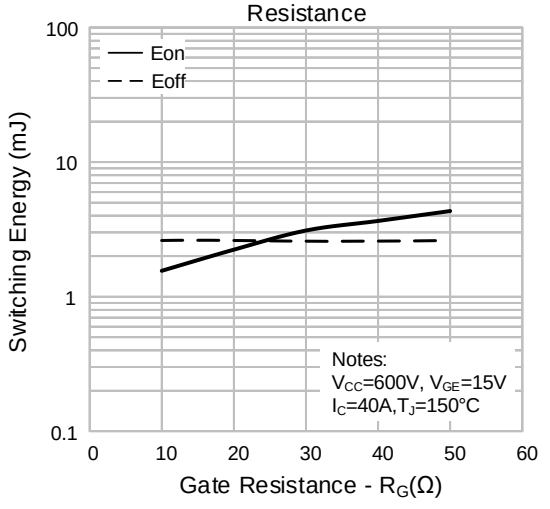


Figure 17. Turn-on Characteristics vs. Collector Current

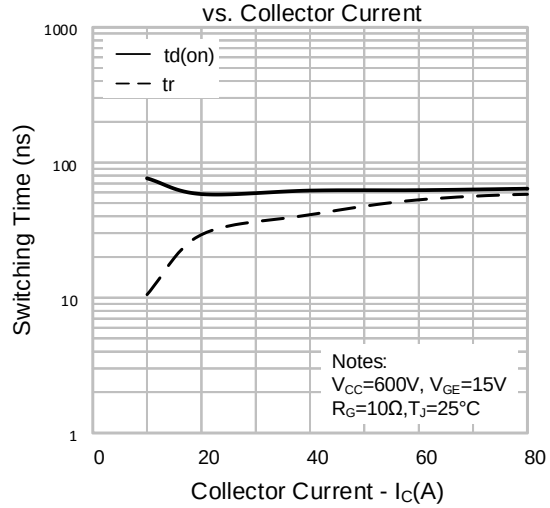
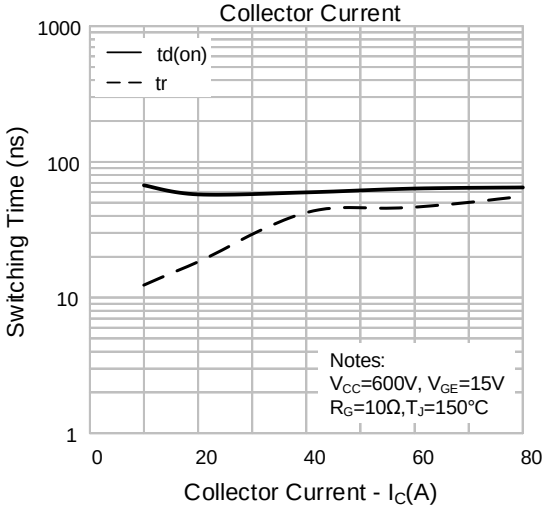


Figure 18. Turn-on Characteristics vs. Collector Current



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 19. Turn-off Characteristics vs. Collector Current

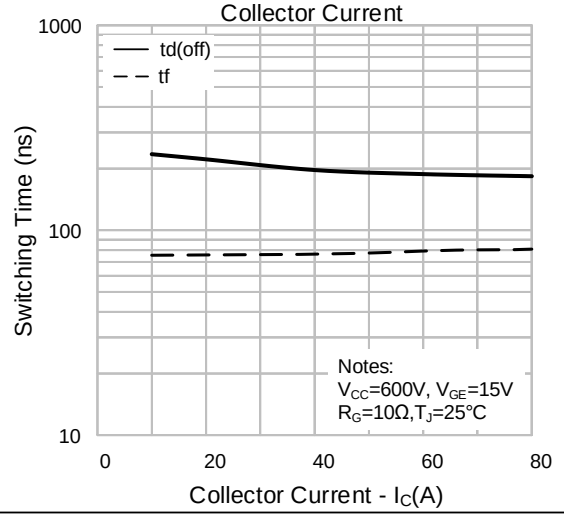


Figure 20. Turn-off Characteristics vs. Collector Current

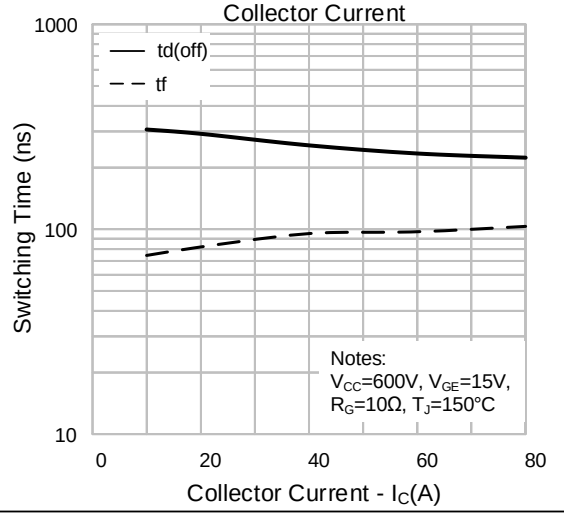


Figure 21. Switching Loss vs. Collector Current

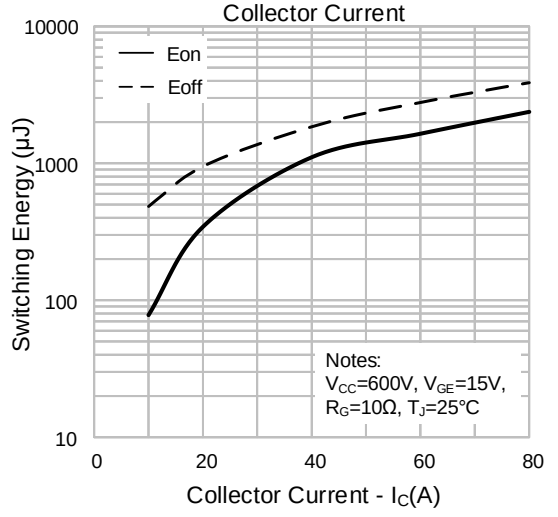


Figure 22. Switching Loss vs. Collector Current

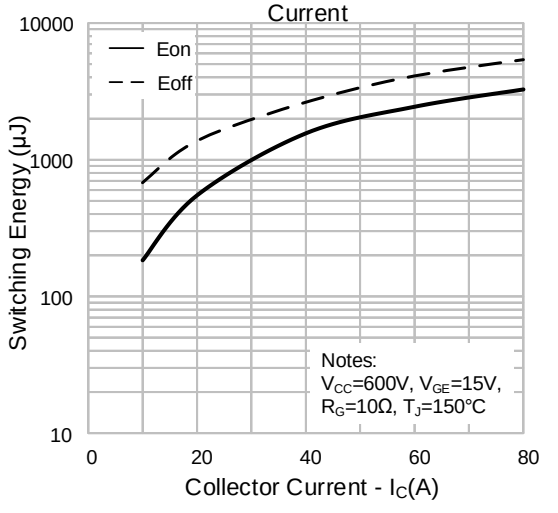


Figure 23. Reverse Recovery Time vs. Forward Current

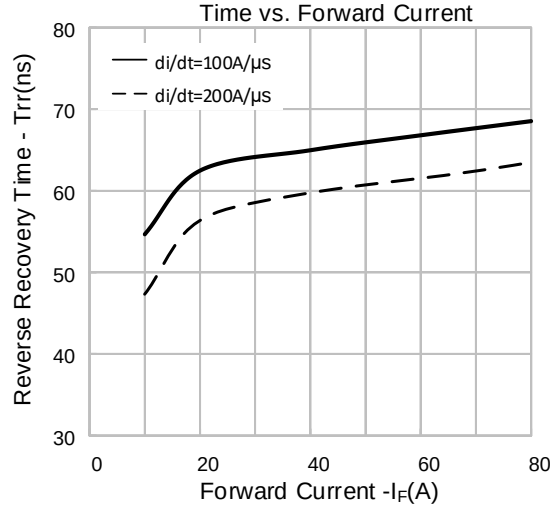
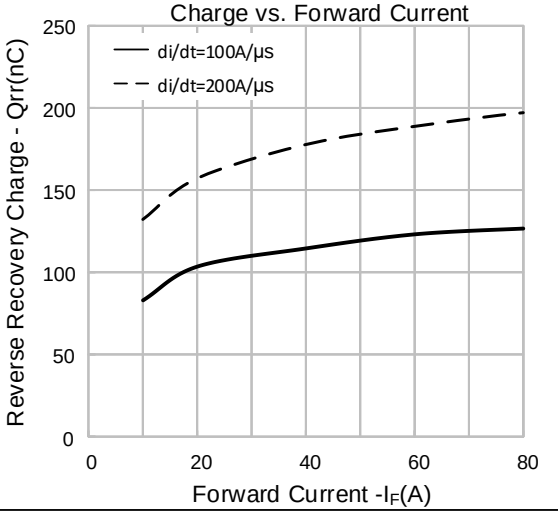


Figure 24. Reverse Recovery Charge vs. Forward Current



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 25. Peak Reverse Recovery Current vs. Forward Current

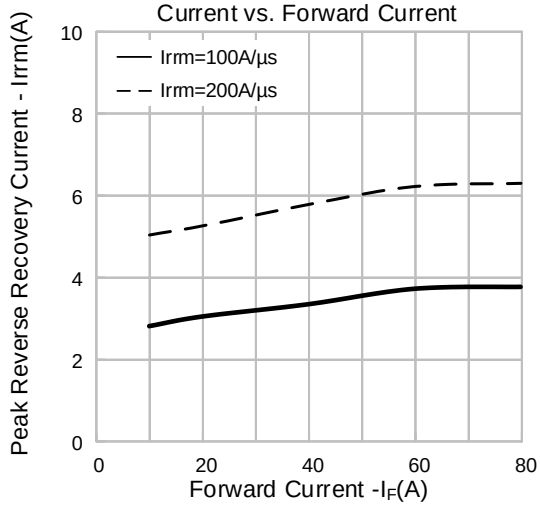


Figure 26. Tb Slope vs. Forward Current

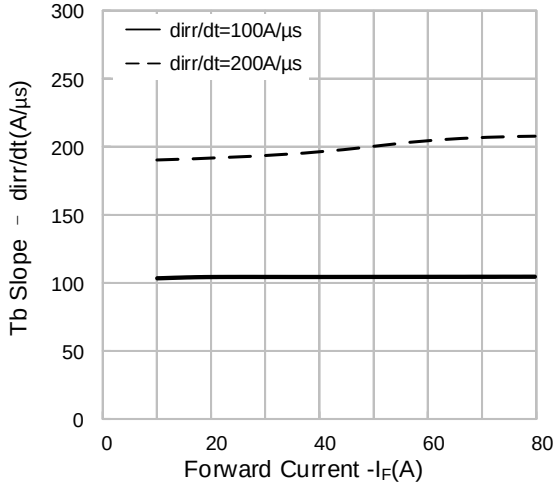


Figure 27. Max. Safe Operating Area

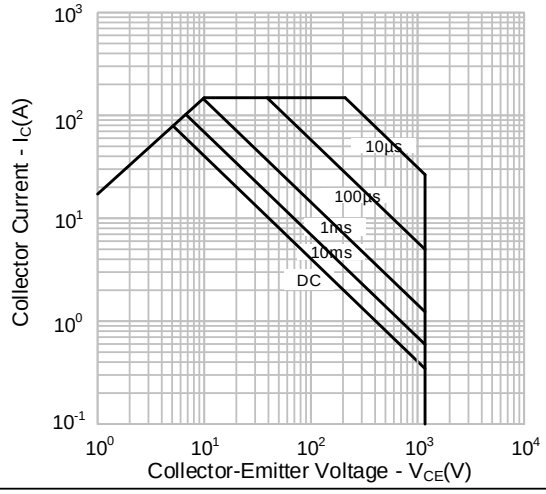


Figure 28. Transient Thermal Impedance vs. On-pulse Duration (IGBT)

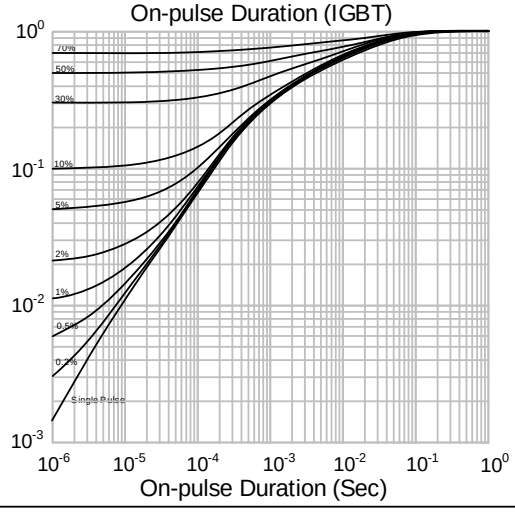
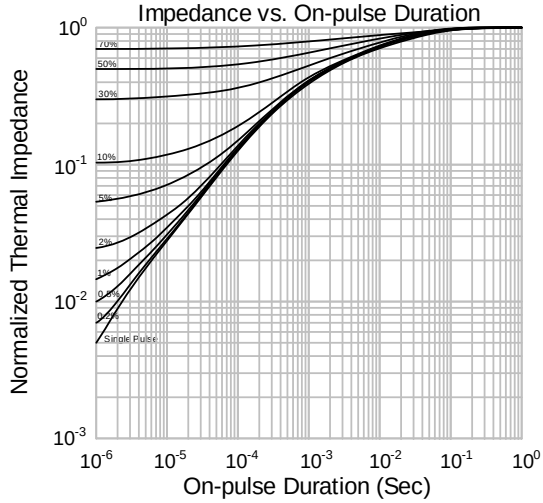
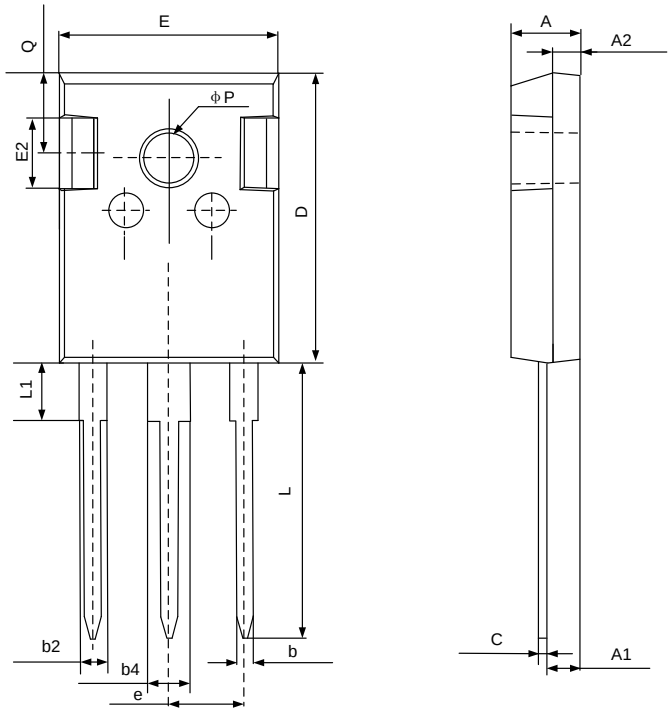


Figure 29. Transient Thermal Impedance vs. On-pulse Duration



PACKAGE OUTLINE

TO-247-3L **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	–	1.36
b2	1.91	–	2.25
b4	2.91	–	3.25
c	0.51	–	0.75
D	20.80	21.00	21.30
E	15.50	15.80	16.10
E2	4.40	5.00	5.20
e	5.44 BSC		
L	19.72	19.92	20.22
L1	–	–	4.30
Q	5.60	5.80	6.00
P	3.40	—	3.80

Important notice :

1. Silan reserves the right to make changes of this instruction without notice.
2. Customers should obtain the latest relevant information when purchasing and should verify whether such information is latest and complete. Please read this instruction and application manual and related materials carefully before using products, including the circuit operation precautions, etc.
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9. Website: http: //www.silan.com.cn

Part No.:	SGTP40V120FDB2P7	Document Type:	Datasheet
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Rev.: 1.3

Revision History:

1. Update nomenclature and parameter names
2. Update important notice

Rev.: 1.2

Revision History:

1. Modify electrical characteristics of FRD
2. Update figures 23, 24, 25, 26

Rev.: 1.1

Revision History:

1. Modify $V_{CE(sat)}$ when T_C=175ºC

Rev.: 1.0

Revision History:

1. First release