

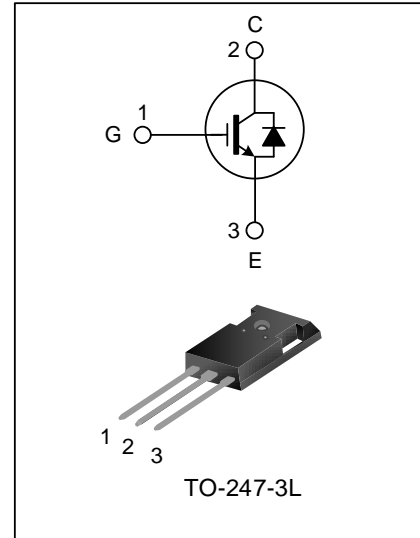
40A, 1200V FIELD STOP IGBT

DESCRIPTION

The SGTQ40T120SDB2P7 field stop IGBT adopts Silan Trench Field Stop IV technology. It features low conduction loss and switching loss, is applicable to photovoltaic, UPS, SMPS and PFC fields.

FEATURES

- ◆ AEC-Q101 qualified
- ◆ 40A, 1200V, $V_{CE(sat)}(typ.)=1.75V@I_C=40A$
- ◆ Low conduction loss
- ◆ Fast switching
- ◆ High input impedance
- ◆ $T_{Jmax.}=175^{\circ}C$



NOMENCLATURE

SGT Q 40 V 120 F D B 2 P7		
IGBT series		Package
Automotive		P7: TO-247-3L
Current,		1,2,3...: Version No.
40: 40A		Blank: Standard diode
N: N-channel		M: Standard diode, full range
NE: N-channel planner gate with ESD		R: Rapid diode
T: Field Stop 3/4		B: Rapid diode, full range
U: Field Stop 4+		S: Ultra soft diode, full range
V: Field Stop 5		D: packaged with fast recovery diode
W: Field Stop 5+		R: RC IGBT
Y: Field Stop5++		Blank: single IGBT
A: Field Stop 6		C: Sic
Voltage,		L: Ultra low switching, recommended frequency ~2KHz
75: 750V		Q: Low switching, recommended frequency 2~20KHz
120: 1200V		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
SGTQ40T120SDB2P7	TO-247-3L	Q40T120SDB2	Halogen free	Tube

ABSOLUTE MAXIMUM RATINGS (UNLESS OTHERWISE NOTED, $T_C=25^{\circ}\text{C}$)

Characteristics		Symbol	Ratings	Unit
Collector-emitter Voltage		V_{CE}	1200	V
Gate-emitter Voltage		V_{GE}	± 20	V
Transient Gate-Emitter Voltage ($t_p \leq 10\mu\text{s}$, $D < 0.010$)		V_{GE}	± 30	V
Collector Current	$T_C=25^{\circ}\text{C}$	I_C	80	A
	$T_C=100^{\circ}\text{C}$		40	
Pulsed Collector Current		I_{CM}	160	A
Diode current	$T_C=25^{\circ}\text{C}$	I_F	80	A
	$T_C=100^{\circ}\text{C}$		40	A
Diode Pulse Current		I_{FM}	160	A
Power Dissipation ($T_C=25^{\circ}\text{C}$)		P_{tot}	429	W
Operating Junction Temperature		T_J	$-40 \sim +175$	$^{\circ}\text{C}$
Storage Temperature Range		T_{stg}	$-55 \sim +150$	$^{\circ}\text{C}$

THERMAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction to Case (IGBT)	$R_{th(j-c)}$	--	--	--	0.35	$^{\circ}\text{C/W}$
Thermal Resistance, Junction to Case (FRD)	$R_{th(j-c)}$	--	--	--	0.45	$^{\circ}\text{C/W}$
Thermal Resistance, Junction to Ambient (IGBT)	$R_{th(j-a)}$	--	--	--	40	$^{\circ}\text{C/W}$
Soldering Temperature (in line)	T_{sld}	15^{+2}_{-0} sec, 1time	--	--	260	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS OF IGBT (UNLESS OTHERWISE NOTED, $T_J=25^{\circ}\text{C}$)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Collector-emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=500\mu A$	1200	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$	--	--	400	μA
Gate-emitter Leakage Current	I_{GES}	$V_{GE}=20V, V_{CE}=0V$	--	--	± 200	nA
Gate-emitter Threshold Voltage	$V_{GE(th)}$	$I_C=1.5mA, V_{CE}=V_{GE}$	4.2	5.8	7.4	V
Collector-emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=40A, V_{GE}=15V, T_J=25^{\circ}\text{C}$	--	1.75	2.2	V
		$I_C=40A, V_{GE}=15V, T_J=175^{\circ}\text{C}$	--	2.1	--	V
Input Capacitance	C_{ies}	$V_{CE}=30V$	--	4257	--	pF
Output Capacitance	C_{oes}	$V_{GE}=0V$	--	197	--	
Reverse Transfer Capacitance	C_{res}	$f=1MHz$	--	81	--	
Turn-On Delay Time	$T_{d(on)}$	$V_{CE}=600V$ $I_C=40A$ $R_g=10\Omega$ $V_{GE}=15V$ inductive load $T_J=25^{\circ}\text{C}$	--	50	--	ns
Rise Time	T_r		--	28	--	
Turn-Off Delay Time	$T_{d(off)}$		--	297	--	
Fall Time	T_f		--	94	--	
Turn-on Energy	E_{on}		--	2.62	--	mJ
Turn-off Energy	E_{off}		--	1.51	--	
Total Switching Energy	E_{st}		--	4.13	--	
Turn-On Delay Time	$T_{d(on)}$	$V_{CE}=600V$ $I_C=20A$ $R_g=10\Omega$ $V_{GE}=15V$ inductive load $T_J=25^{\circ}\text{C}$	--	46	--	ns
Rise Time	T_r		--	15	--	
Turn-Off Delay Time	$T_{d(off)}$		--	321	--	
Fall Time	T_f		--	92	--	
Turn-on Energy	E_{on}		--	1.31	--	mJ
Turn-off Energy	E_{off}		--	0.88	--	
Total Switching Energy	E_{st}		--	2.19	--	
Total Gate Charge	Q_g	$V_{CE}=600V, I_C=40A, V_{GE}=15V$	--	267	--	nC
Gate to Emitter Charge	Q_{ge}		--	41	--	
Gate to Collector Charge	Q_{gc}		--	141	--	

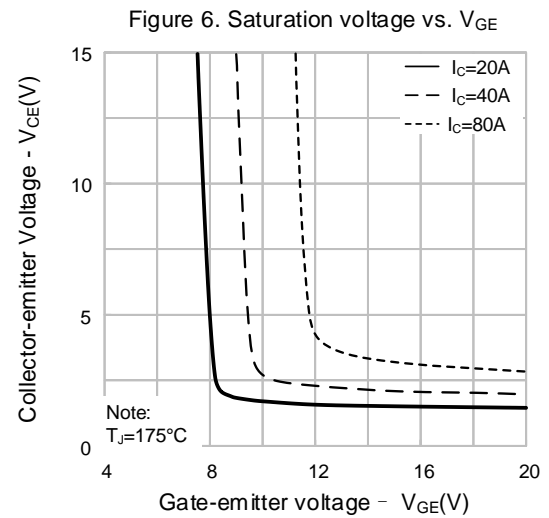
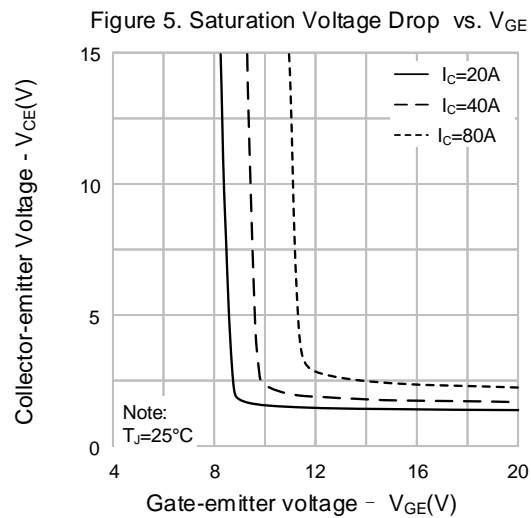
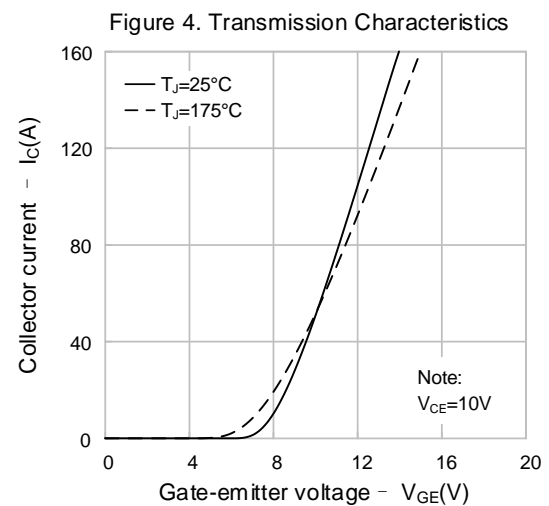
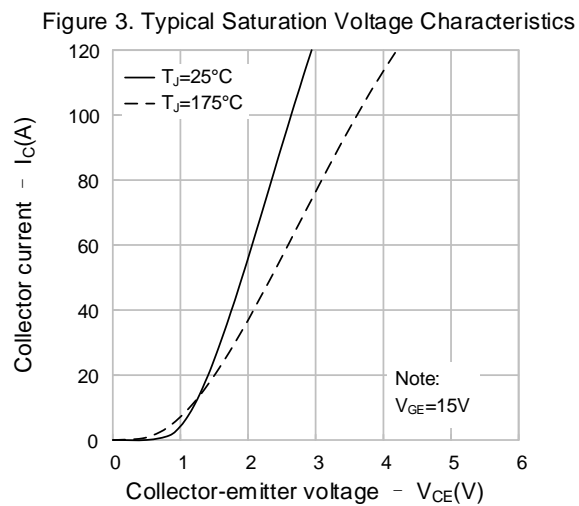
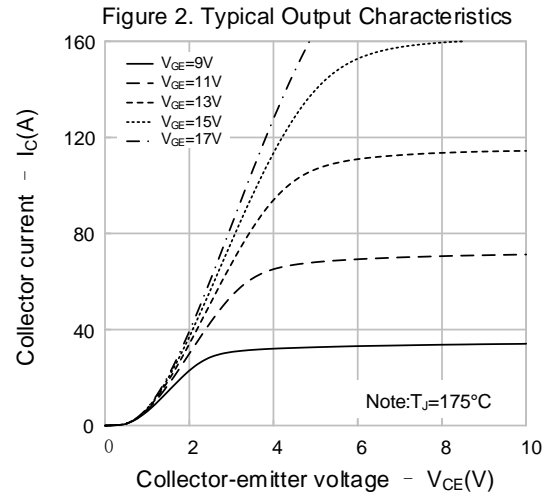
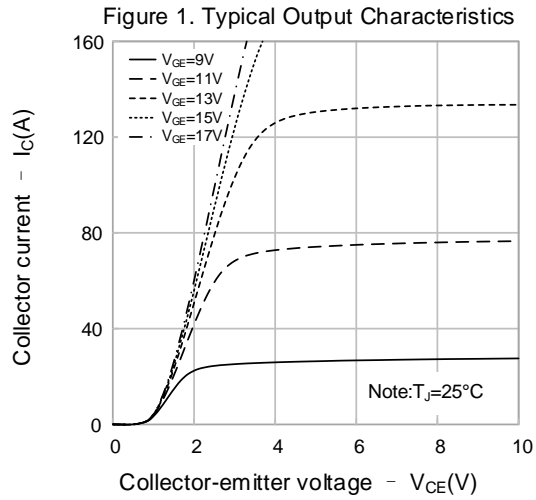
ELECTRICAL CHARACTERISTICS OF FRD ($T_J=25^{\circ}\text{C}$, UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	$I_F=40A, T_J=25^{\circ}\text{C}$	--	1.35	1.7	V
		$I_F=40A, T_J=175^{\circ}\text{C}$	--	1.21	--	
Diode Reverse Recovery Time	T_{rr}	$I_{ES}=40A, di_{ES}/dt=100A/\mu s,$ $V_R=50V, T_J=25^{\circ}\text{C}$	--	512	--	ns
Diode Reverse Recovery Charge	Q_{rr}		--	1.92	--	μC
Diode Reverse Recovery Current	I_{rrm}		--	10	--	A

ELECTRICAL CHARACTERISTICS OF IGBT (T_J=150°C)

Parameter	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	--	64	--	ns
Rise Time	T _r		--	55	--	
Turn-Off Delay Time	T _{d(off)}		--	402	--	
Fall Time	T _f		--	186	--	
Turn-on Energy	E _{on}		--	4.82	--	mJ
Turn-off Energy	E _{off}		--	3.49	--	
Total Switching Energy	E _{st}		--	8.31	--	
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	--	44	--	ns
Rise Time	T _r		--	18	--	
Turn-Off Delay Time	T _{d(off)}		--	399	--	
Fall Time	T _f		--	197	--	
Turn-on Energy	E _{on}		--	1.55	--	mJ
Turn-off Energy	E _{off}		--	2.08	--	
Total Switching Energy	E _{st}		--	3.63	--	

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Saturation Voltage vs. Temperature

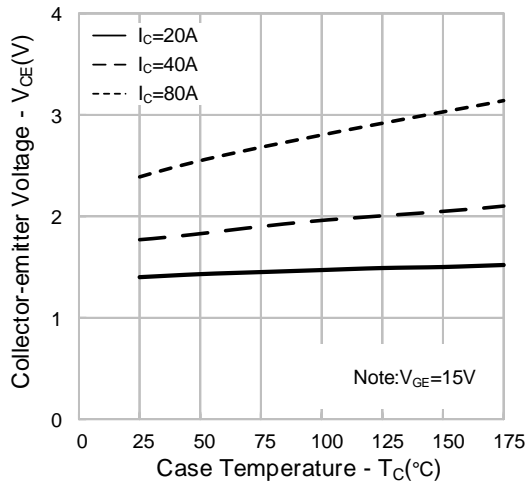


Figure 8. Capacitance Characteristics

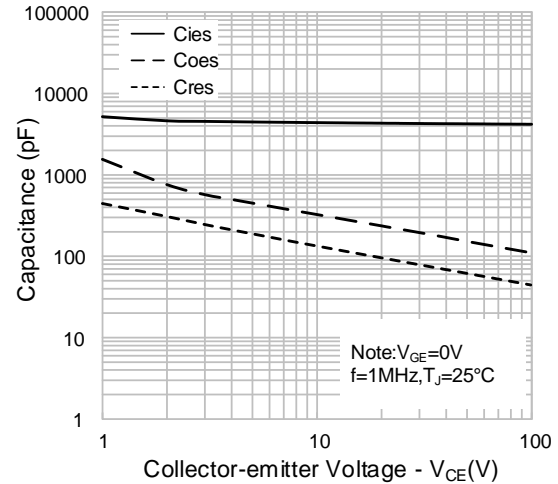


Figure 9. Gate Charge Characteristics

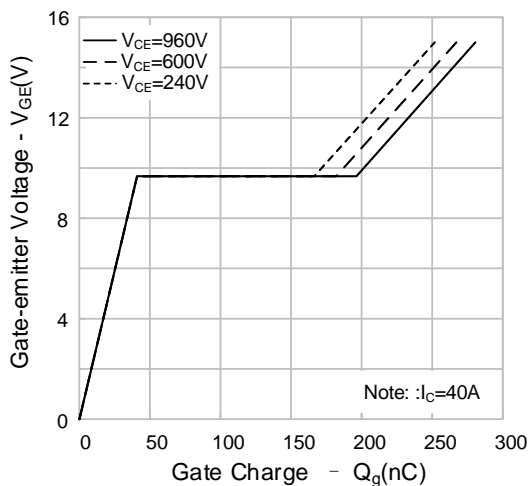


Figure 10. Forward Characteristics

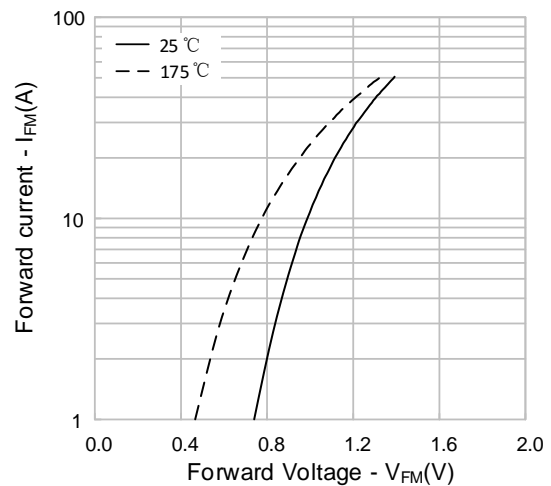


Figure 11. Turn-on Characteristics vs. Gate Resistance

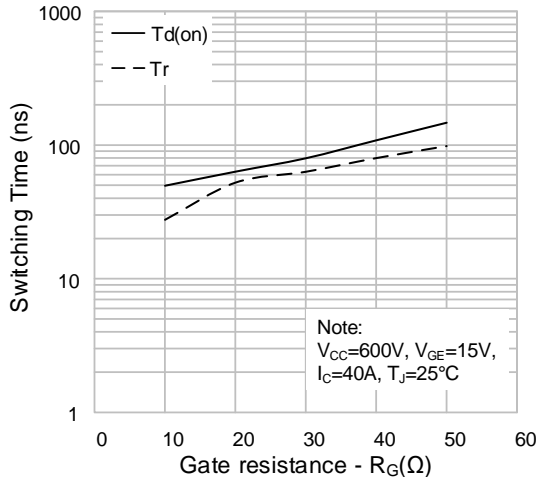
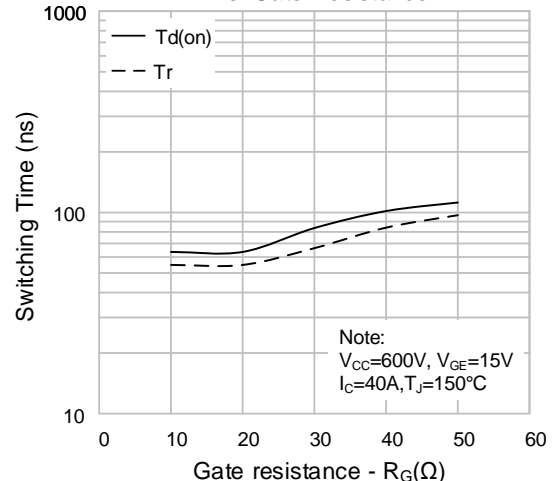
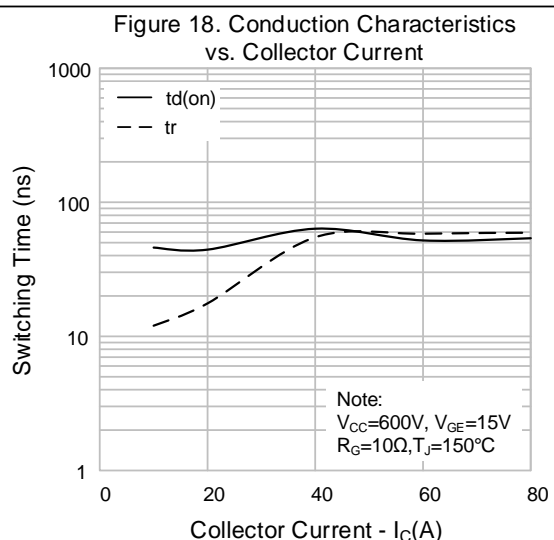
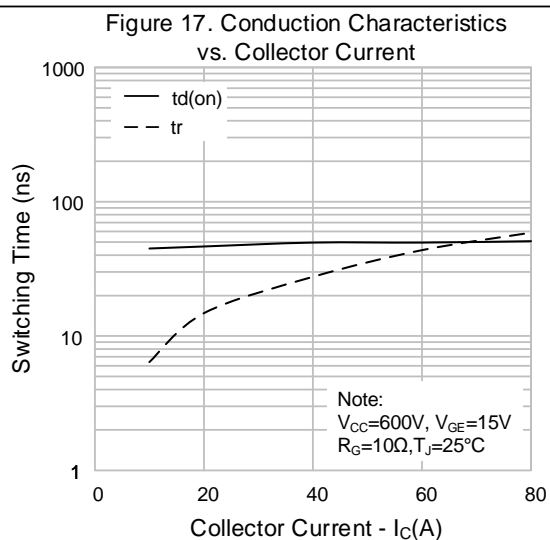
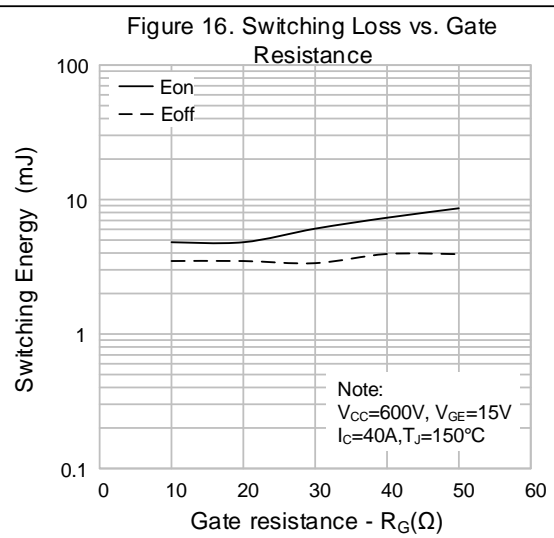
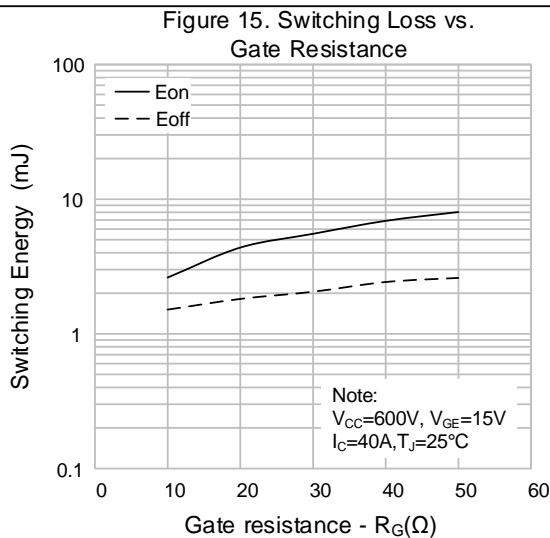
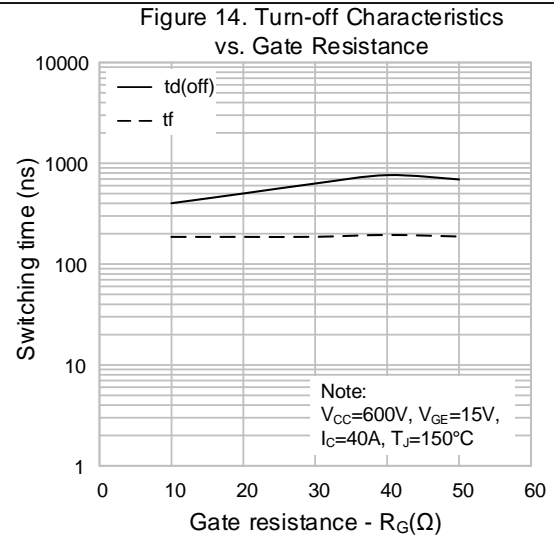
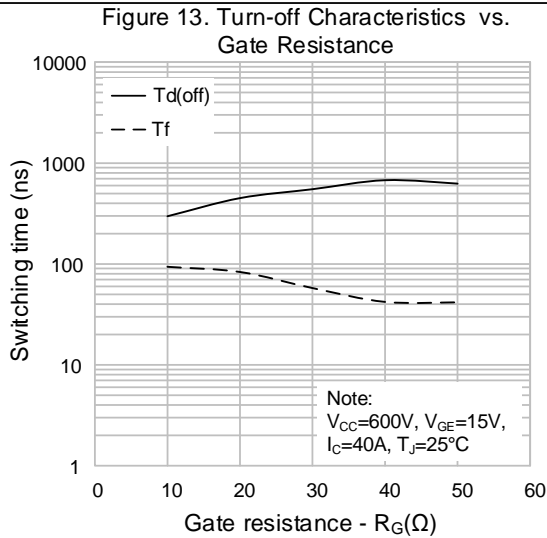


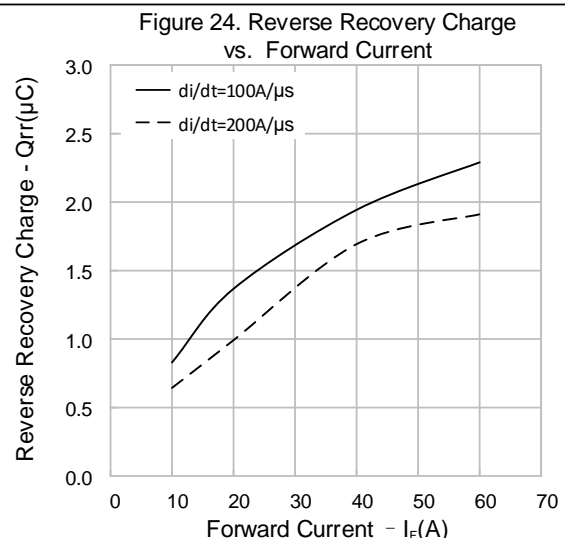
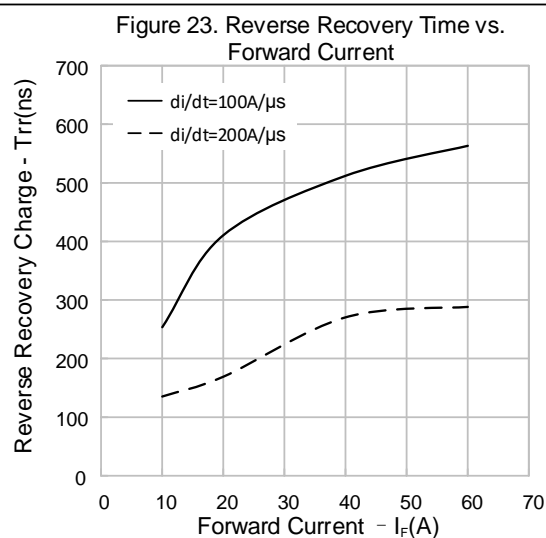
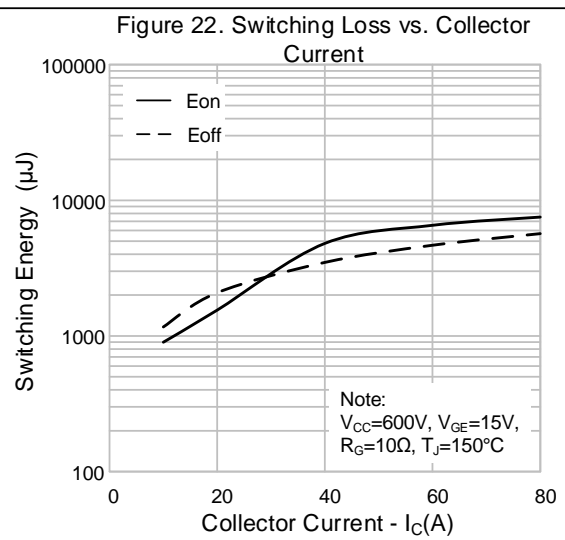
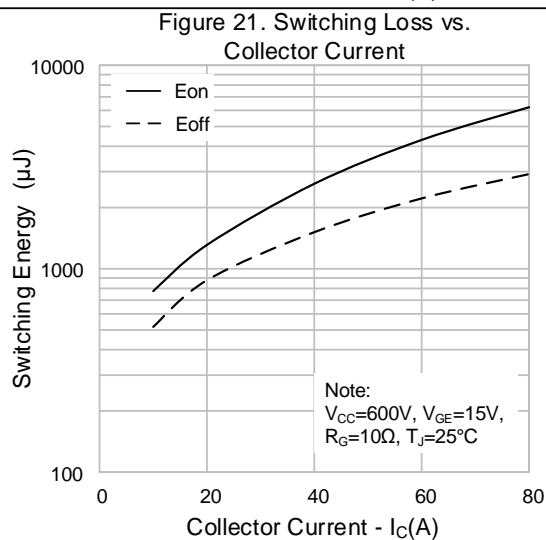
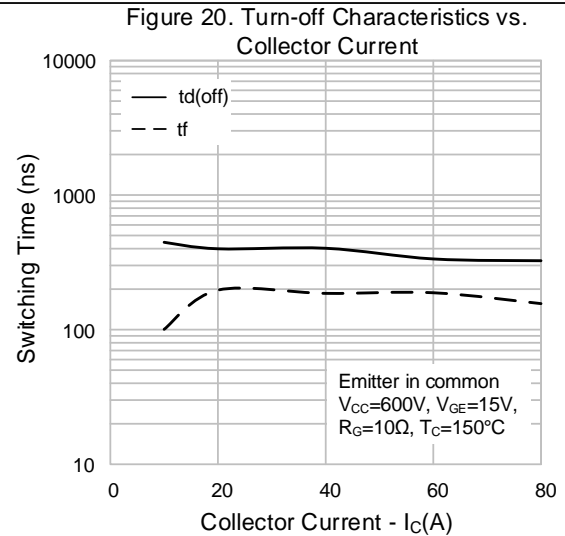
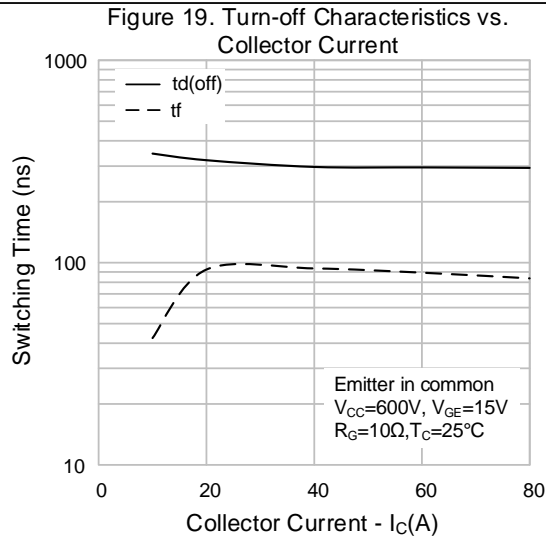
Figure 12. Turn-on Characteristics vs. Gate Resistance



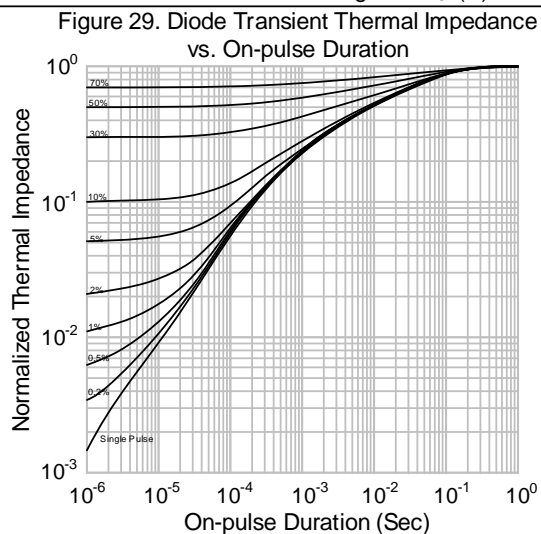
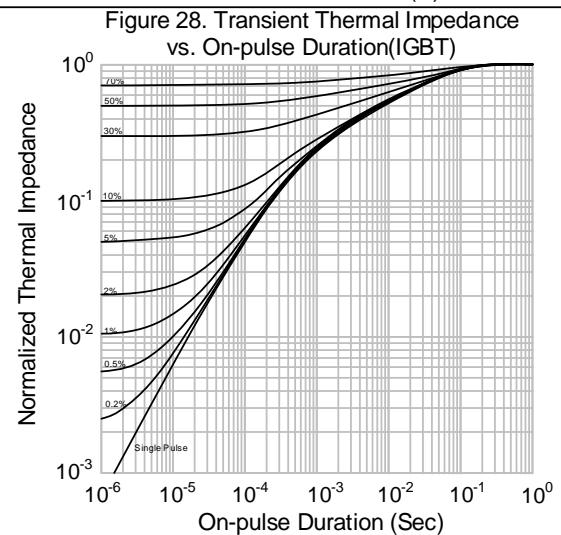
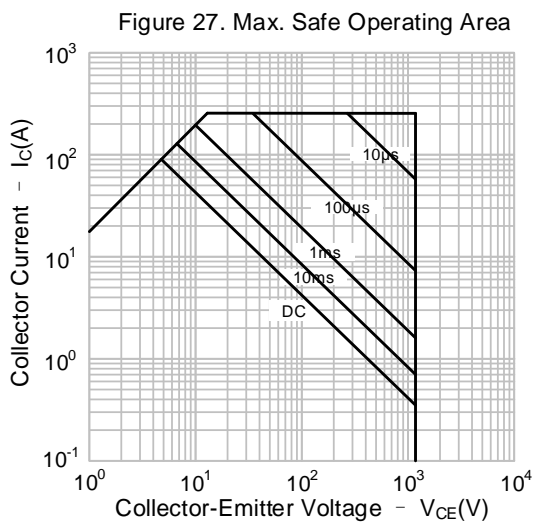
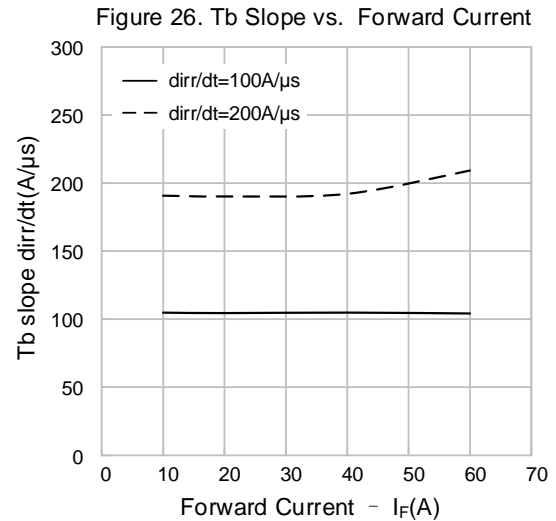
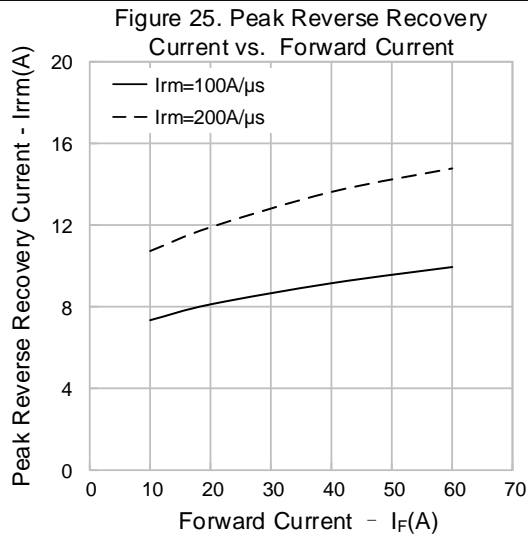
TYPICAL CHARACTERISTICS (CONTINUED)



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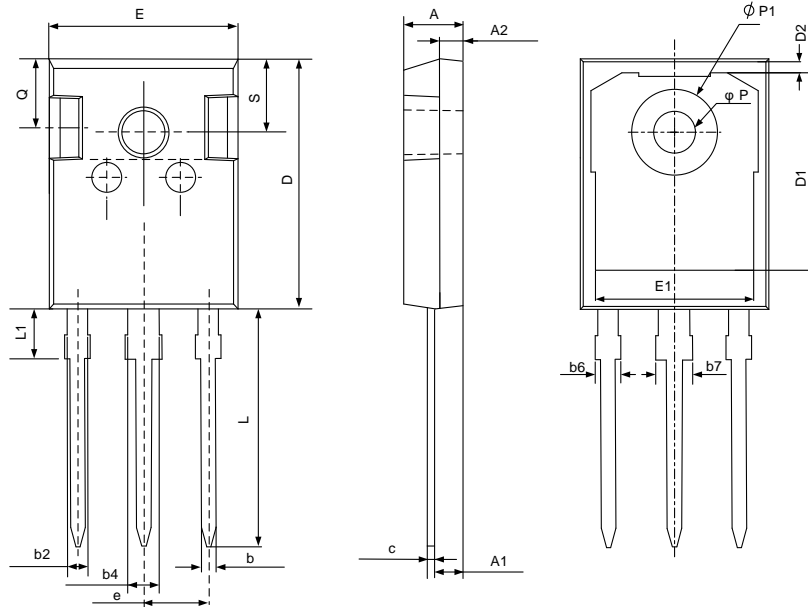
TYPICAL CHARACTERISTICS (CONTINUED)



PACKAGE OUTLINE

TO-247-3L

UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16	1.21	1.26
b2	1.96	—	2.06
b4	2.96	—	3.06
b6	—	—	2.25
b7	—	—	3.25
c	0.59	0.61	0.66
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.20	1.35
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
e	5.44BSC		
L	19.80	19.92	20.10
L1	—	—	4.30
Q	5.60	5.80	6.00
P	3.40	—	3.70
P1	7.00	—	7.40
S	6.15BSC		



IGBT DEVICES OPERATE NOTES:

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the IGBT electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- IGBT devices should be packed in antistatic/conductive containers for transportation.

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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Rev.: 1.2

Revision History:

1. Update features
 2. Update some parameter names
-

Rev.: 1.1

Revision History:

1. Update package outline
-

Rev.: 1.0

Revision History:

1. First release
-
-