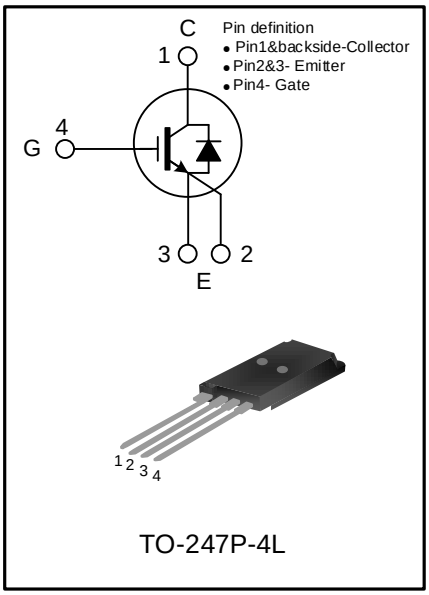
140A, 1200V FIELD STOP IGBT

DESCRIPTION

The SGTP140V120FDB7PW4 field stop IGBT adopts Silan Field Stop 5+ technology. It features low conduction loss and switching loss, is applicable to photovoltaic, UPS, SMPS and PFC fields.



FEATURES

- 140A, 1200V, $V_{CE(sat)(typ.)}$=1.6V@I_C=140A
- Low conduction loss
- Fast switching
- High input impedance
- T_{Jmax}=175°C

NOMENCLATURE

SGT P 140 V 120 F D B 7 PW4

IGBT series
Industrial grade
Current,
75: 75A

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,
65:650V
120: 1200V

Package PW4: TO-247P-4L
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
SGTP140V120FDB7PW4	TO-247P-4L	P140V120FDB7	Halogen free	Tube

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

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	175	A
	T_C=100°C		154	
Pulsed Collector Current		I_{CM}	560	A
Diode Forward Current	T_C=25°C	I_F	170	A
	T_C=91°C		140	
Diode Pulse Current		I_{FM}	560	A
Power Dissipation (T_C=25°C)		P_{tot}	833	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)	$R_{th(j-C)}$	--	--	--	0.18	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{th(j-C)}$	--	--	--	0.30	°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 (T_J=25°C, UNLESS OTHERWISE NOTED)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Collector- emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=1mA	1200	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE}=1200V, V_{GE}=0V	--	--	40	μA
Gate-emitter Leakage Current	I_{GES}	V_{GE}=20V, V_{CE}=0V	--	--	±100	nA
Gate-emitter Threshold Voltage	$V_{GE(th)}$	I_C=1mA, V_{CE}=V_{GE}	4.2	5.4	6.8	V
Collector-emitter Saturation Voltage	V_{CEsat}	I_C=140A, V_{GE}=15V, T_J=25°C	--	1.6	2.4	V
		I_C=140A, V_{GE}=15V, T_J=175°C	--	2.0	--	V
Input Capacitance	C_{ies}	V_{CE}=30V V_{GE}=0V f=1MHz	--	19007	--	pF
Output Capacitance	C_{oes}		--	354	--	
Reverse Transfer Capacitance	C_{res}		--	97	--	
Turn-on Delay Time	$T_{d(on)}$	V_{CE}=600V I_C=140A R_g=5.0Ω V_{GE}=15V Inductive load T_J=25°C	--	49	--	ns
Rise Time	T_r		--	28	--	
Turn-off Delay Time	$T_{d(off)}$		--	380	--	
Fall Time	T_f		--	61	--	
Turn-on Energy	E_{on}		--	8.74	--	mJ
Turn-off Energy	E_{off}		--	2.66	--	
Total Switching Energy	E_{st}		--	11.40	--	
Turn-on Delay Time	$T_{d(on)}$	V_{CE}=600V I_C=70A R_g=5.0Ω V_{GE}=15V Inductive load T_J=25°C	--	45	--	ns
Rise Time	T_r		--	19	--	
Turn-off Delay Time	$T_{d(off)}$		--	411	--	
Fall Time	T_f		--	55	--	
Turn-on Energy	E_{on}		--	4.23	--	mJ
Turn-off Energy	E_{off}		--	1.57	--	
Total Switching Energy	E_{st}		--	5.80	--	
Total Gate Charge	Q_g	V_{CE}=600V, I_C=140A, V_{GE}=15V	--	908	--	nC
Gate to Emitter Charge	Q_{ge}		--	118	--	
Gate to Collector Charge	Q_{gc}		--	382	--	

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

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	I_F=140A, T_J=25°C	--	3.0	3.8	V
		I_F=140A, T_J=175°C	--	2.4	--	
Diode Reverse Recovery Time	T_{rr}	V_R=600V, I_F=140A, R_g=10Ω, T_J=25°C	--	131	--	ns
Diode Reverse Recovery Charge	Q_{rr}		--	3.3	--	μC
Diode Peak Reverse Recovery Current	I_{rrm}		--	34	--	A
Diode Reverse Recovery Energy	E_{rec}		--	1.46	--	mJ

ELECTRICAL CHARACTERISTICS OF IGBT (T_J=175°C)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Turn-on Delay Time	$T_{d(on)}$	V_{CE}=600V I_C=140A R_g=5.0Ω V_{GE}=15V Inductive load T_J=175°C	--	46	--	ns
Rise Time	T_r		--	30	--	
Turn-off Delay Time	$T_{d(off)}$		--	434	--	
Fall Time	T_f		--	100	--	
Turn-on Energy	E_{on}		--	9.86	--	mJ
Turn-off Energy	E_{off}		--	4.75	--	
Total Switching Energy	E_{st}		--	14.61	--	
Turn-on Delay Time	$T_{d(on)}$	V_{CE}=600V I_C=70A R_g=5.0Ω V_{GE}=15V Inductive load T_J=175°C	--	42	--	ns
Rise Time	T_r		--	22	--	
Turn-off Delay Time	$T_{d(off)}$		--	476	--	
Fall Time	T_f		--	102	--	
Turn-on Energy	E_{on}		--	5.17	--	mJ
Turn-off Energy	E_{off}		--	3.04	--	
Total Switching Energy	E_{st}		--	8.21	--	

ELECTRICAL CHARACTERISTICS OF FRD(T_J=175°C, UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Diode Reverse Recovery Time	T_{rr}	V_R=600V, I_F=140A, R_g=10Ω, T_J=175°C	--	206	--	ns
Diode Reverse Recovery Charge	Q_{rr}		--	21.7	--	μC
Diode Peak Reverse Recovery Current	I_{rrm}		--	80	--	A
Diode Reverse Recovery Energy	E_{rec}		--	5.34	--	mJ

TYPICAL CHARACTERISTICS

Figure 1. Typical Output Characteristics

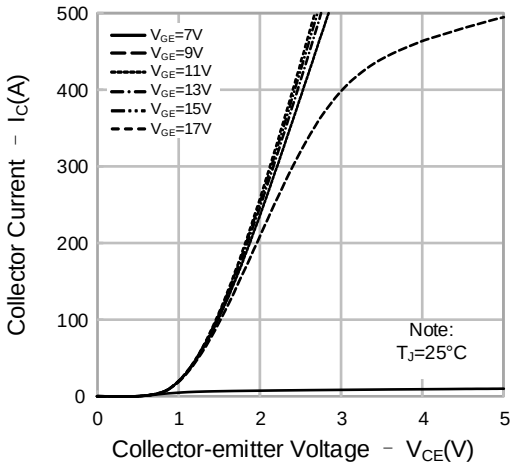


Figure 2. Typical Output Characteristics

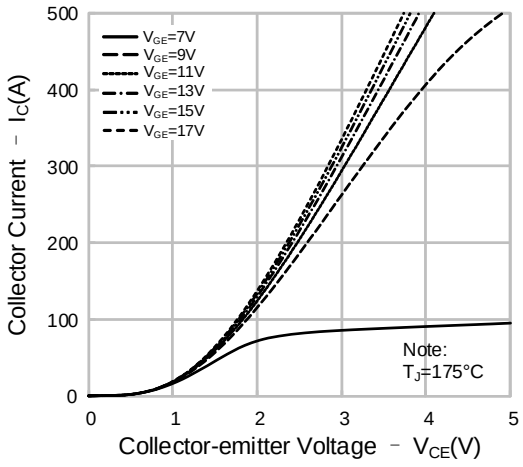


Figure 3. Typical Saturation Voltage Characteristics

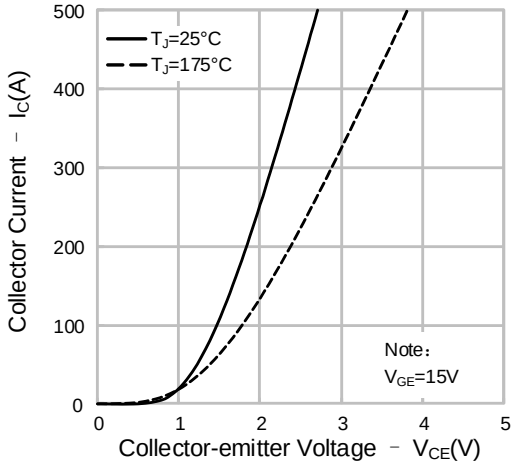


Figure 4. Transmission Characteristics

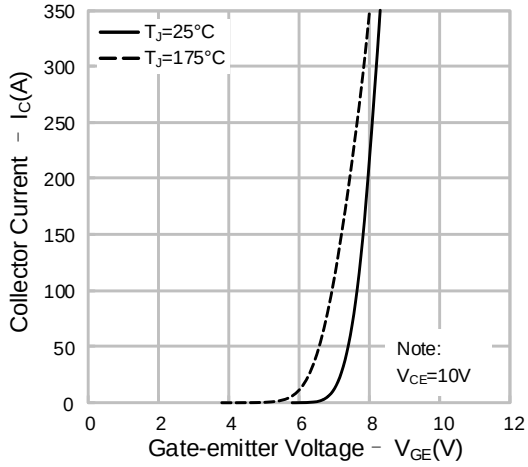


Figure 5. Saturation Voltage Drop vs. V_{GE}

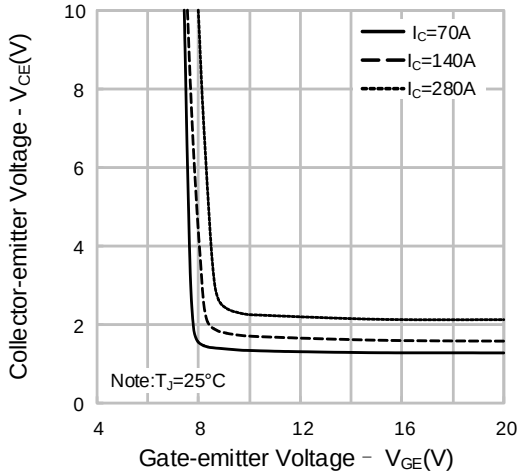
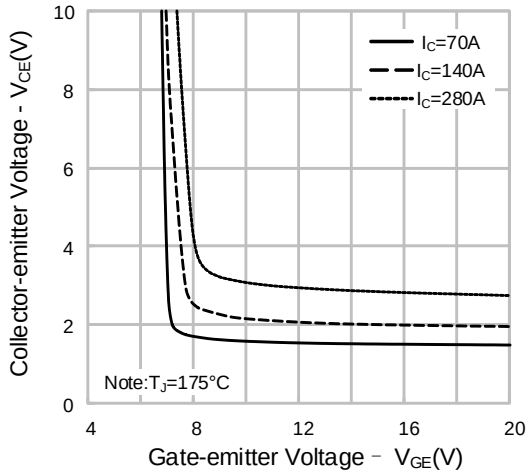


Figure 6. Saturation Voltage Drop vs. V_{GE}



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Saturation Voltage vs. Temperature

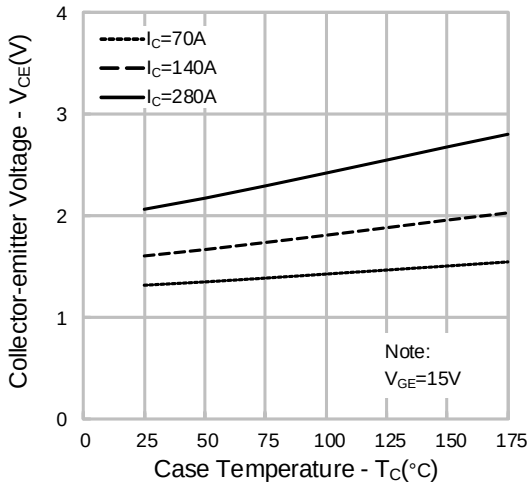


Figure 8. Capacitance Characteristics

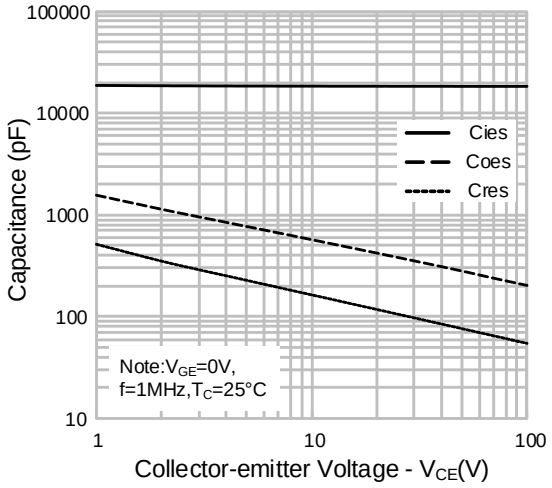


Figure 9. Gate Charge Characteristics

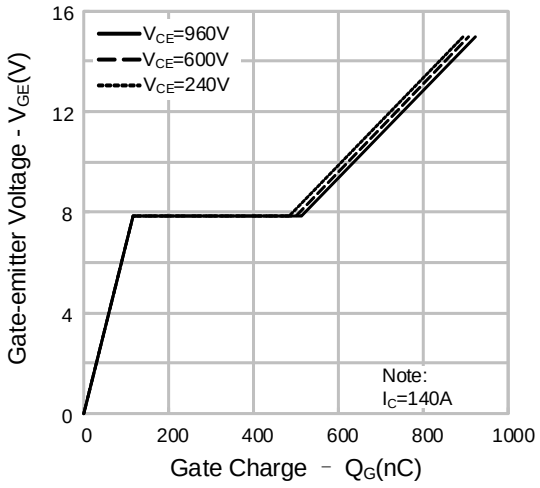


Figure 10. Forward Characteristics

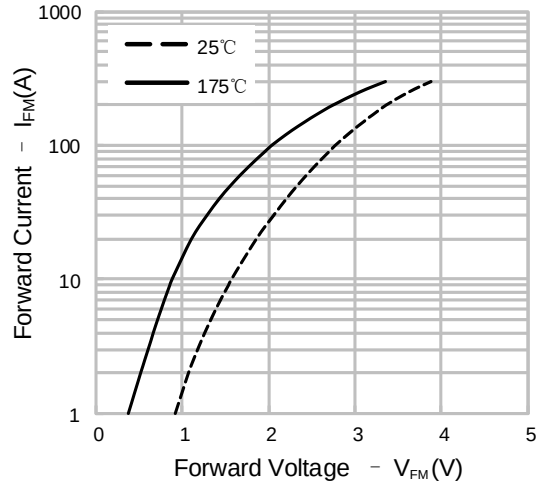


Figure 11. Turn-on Characteristics vs. Gate Resistance

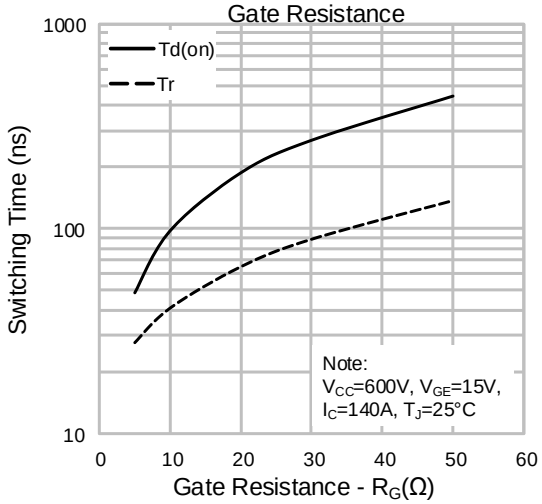
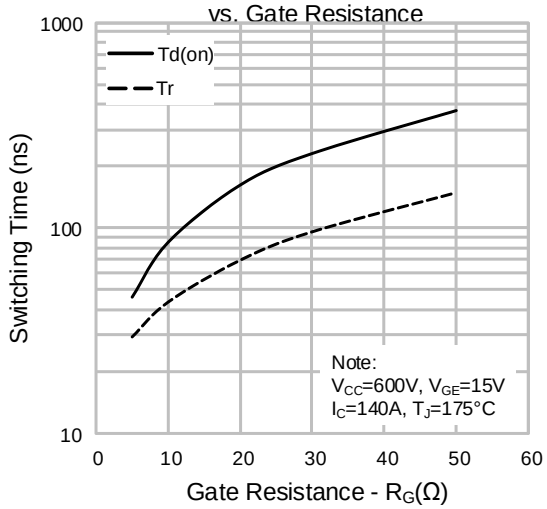


Figure 12. Turn-on Characteristics vs. Gate Resistance



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 13. Turn-off Characteristics vs. Gate Resistance

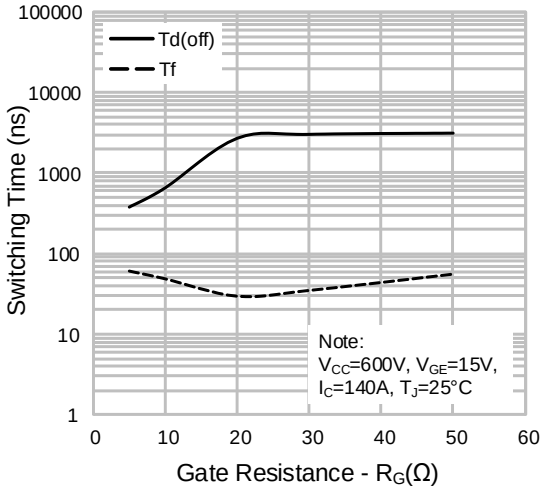


Figure 14. Turn-off Characteristics vs. Gate Resistance

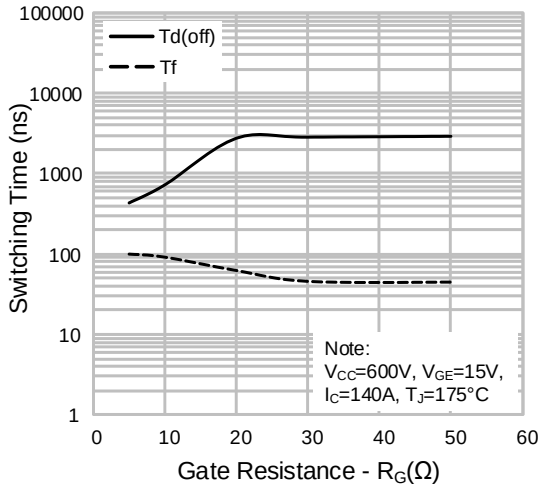


Figure 15. Switching Loss vs. Gate Resistance

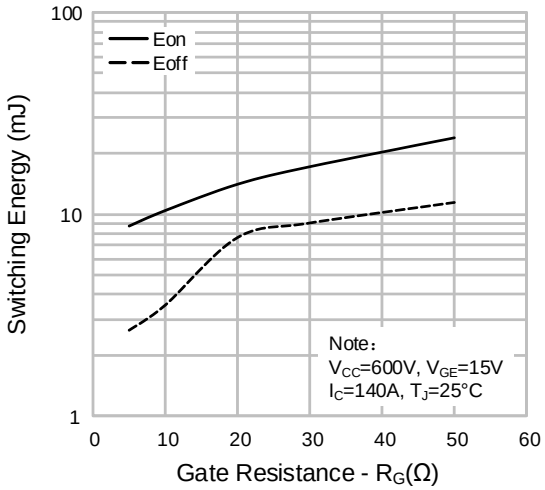


Figure 16. Switching Loss vs. Gate Resistance

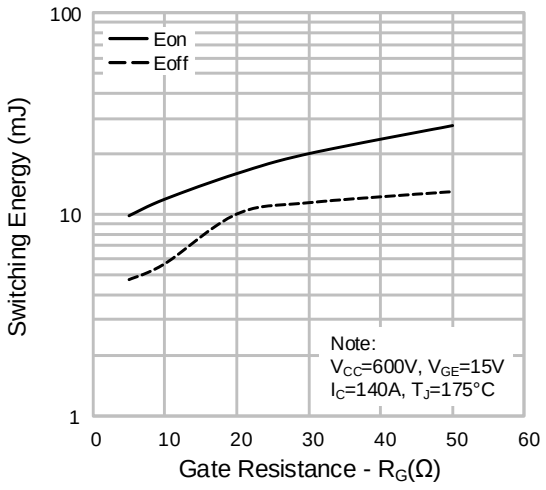


Figure 17. Conduction Characteristics vs. Collector Current

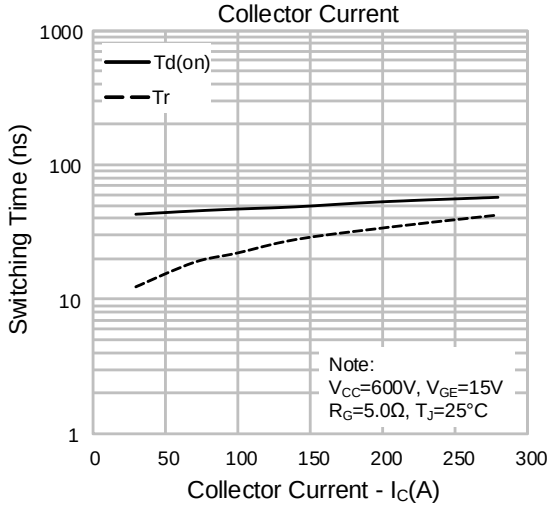
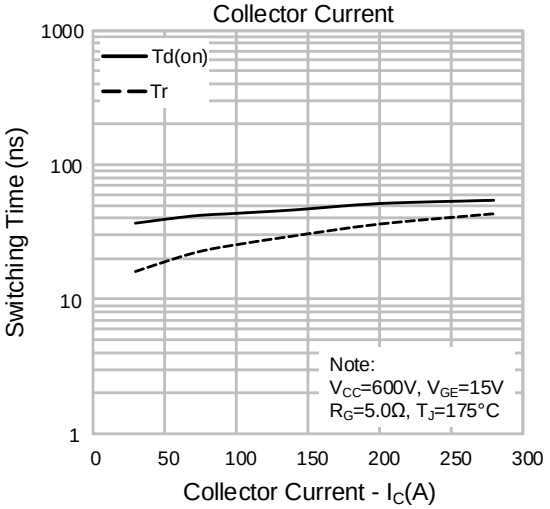


Figure 18. Conduction Characteristics vs. Collector Current



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 19. Turn-off Characteristics vs. Collector Current

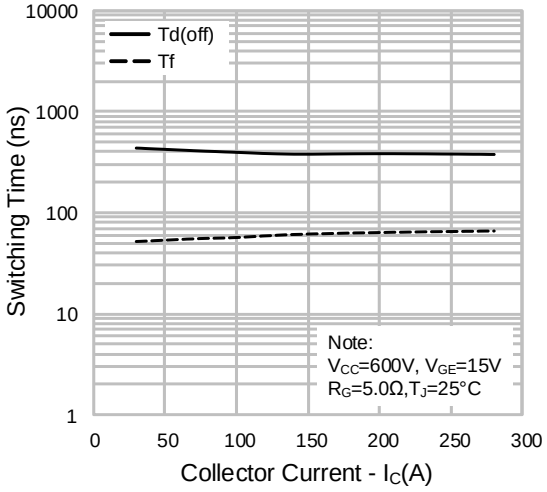


Figure 20. Turn-off Characteristics vs. Collector Current

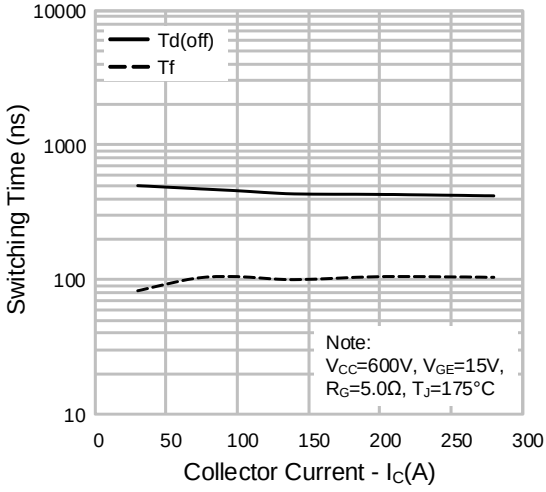


Figure 21. Switching Loss vs. Collector Current

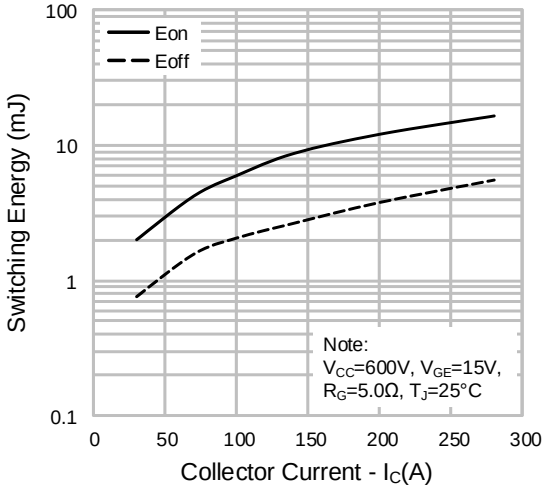


Figure 22. Switching Loss vs. Collector Current

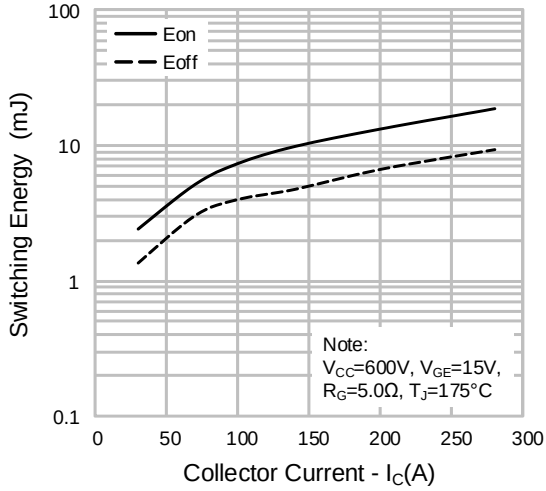


Figure 23. Current Slope vs. Gate Resistance

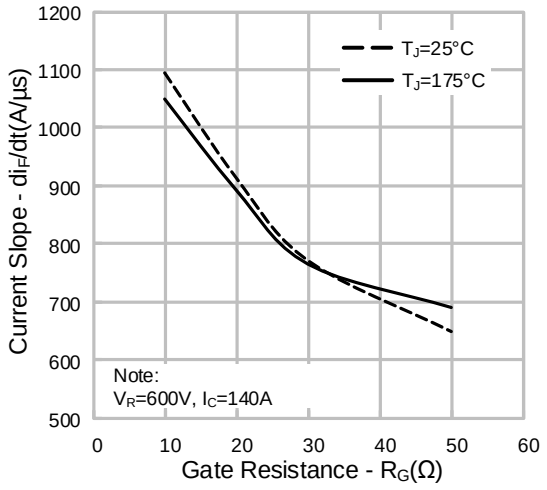
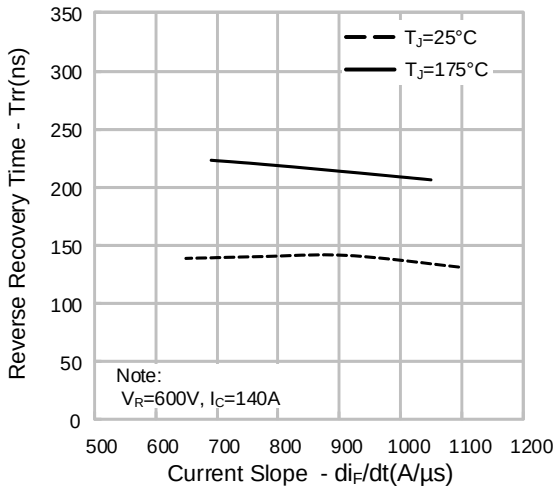


Figure 24. Reverse Recovery Time vs. Current Slope



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 25. Reverse Recovery Charge vs. Current Slope

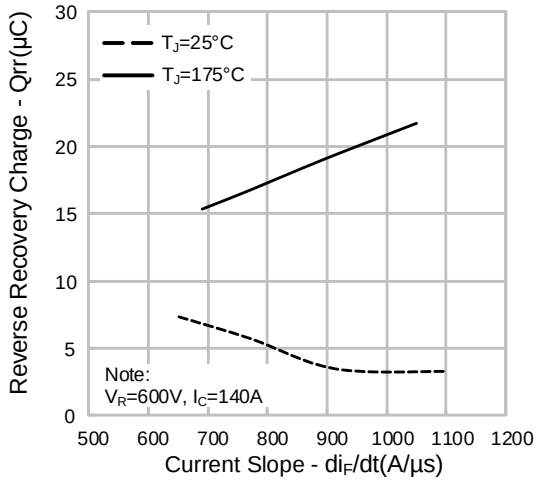


Figure 26. Peak Reverse Recovery Current vs. Current Slope

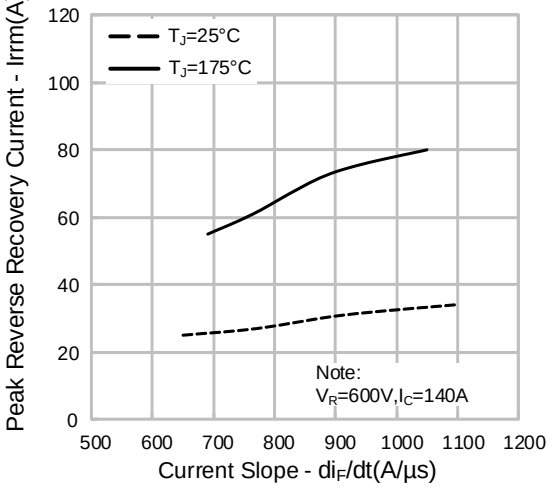


Figure 27. Reverse Recovery Energy vs. Current Slope

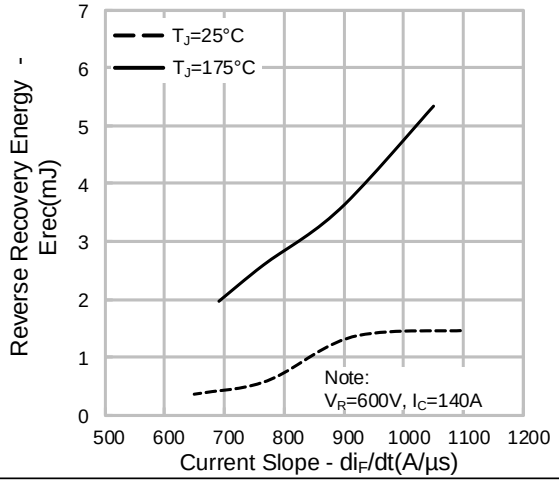


Figure 28. Safe Operating Area

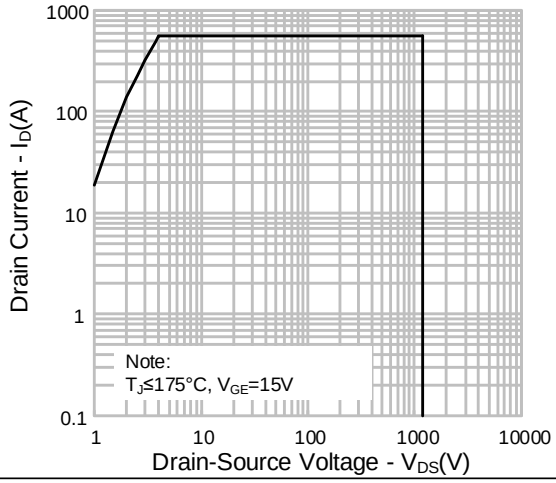


Figure 29. Transient Thermal Impedance vs. On-pulse Duration (IGBT)

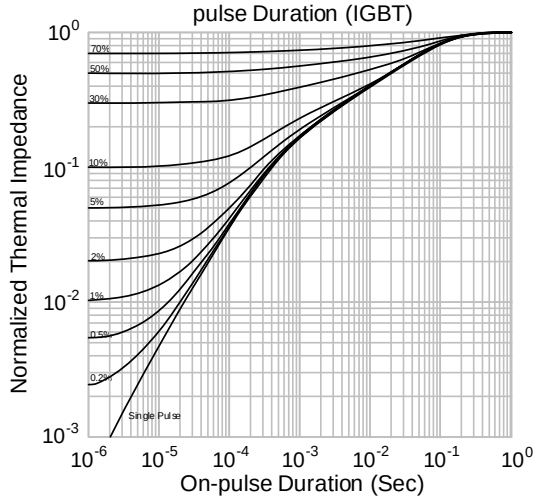
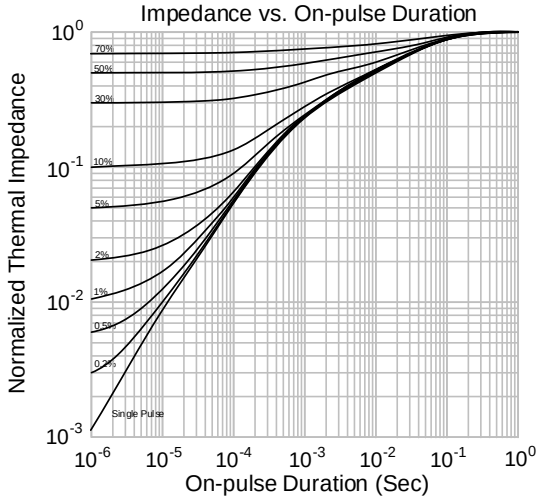
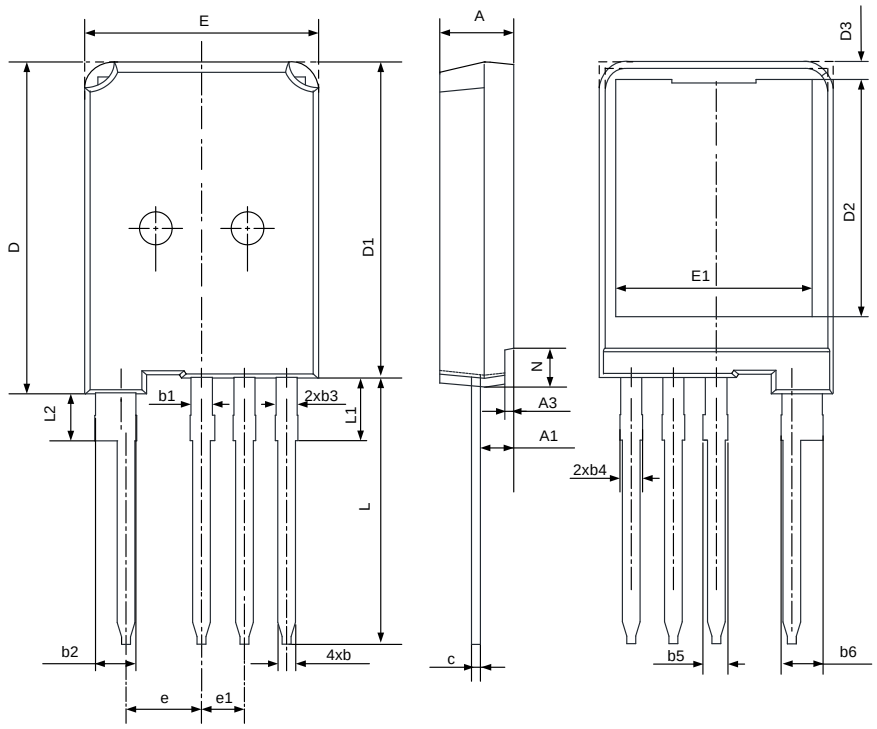


Figure 30. Diode Transient Thermal Impedance vs. On-pulse Duration



PACKAGE OUTLINE

TO-247P-4L **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A3	0.80	0.90	1.00
b	1.16	—	1.29
b1	1.36	—	1.49
b2	2.16	—	2.29
b3	1.16	—	1.29
b4	—	—	1.45
b5	—	—	1.65
b6	—	—	2.40
c	0.59	0.625	0.66
D	22.30	22.40	22.50
D1	20.90	21.00	21.10
D2	15.95	16.25	16.55
D3	1.00	1.17	1.35
e	5.080 BSC		
e1	2.540 BSC		
E	15.70	15.80	15.90
E1	13.06	13.26	13.50
L	19.80	19.92	21.00
L1	3.90	4.10	4.30
L2	2.55	2.70	2.85
N	3.24	3.34	3.44

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.
3. It is neither tested nor verified in accordance with AEC-Q series standards testing or application requirements. Silan does not give any warranties as to the suitability of the Silan's product for any specific use. The design intent, design definition and design of the product are not intended for application (the application stated in this instruction includes use, etc.) in transportation equipment, medical equipment, life-saving equipment, aerospace equipment, non-civil equipment or non-civil use, etc. (the equipment stated in this instruction includes systems, devices, etc., all referred to as equipment).The product should not be used in any equipment or system whose manufacture, use or sale is prohibited under any applicable laws or regulations("unintended use"). If the product is used for unintended use, therefore the full risks of such products application are borne by the customer and Silan assumes no liability for the product used for the unintended use. If the customer intends to use the Silan's product in a application where malfunction or failure can be reasonably be expected to result in personal injury, or serious property, or environment damage, the customer shall make adequate assessment, testing and verification, and Silan shall not be liable for such applications.
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1. First release