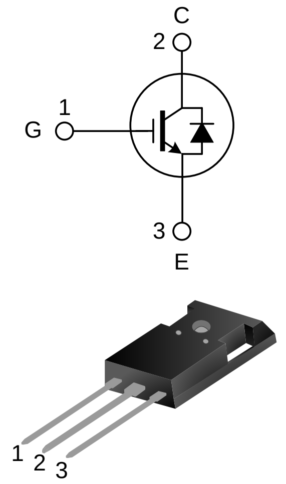
50A, 650V FIELD STOP IGBT

DESCRIPTION

The SGTP50V65SDB1P7 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.

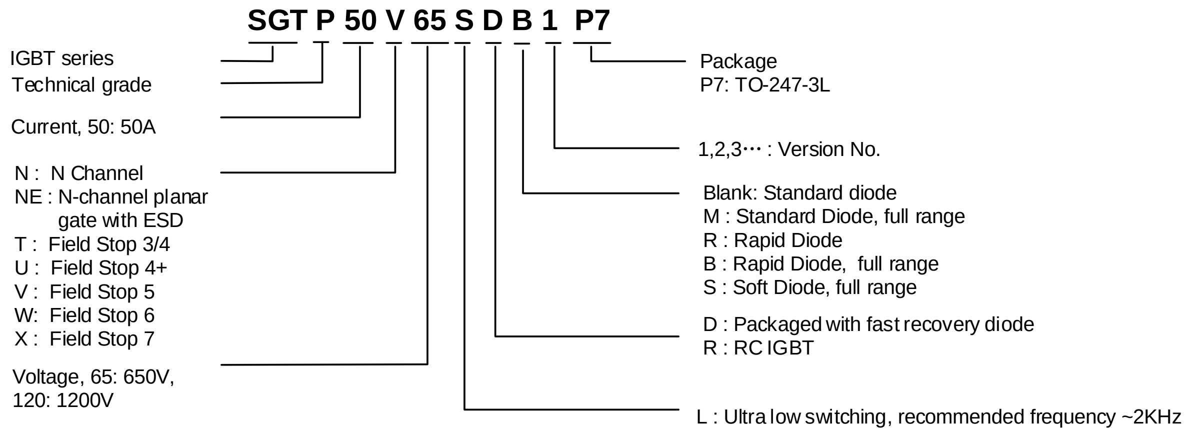
FEATURES

- 50A, 650V, $V_{CE(sat)(typ.)}$=1.45V@I_C=50A
- Low conduction loss
- Ultra-fast switching
- High input impedance
- T_{Jmax}=175°C



TO-247-3L

NOMENCLATURE



SGT P 50 V 65 S D B 1 P7

IGBT series
Technical grade
Current, 50: 50A
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
P7: 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 : Soft Diode, full range

D : Packaged with fast recovery diode
R : RC IGBT

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 frequency10~60KHz
UF : Ultra fast switching, recommended frequency 40KHz~

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SGTP50V65SDB1P7	TO-247-3L	P50V65SDB1	Halogen free	Tube

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

Characteristics		Symbol	Ratings	Unit
Collector to Emitter Voltage		V_{CE}	650	V
Gate to Emitter Voltage		V_{GE}	±20	V
Transient Gate to Emitter Voltage (t_p≤10µs, D<0.010)		V_{GE}	±30	V
Collector Current	T_C=25°C	I_C	100	A
	T_C=100°C		50	
Pulsed Collector Current		I_{CM}	150	A
Diode Current	T_C=25°C	I_F	100	A
	T_C=100°C		50	A
Pulsed Diode Current		I_{FM}	150	A
Power Dissipation (T_C=25°C)		P_D	273	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)	$R_{\theta JC}$	--	--	--	0.55	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{\theta JC}$	--	--	--	0.65	°C/W
Thermal Resistance, Junction to Ambient (IGBT)	$R_{\theta JA}$	--	--	--	40	°C/W
Soldering Temperature (in line)	T_{sold}	15^{+2}_{-0} sec, 1time	--	--	260	°C

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

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Collector to Emitter Breakdown Voltage	BV_{CE}	V_{GE}=0V, I_C=250µA	650	--	--	V
C-E Leakage Current	I_{CES}	V_{CE}=650V, V_{GE}=0V	--	--	50	µA
G-E Leakage Current	I_{GES}	V_{GE}=20V, V_{CE}=0V	--	--	±100	nA
G-E Threshold Voltage	$V_{GE(th)}$	I_C=250uA, V_{CE}=V_{GE}	3.2	4.0	4.8	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=50A, V_{GE}=15V, T_C=25°C	--	1.45	1.9	V
		I_C=50A, V_{GE}=15V, T_C=175°C	--	1.65	--	V
Input Capacitance	C_{ies}	V_{CE}=30V V_{GE}=0V f=1MHz	--	3492	--	pF
Output Capacitance	C_{oes}		--	87	--	
Reverse Transfer Capacitance	C_{res}		--	13	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V I_C=50A R_g=10Ω V_{GE}=15V inductive load T_C=25°C	--	30	--	ns
Rise Time	T_r		--	27	--	
Turn-Off Delay Time	$T_{d(off)}$		--	201	--	
Fall Time	T_f		--	27	--	
Turn-On Switching Loss	E_{on}		--	0.48	--	mJ
Turn-Off Switching Loss	E_{off}		--	0.70	--	
Total Switching Loss	E_{st}		--	1.18	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V I_C=25A R_g=10Ω V_{GE}=15V inductive load T_C=25°C	--	28	--	ns
Rise Time	T_r		--	16	--	
Turn-Off Delay Time	$T_{d(off)}$		--	217	--	
Fall Time	T_f		--	28	--	
Turn-On Switching Loss	E_{on}		--	0.19	--	mJ
Turn-Off Switching Loss	E_{off}		--	0.37	--	
Total Switching Loss	E_{st}		--	0.56	--	
Total Gate Charge	Q_g	V_{CE}=520V, I_C=50A, V_{GE}=15V	--	132	--	nC
Gate to Emitter Charge	Q_{ge}		--	25	--	
Gate to Collector Charge	Q_{gc}		--	35	--	

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

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{FM}	I_F=50A, T_C=25°C	--	1.5	1.9	V
		I_F=50A, T_C=175°C	--	1.36	--	
Diode Reverse Recovery Time	T_{rr}	I_{ES}=50A, dI_{ES}/dt=200A/µs, V_R=50V, T_C=25°C	--	132	--	ns
Diode Reverse Recovery Charge	Q_{rr}		--	0.35	--	µC
Diode Reverse Recovery Current	I_{rm}		--	6.0	--	A

ELECTRICAL CHARACTERISTICS OF IGBT (UNLESS OTHERWISE NOTED, T_C=175°C)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V I_C=50A R_g=10Ω V_{GE}=15V inductive load T_C=175°C	--	35	--	ns
Rise Time	T_r		--	25	--	
Turn-Off Delay Time	$T_{d(off)}$		--	244	--	
Fall Time	T_f		--	34	--	
Turn-On Switching Loss	E_{on}		--	0.61	--	mJ
Turn-Off Switching Loss	E_{off}		--	1.20	--	
Total Switching Loss	E_{st}		--	1.81	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V I_C=25A R_g=10Ω V_{GE}=15V inductive load T_C=175°C	--	28	--	ns
Rise Time	T_r		--	15	--	
Turn-Off Delay Time	$T_{d(off)}$		--	273	--	
Fall Time	T_f		--	39	--	
Turn-On Switching Loss	E_{on}		--	0.22	--	mJ
Turn-Off Switching Loss	E_{off}		--	0.57	--	
Total Switching Loss	E_{st}		--	0.79	--	

TYPICAL CHARACTERISTICS

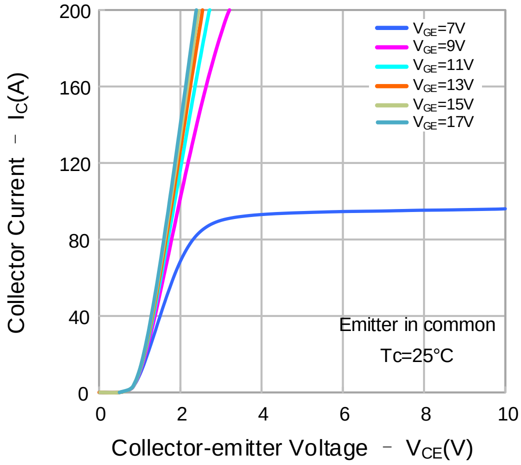


Figure 1. Typical Output Characteristics

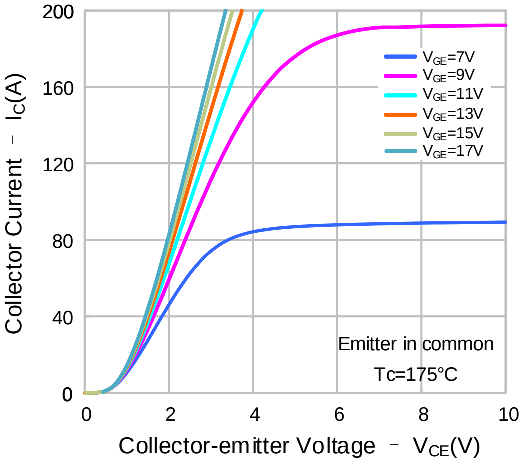


Figure 2. Typical Output Characteristics

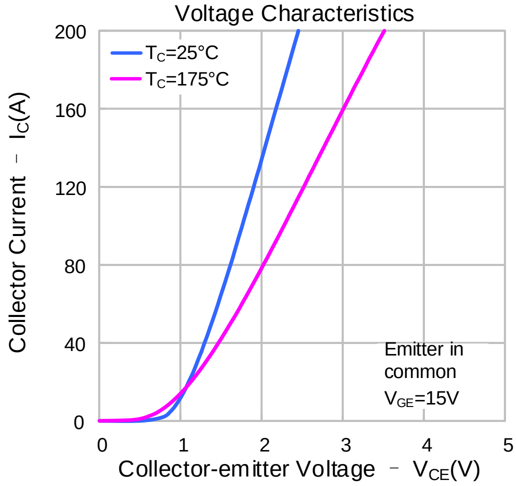


Figure 3. Typical Saturation Voltage Characteristics

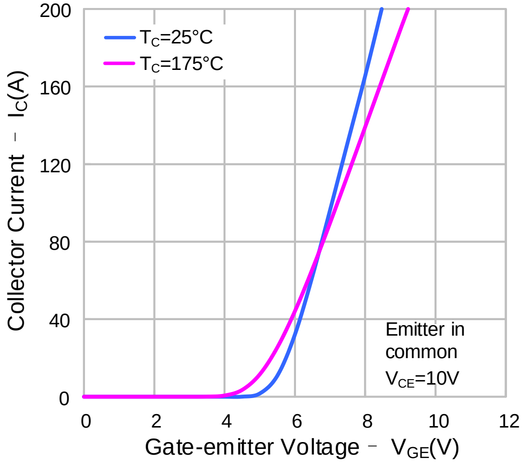


Figure 4. Transmission Characteristics

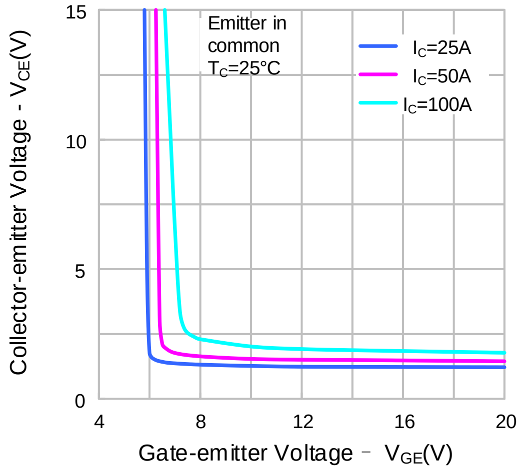


Figure 5. Saturation Voltage Drop vs. V_{GE}

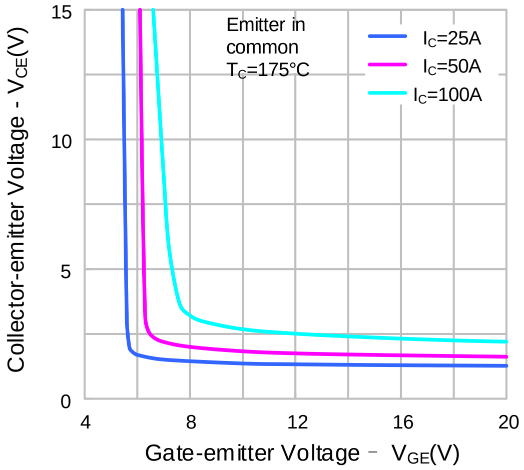


Figure 6. Saturation Voltage Drop vs. V_{GE}

TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Saturation Voltage Drop vs. Temperature

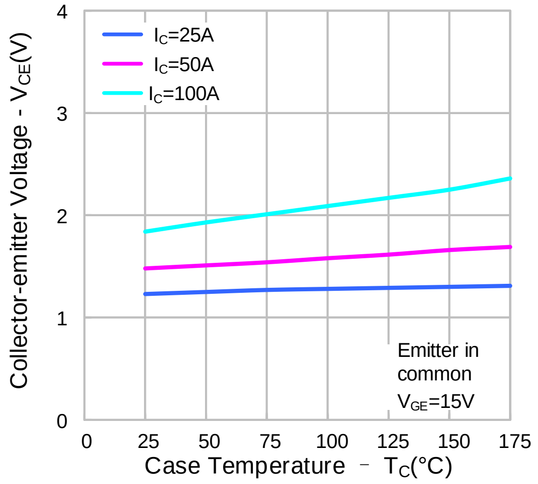


Figure 8. Capacitance Characteristics

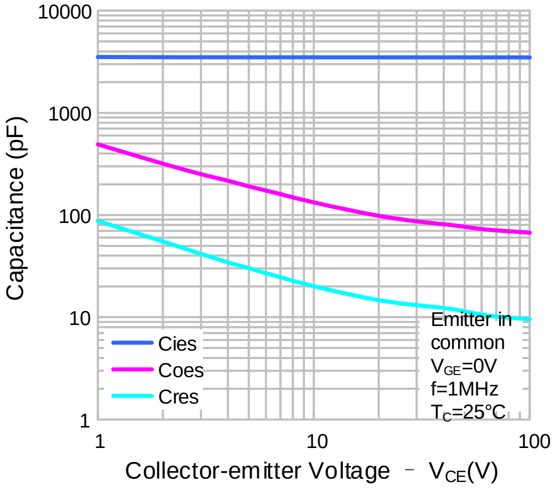


Figure 9. Gate Charge Characteristics

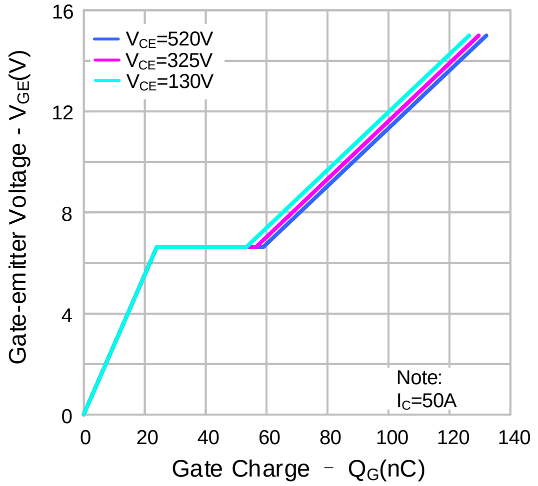


Figure 10. Forward Characteristics

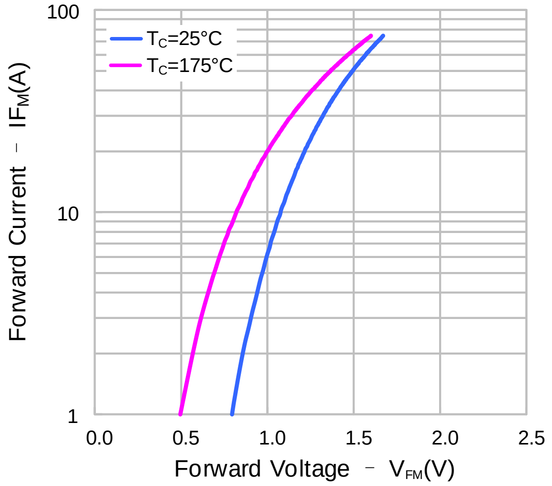


Figure 11. Turn-on Characteristics vs. Gate Resistance

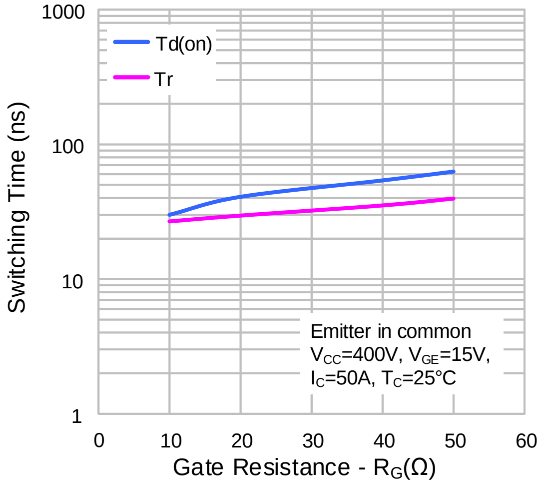
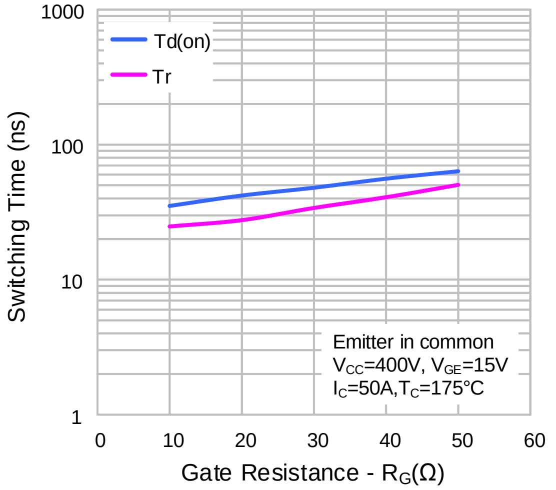


Figure 12. Turn-on Characteristics vs. Gate Resistance



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 13. Turn-off Characteristics vs. Gate Resistance

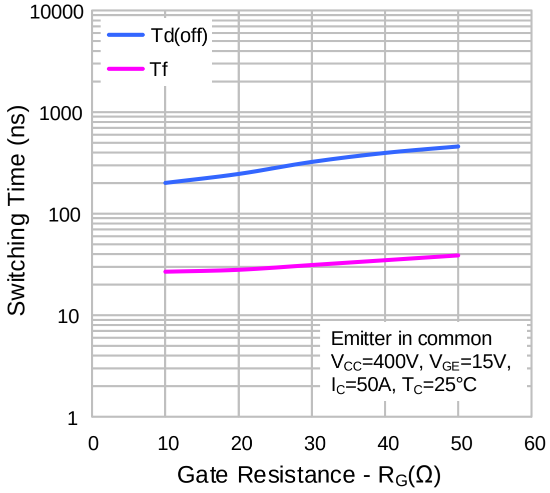


Figure 14. Turn-off Characteristics vs. Gate Resistance

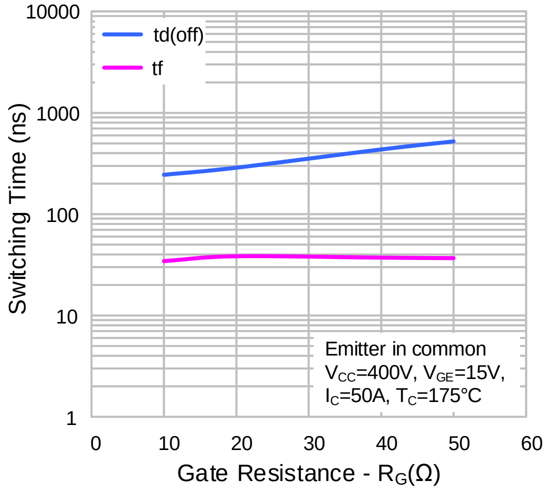


Figure 15. Switching Loss vs. Gate Resistance

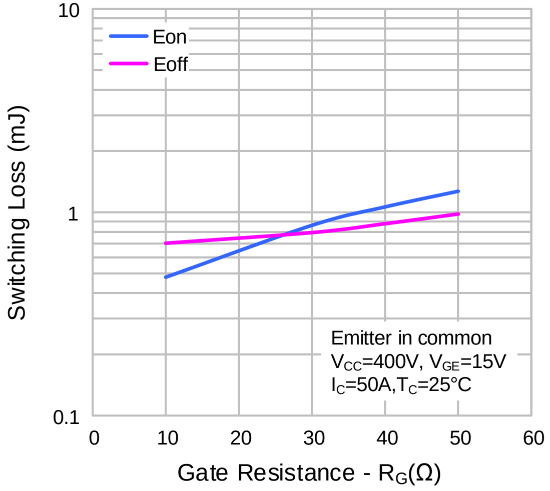


Figure 16. Switching Loss vs. Gate Resistance

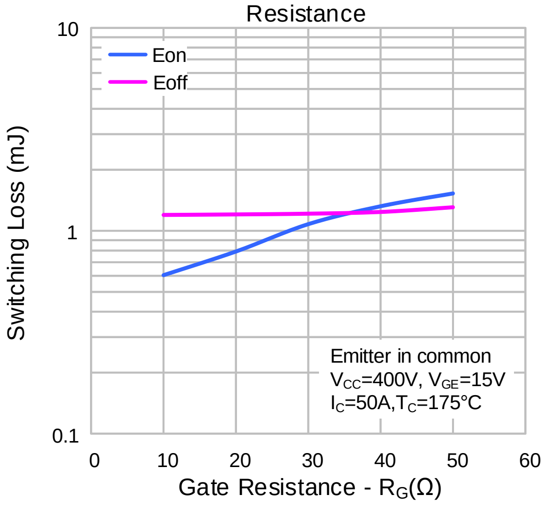


Figure 17. Turn-on Characteristics vs. Collector Current

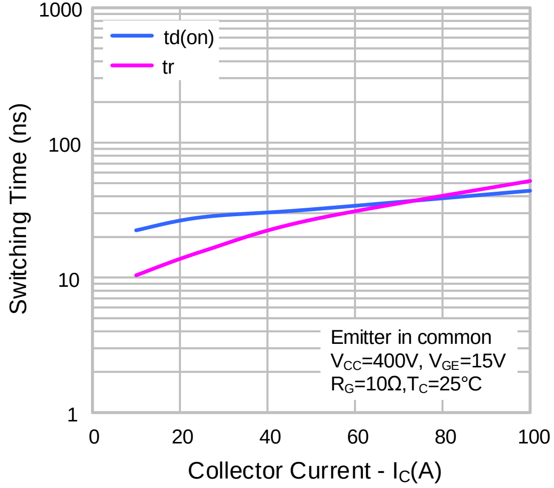
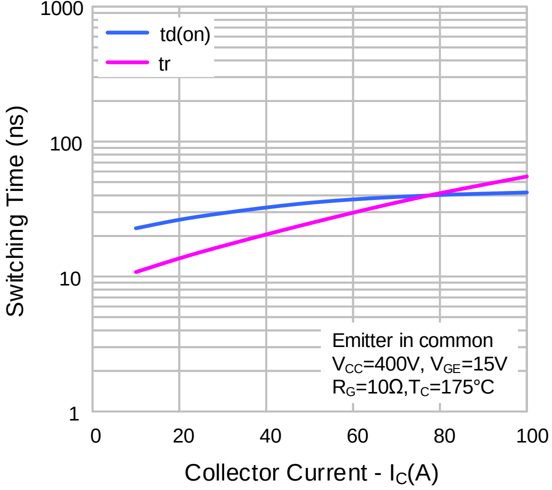


Figure 18. Turn-on Characteristics vs. Collector Current



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 19. Turn-off Characteristics vs. Collector Current

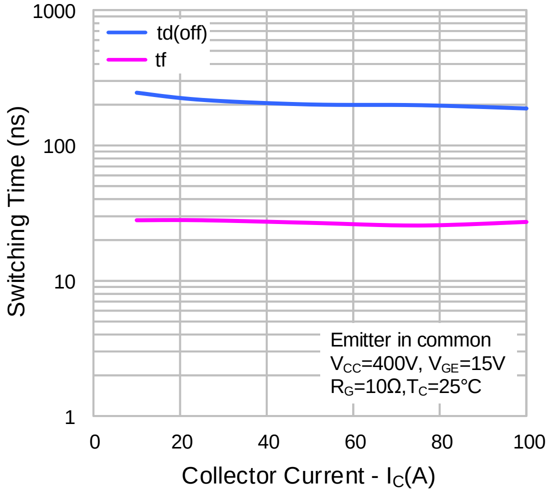


Figure 20. Turn-off Characteristics vs. Collector Current

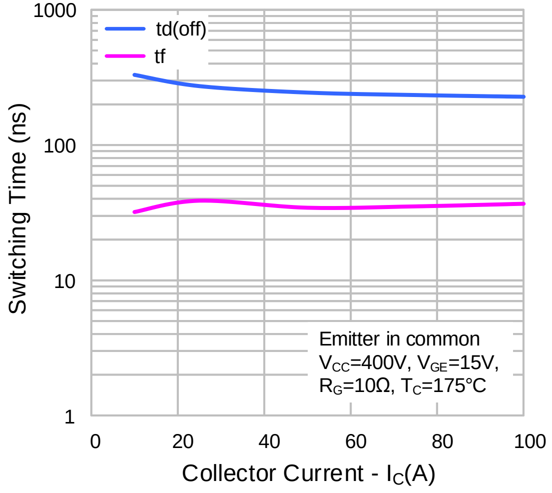


Figure 21. Switching Loss vs. Collector Current

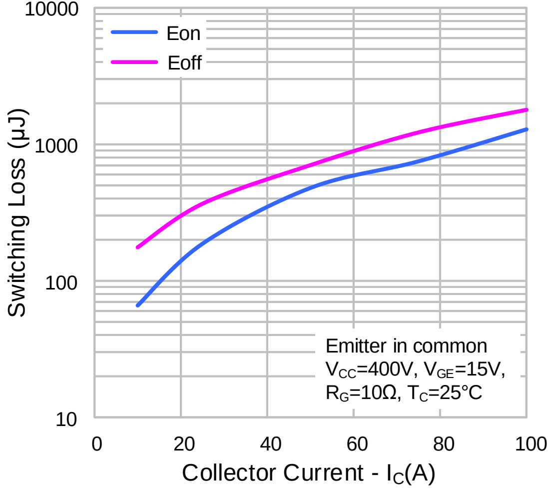


Figure 22. Switching Loss vs. Collector Current

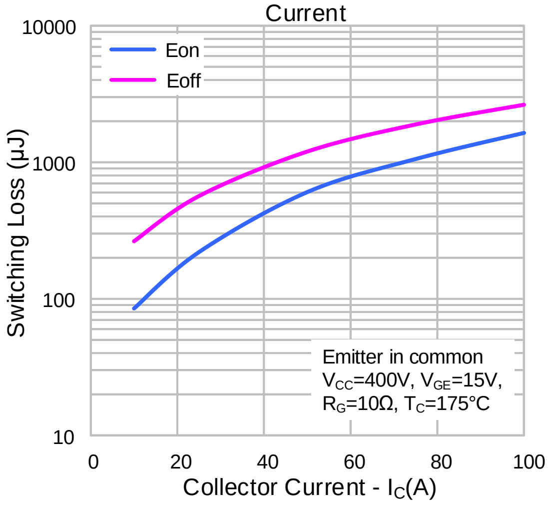


Figure 23. Reverse Recovery Time vs. Forward Current

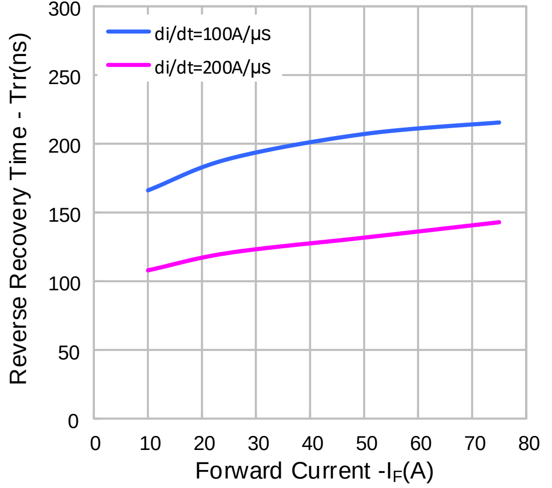
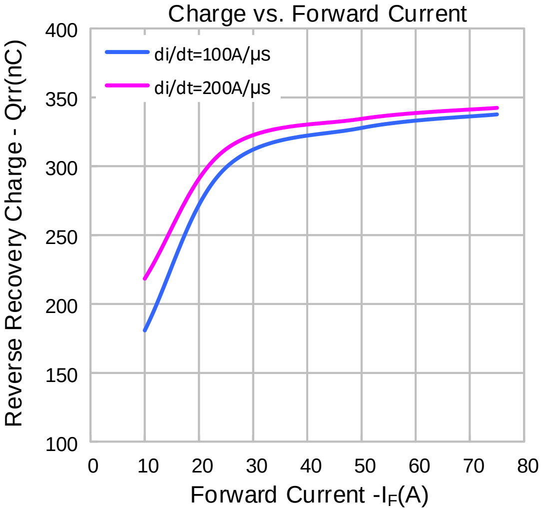


Figure 24. Reverse Recovery Charge vs. Forward Current



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 25. Reverse Recovery Current vs. Forward Current

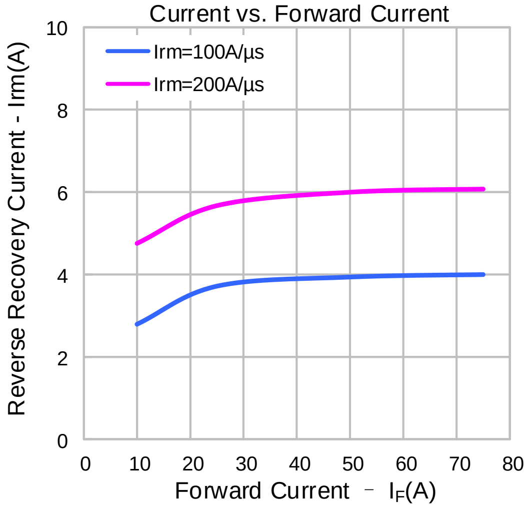


Figure 26. Tb Slope vs. Forward Current

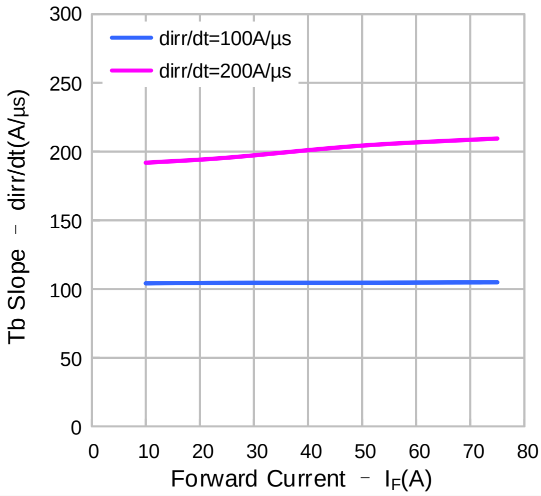


Figure 27. Max. Safe Operating Area

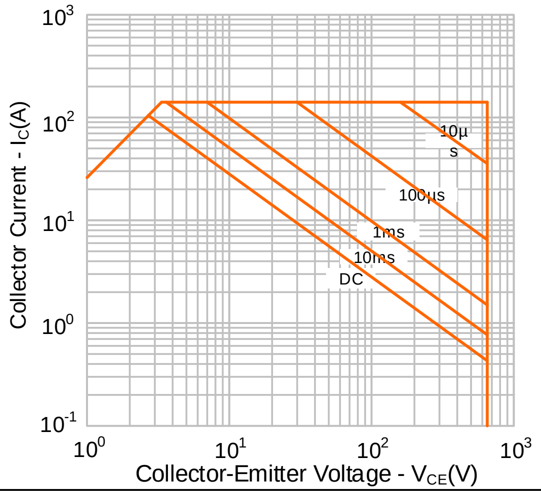


Figure 28. Transient Thermal Impedance vs. On-pulse Duration (IGBT)

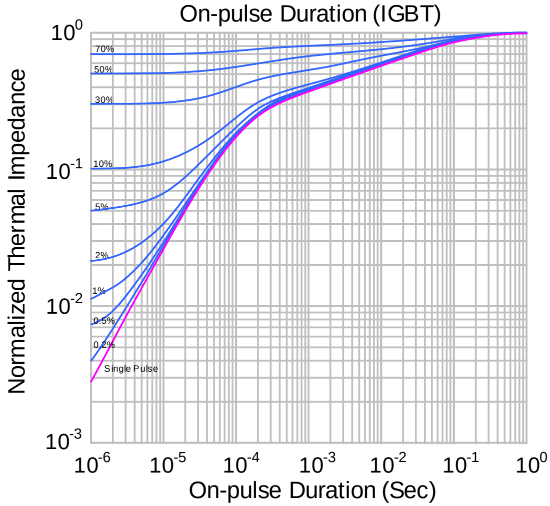
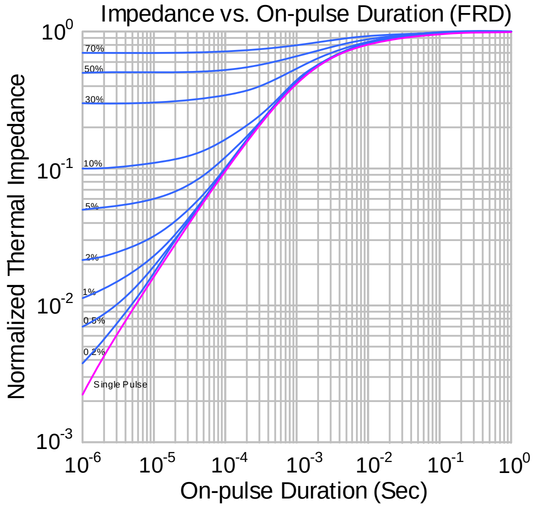
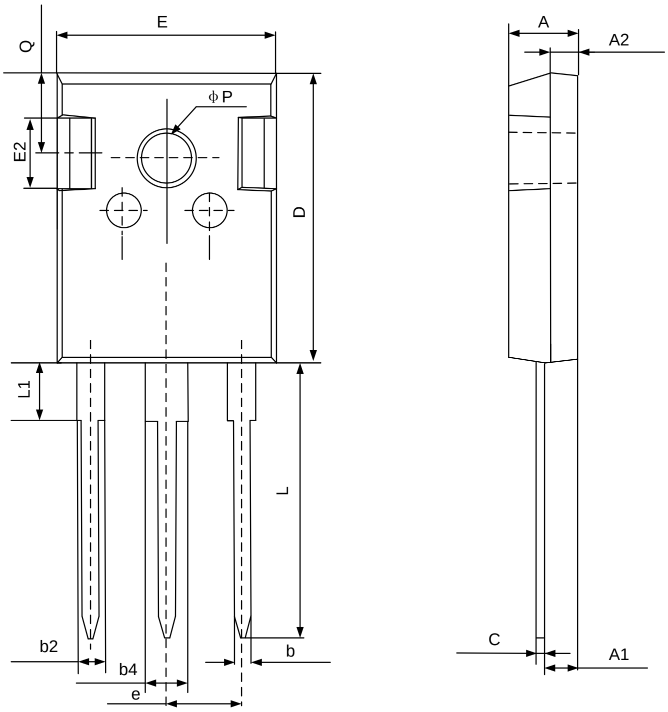


Figure 29. Transient Thermal Impedance vs. On-pulse Duration (FRD)



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

CAUTION
ELECTROSTATIC
SENSITIVE DEVICE
DO NOT OPEN OR HANDLE
EXPECT AT A STATIC-FREE
WORKSTATION

MOS DEVICES OPERATE NOTES:

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS 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.
- MOS 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.
4. The application of the product described in this instruction, the application manual of the product and related materials is for illustrative purposes only, and Silan makes no warranty that such application can be used directly without further testing, verification or modification. Silan is not responsible for any assistance in product application or customers' product design. Customer shall be responsible for the application of Silan's products and the design, manufacture and use of customers' products using Silan's products (in this document, "use products", "apply Silan's products", "product application" and "customers' products using Silan's products" are synonymous). It is the sole responsibility of the customer to take the following actions: 1) Verify and determine whether Silan's products are suitable for the customers' applications and customers' products; 2) All applicable standards of the customers' industry shall be complied with and fully tested and verified when applying Silan's product or using Silan's product to develop and design customers' products; 3) Although Silan is constantly committed to improve product's quality and reliability, semiconductor products have possibility to malfunction or fail in various application environments. Customers are responsible for complying with safety standards and for providing adequate designs and safeguards for customers' products using Silan's product to minimize risks and avoid situations in which a malfunction or failure could cause bodily injury or damage to property; 4) When using the products, please do not exceed the maximum rating of the products, Stress above one or more limiting values will cause damage to the product and the equipment or affect the reliability to the equipment (customers' product); 5) Ensure customers' product using Silan's product are designed, manufactured and used in full compliance with all applicable standards, safety standards and other requirements of the customers' industry. The parameters stated in this instruction may and do vary in different applications, actual performance may vary over time, and customers must use the products within their effective static storage period (within one year from the delivery date of Silan). Customer should confirm the effective static storage period of the product if purchasing from a third party. Silan does not assume any responsibility if the product has exceeded the static storage period when it is used.
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7. Please use and apply product in compliance with all applicable laws and regulations, including but not limited to trade control regulations etc. The product is civil electronic product, please do not use it in non-civil fields.
8. Product promotion is endless, our company will wholeheartedly provide customers with better products!
9. Website: http: //www.silan.com.cn

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Rev.: 1.0

Revision History:

1. First release