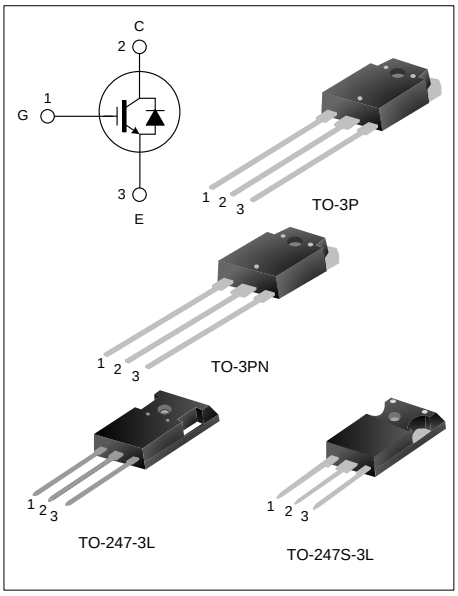
50A, 650V FIELD STOP IGBT

DESCRIPTION

SGT50T65FD1PN/P7/PS/PT using Field Stop IV IGBT technology, offers the optimum performance for induction Heating, UPS, SMPS and PFC application.



FEATURES

- 50A, 650V, $V_{CE(sat)(typ.)}$=2.2V@I_C=50A
- Low conduction loss
- Fast switching
- High input impedance

NOMENCLATURE

SGT 50 T 65 F D _ 1 PN

- IGBT series
- 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 5+
  X : Field Stop 6
  Y : Field Stop 7
- Voltage, 65: 650V
  120: 1200V
- L : Ultra low switching, recommended frequency ~2KHz
  Q : Low switching, recommended frequency2~20KHz
  S : Standard frequency, recommended frequency5~40KHz
  F : Fast switching, recommended frequency10~60KHz
  UF : Ultra fast switching, recommended frequency 40KHz~
  I : IGNITION
- D : Packaged with fast recovery diode
  R : RC IGBT
  Empty:Single IGBT chip
  C : SiC diode
- Blank: Standard diode
  M : Standard Diode, full range
  R : Rapid Diode
  B : Rapid Diode, full range
  S : Soft Diode, full range
- 1,2,3··· : Version No.
- Package
  PN : TO-3P

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SGT50T65FD1PN	TO-3P	50T65FD1	Pb free	Tube
SGT50T65FD1P7	TO-247-3L	50T65FD1	Pb free	Tube
SGT50T65FD1PS	TO-247S-3L	50T65D1	Pb free	Tube
SGT50T65FD1PT	TO-3PN	50T65FD1	Pb free	Tube

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

Parameter		Symbol	Ratings	Units
Collector - Emitter Voltage		V_{CE}	650	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	100	A
	T_C=100°C		50	
Pulsed Collector Current		I_{CM}	150	A
Diode Current	T_C=25°C	I_F	50	A
	T_C=100°C		25	
Diode Pulsed Current		I_{FM}	75	A
Power Dissipation (T_C=25°C)		P_{tot}	235	W
Operating Junction Temperature Range		T_J	-55～+150	°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)	$R_{th(j-C)}$	--	--	--	0.53	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{th(j-C)}$	--	--	--	1.48	°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)

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Collector - Emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=250μA	650	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE}=650V, V_{GE}=0V	--	--	200	μA
Gate-emitter Leakage Current	I_{GES}	V_{GE}=20V, V_{CE}=0V	--	--	±400	nA
Gate-emitter Threshold Voltage	$V_{GE(th)}$	I_C=250μA, V_{CE}=V_{GE}	4.0	5.0	6.5	V
Collector-emitter Saturation Voltage	V_{CEsat}	I_C=50A, V_{GE}=15V, T_J=25°C	--	2.2	2.6	V
		I_C=50A, V_{GE}=15V, T_J=125°C	--	2.4	--	V
Input Capacitance	C_{ies}	V_{CE}=30V, V_{GE}=0V, f=1MHz	--	4532	--	pF
Output Capacitance	C_{oes}		--	90	--	
Reverse Transfer Capacitance	C_{res}		--	41	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=400V I_C=50A R_g=10Ω V_{GE}=15V Inductive Load T_J=25°C	--	45	--	ns
Rise Time	T_r		--	145	--	
Turn-Off Delay Time	$T_{d(off)}$		--	125	--	
Fall Time	T_f		--	130	--	
Turn-on Energy	E_{on}		--	2.8	--	mJ
Turn-off Energy	E_{off}		--	1.0	--	
Total Switching Energy	E_{st}		--	3.8	--	
Total Gate Charge	Q_g	V_{CE}=400V, I_C=50A, V_{GE}=15V	--	145	--	nC
Gate to Emitter Charge	Q_{ge}		--	48	--	
Gate to Collector Charge	Q_{gc}		--	46	--	

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

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Diode Forward Voltage	V_F	I_F=25A, T_J=25°C	--	1.95	--	V
		I_F=25A, T_J=125°C	--	1.7	--	
Diode Reverse Recovery Time	T_{rr}	I_{EC}=25A, dI_{EC}/dt=200A/μs	--	33	--	ns
Diode Reverse Recovery Charge	Q_{rr}	I_{EC}=25A, dI_{EC}/dt=200A/μs	--	65	--	nC

TYPICAL CHARACTERISTIC CURVES

Figure 1. Typical Output Characteristics

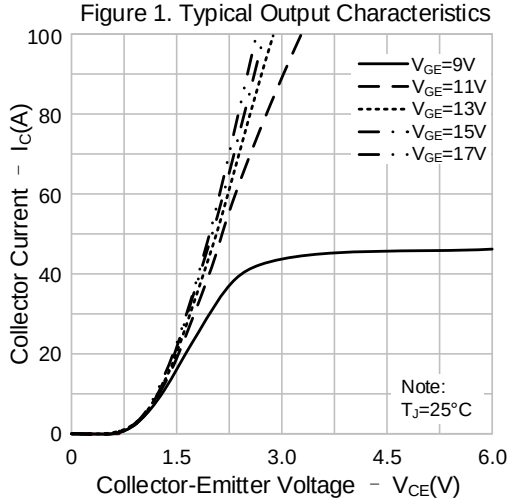


Figure 2. Typical Output Characteristics

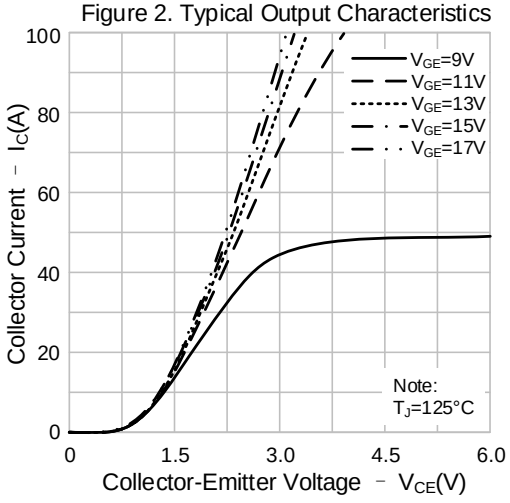


Figure 3. Typical Saturation Voltage Characteristics

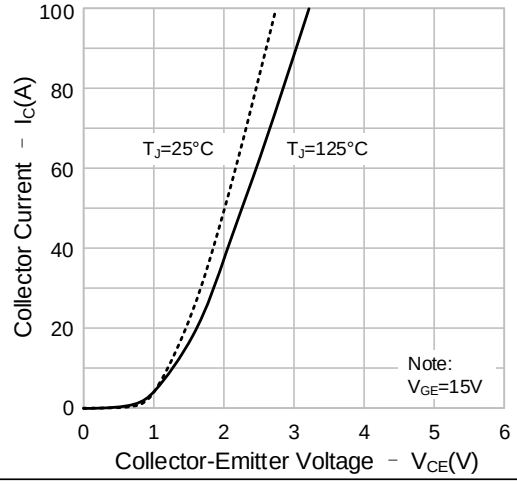


Figure 4. Transmission Characteristics

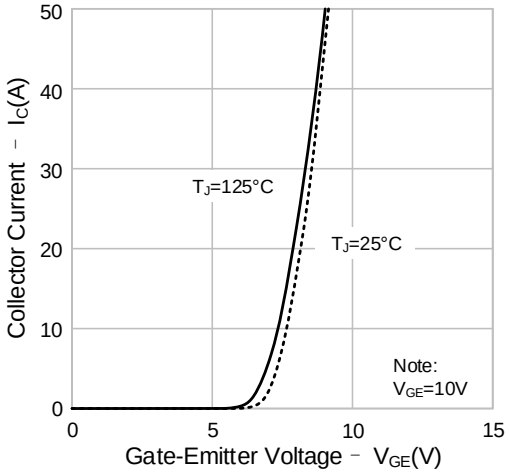


Figure 5. Saturation Voltage vs. V_{GE}

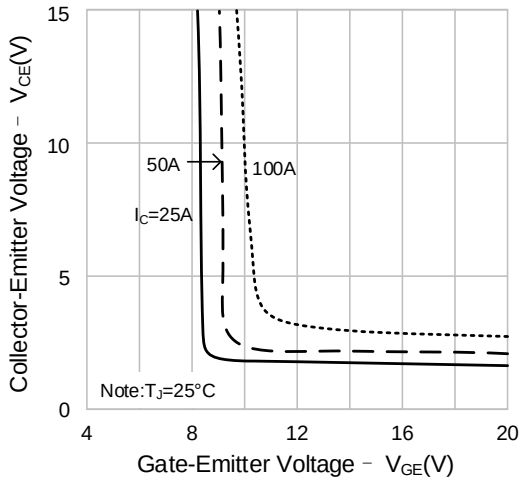
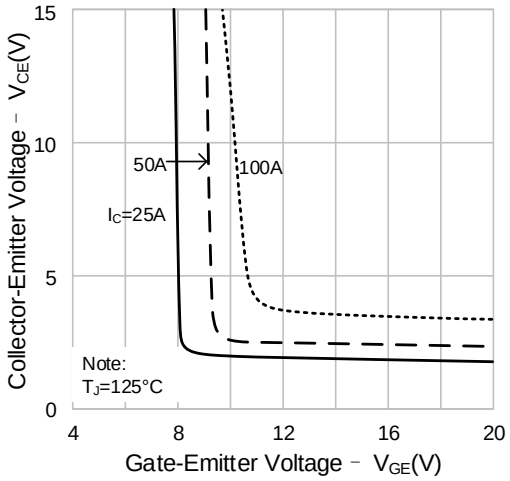


Figure 6. Saturation Voltage vs. V_{GE}



TYPICAL CHARACTERISTIC CURVES (CONTINUED)

Figure 7. Saturation voltage vs. temperature

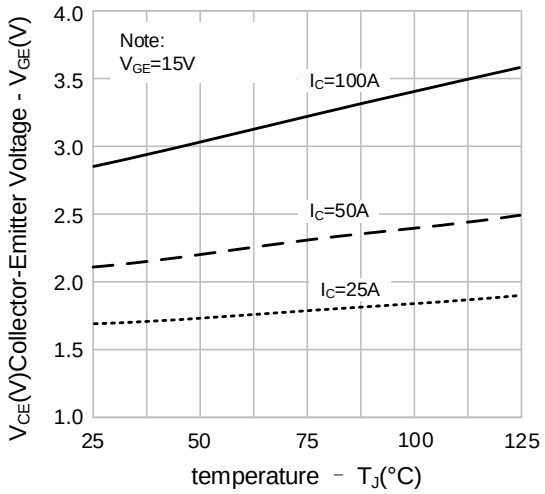


Figure 8. Capacitance Characteristics

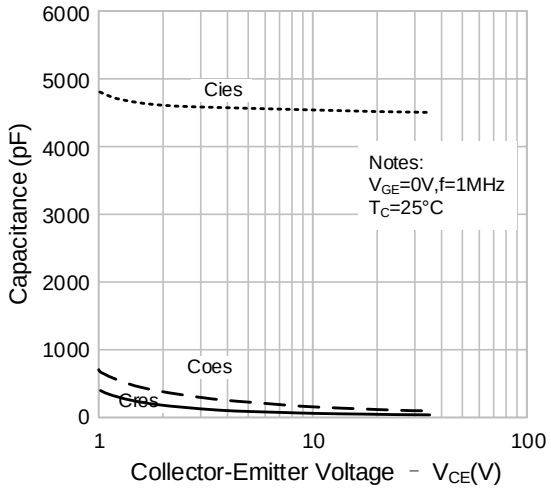


Figure 9. Gate Charge Characteristics

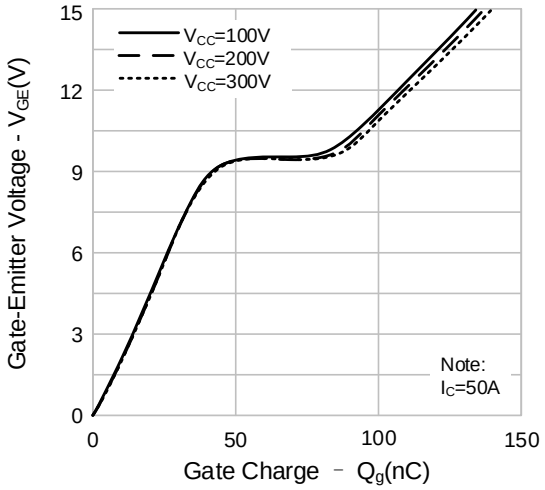


Figure 10. Turn-on Characteristics vs. Gate Resistance

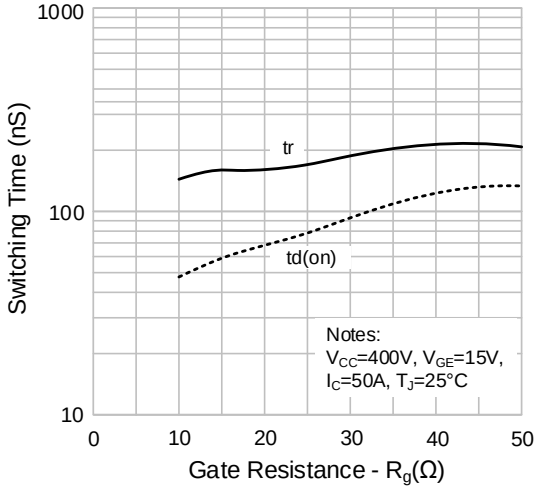


Figure 11. Turn-off Characteristics vs. Gate Resistance

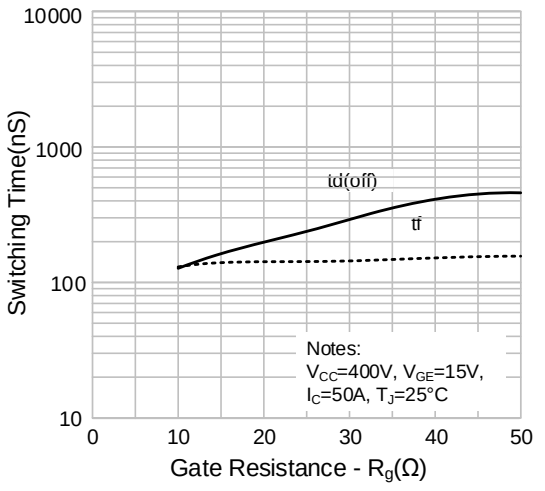
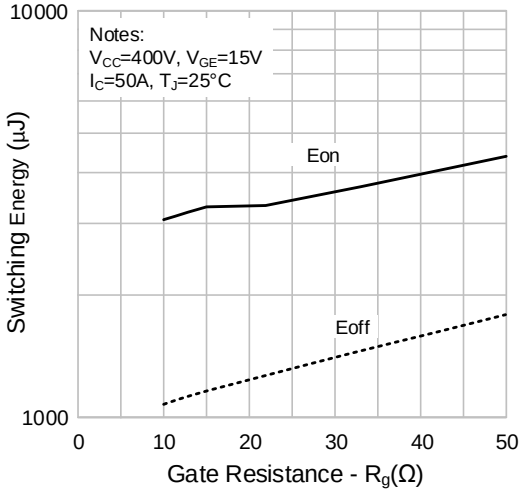


Figure 12. Switching loss vs. Gate Resistance



TYPICAL CHARACTERISTIC CURVES (CONTINUED)

Figure 13. Turn-on Characteristics vs. Collector Current

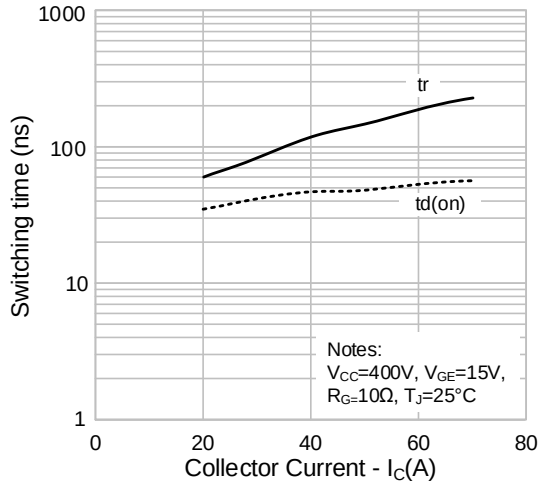


Figure 14. Turn-off Characteristics vs. Collector Current

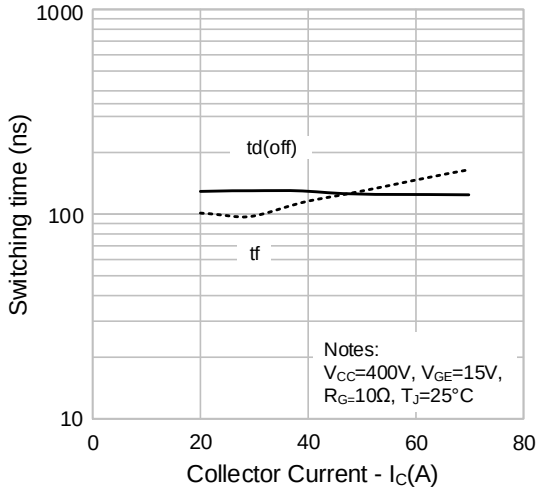


Figure 15. Switching loss vs. collector current

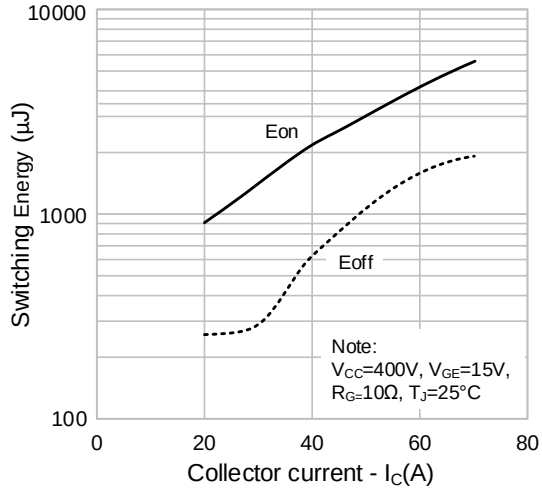


Figure 16. Forward Characteristics

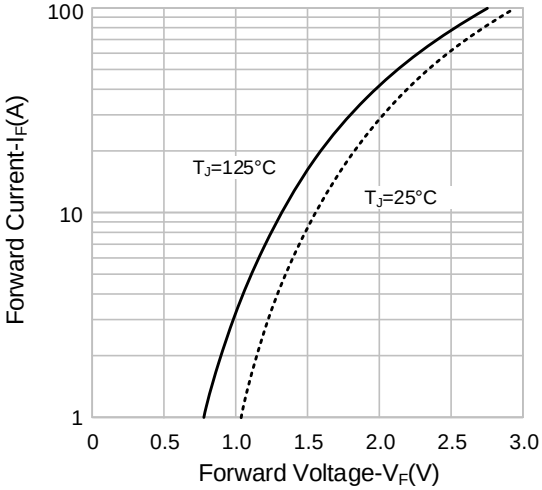


Figure 17. Reverse Recovery Time vs. Forward Current

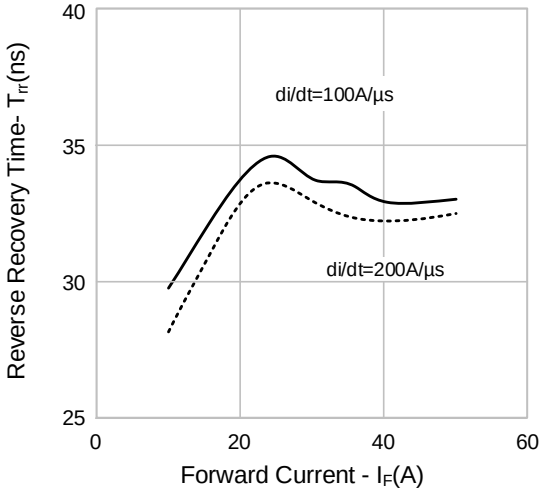
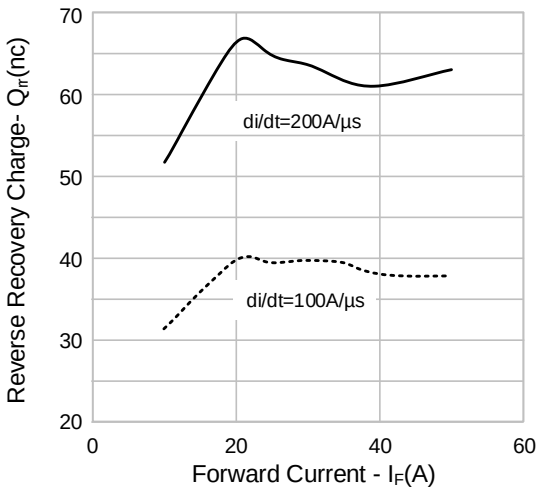
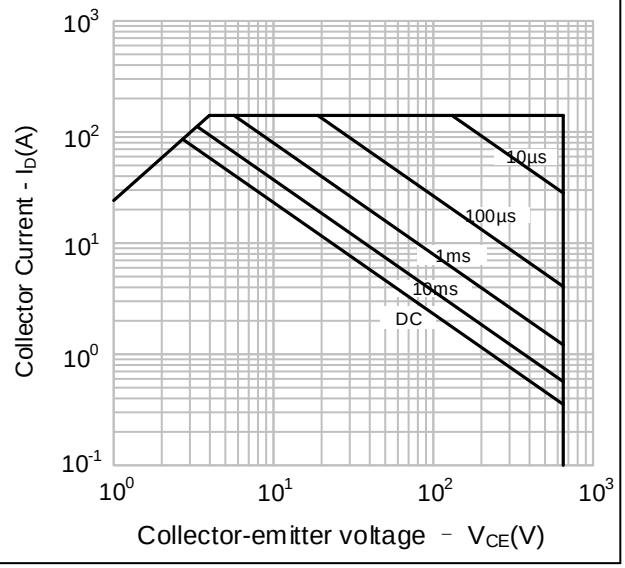


Figure 18. Reverse Recovery Charge vs. Forward Current



TYPICAL CHARACTERISTIC CURVES (CONTINUED)

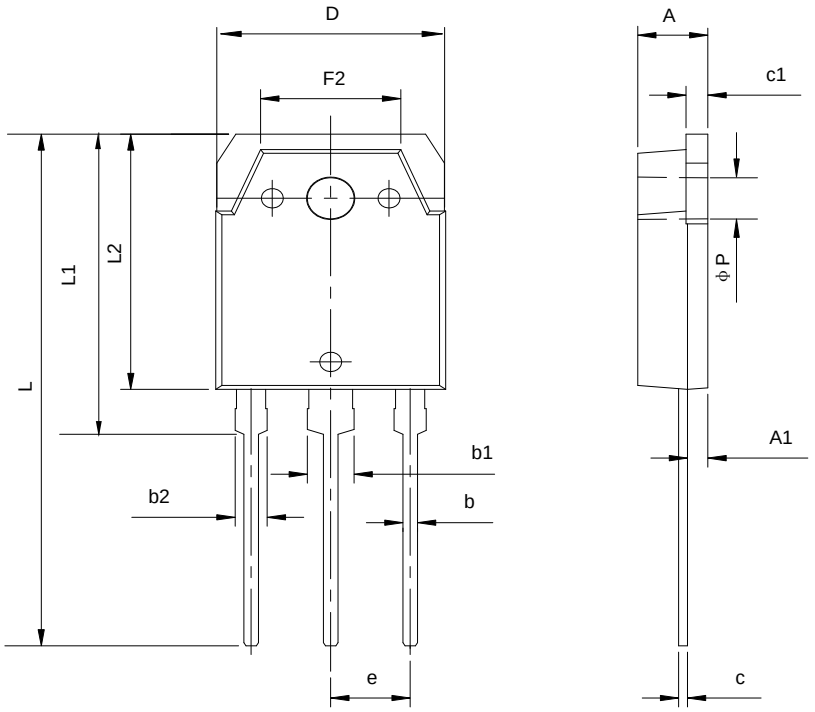
Figure 19. Maximum Safety Operating Area



PACKAGE OUTLINE

TO-3P

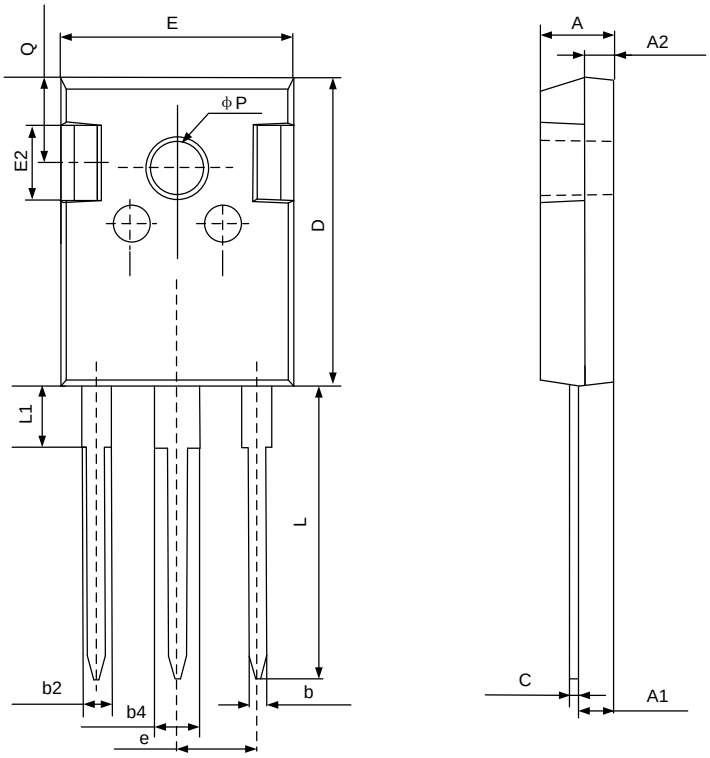
UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.4	—	5.2
c1	1.2	—	1.8
A1	1.2	—	2.0
b	0.7	1.0	1.3
b1	2.7	3.0	3.3
b2	1.7	2.0	2.3
D	15.0	15.5	16.0
c	0.4	0.6	0.8
F2	8.5	—	10.0
e	5.45 TYP		
L1	22.6	—	23.6
L	39.0	—	41.5
L2	19.5	—	21.0
P	3.0	—	3.4

TO-247-3L

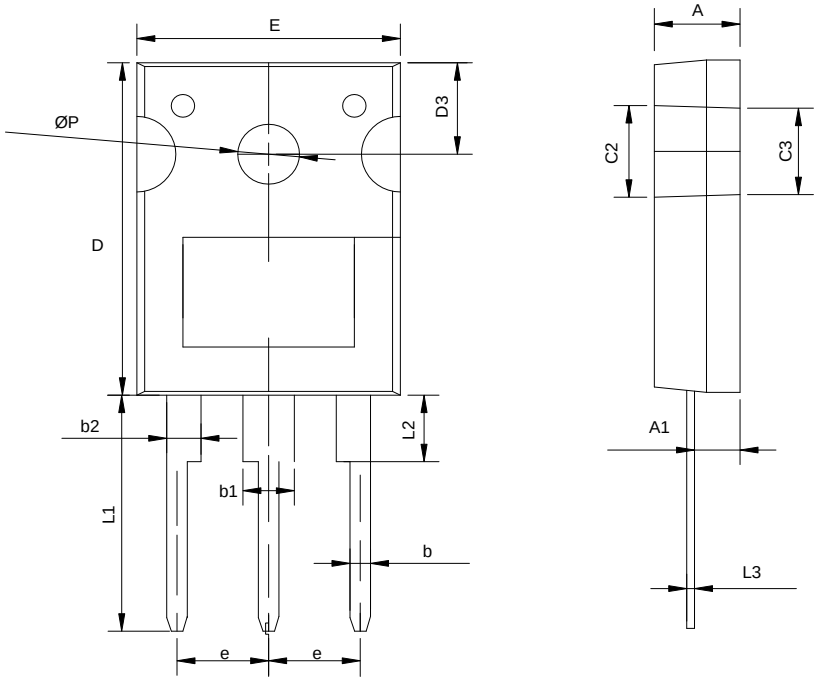
UNIT: mm



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

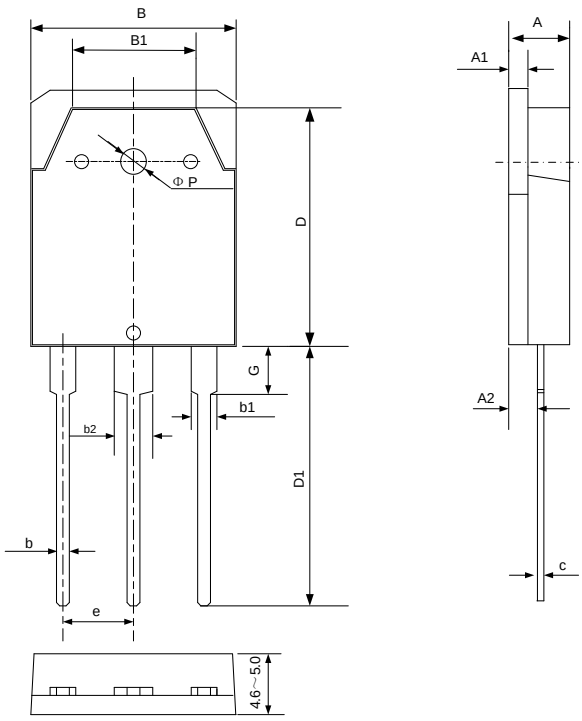
PACKAGE OUTLINE(CONTINUED)

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



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.30	2.50	2.70
b	1.10	1.20	1.30
b1	2.90	3.10	3.30
b2	1.90	2.10	2.30
c2	5.50	6.00	6.50
c3	4.95	5.10	5.25
D	19.00	20.00	21.00
D3	5.30	5.50	5.70
e	5.34	5.44	5.54
E	15.40	15.60	15.80
L1	14.40	14.60	14.80
L2	3.85	4.00	4.15
L3	0.35	0.50	0.65
ØP	3.40	3.60	3.80

TO-3PN **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.60	4.80	5.00
A1	1.30	1.50	1.70
A2	2.20	2.40	2.60
b	0.80	1.00	1.20
b1	1.80	2.00	2.20
b2	2.90	3.10	3.30
B	15.20	15.60	16.00
B1	9.10	9.30	9.50
c	0.50	0.60	0.70
D	18.30	18.50	18.70
D1	19.00	19.50	20.00
e	5.25	5.45	5.65
G	2.80	3.00	3.20
ØP	3.00	3.20	3.40

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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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.: 2.1

Revision History:

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

Rev.: 2.0

Revision History:

1. Update typical characteristic curves
2. Update important notice

Rev.: 1.9

Revision History:

1. Modify electrical characteristics

Rev.: 1.8

Revision History:

1. Add TO-3PN
2. Update important notice

Rev.: 1.7

Revision History:

1. Update characteristics
2. Update the package outline

Rev.: 1.6

Revision History:

1. Add package outline of TO-247S-3L
2. Modify NOMENCLATURE

Rev.: 1.5

Revision History:

1. Update Electrical characteristics

Rev.: 1.4

Revision History:

1. Add Max. value of Vcesat

Rev.: 1.3

Revision History:

1. Modify TO-247-3L

Rev.: 1.2

Revision History:

1. Add TO-247-3L
2. Modify Diode Current to 25A

Rev.: 1.1

Revision History:

1. Add TransientUpdate the package outline

Rev.: 1.0

Revision History:

1. First release