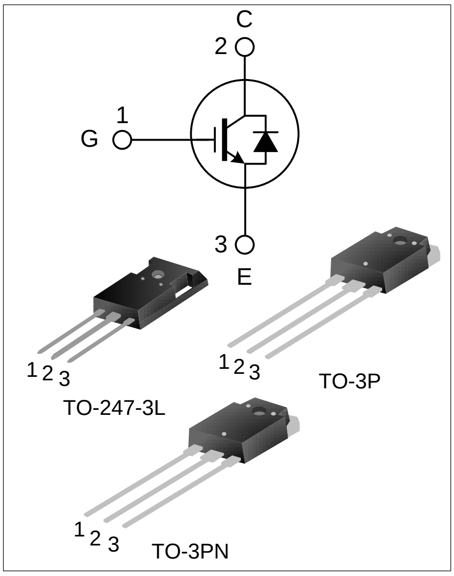
20A, 1350V INVERSE IGBT

DESCRIPTION

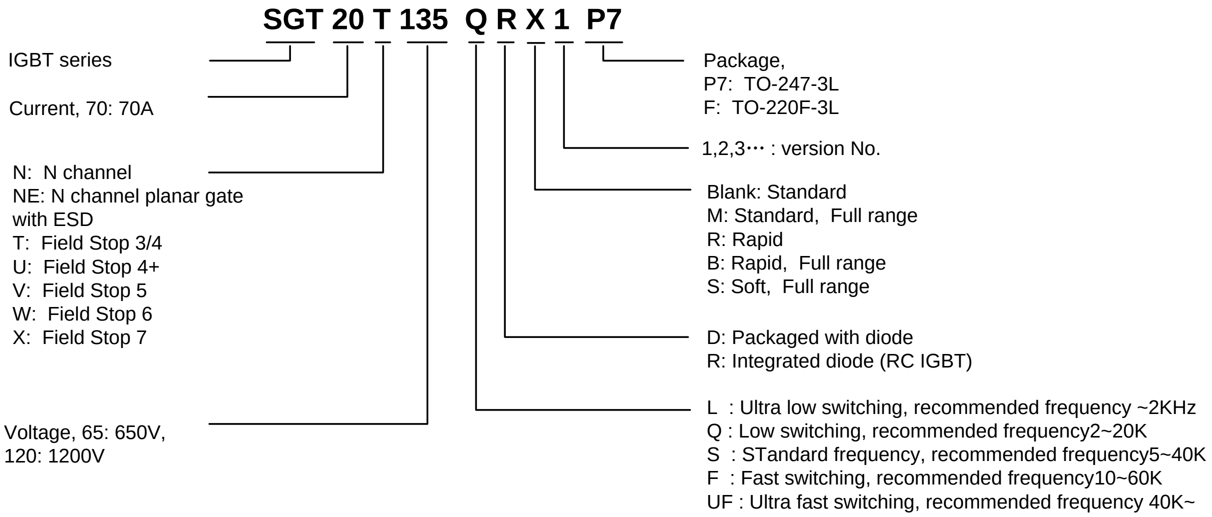
SGT20T135QR1P7/PN/PT inverse IGBT employs Silan new Reverse Conducting technology, features low conduction loss, low switching loss, high breakdown voltage, internal Freewheeling diode, positive/negative temperature coefficient. It is suitable for Induction heating field.



FEATURES

- 20A, 1350V, $V_{CE(sat)(typ.)}$=1.8V@I_C=20A
- Low conduction loss
- Internal freewheeling diode
- High breakdown voltage

NOMENCLATURE



SGT 20 T 135 Q R X 1 P7

IGBT series

Current, 70: 70A

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
F: TO-220F-3L

1,2,3… : version No.

Blank: Standard
M: Standard, Full range
R: Rapid
B: Rapid, Full range
S: Soft, Full range

D: Packaged with diode
R: Integrated diode (RC IGBT)

L : Ultra low switching, recommended frequency ~2KHz
Q : Low switching, recommended frequency2~20K
S : STandard frequency, recommended frequency5~40K
F : Fast switching, recommended frequency10~60K
UF : Ultra fast switching, recommended frequency 40K~

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SGT20T135QR1P7	TO-247-3L	20T135QR1	Pb free	Tube
SGT20T135QR1PN	TO-3P	20T135QR	Pb free	Tube
SGT20T135QR1PT	TO-3PN	20T135QR	Pb free	Tube

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

Parameter		Symbol	Ratings	Units
Collector to Emitter Voltage		V_{CE}	1350	V
Gate to Emitter Voltage		V_{GE}	±20	V
Transient Gate to Emitter Voltage(t_p≤10μs,D<0.010)			±25	
Collector Current	T_C=25°C	I_C	40	A
	T_C=100°C		20	
Pulsed Collector Current		I_{CM}	60	A
Power Dissipation (T_C=25°C)		P_D	250	W
- Derate above 25°C			2	W/°C
Operating Junction Temperature		T_J	-55～+150	°C
Storage Temperature Range		T_{stg}	-55～+150	°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Ratings	Units
Thermal Resistance, Junction to Case (IGBT)	$R_{\theta JC}$	0.5	°C/W
Thermal Resistance, Junction to Case (FRD)	$R_{\theta JC}$	0.5	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	40	°C/W

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

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Collector to Emitter Breakdown Voltage	BV_{CE}	V_{GE}=0V, I_C=1mA	1350	--	--	V
C-E Leakage Current	I_{CES}	V_{CE}=1200V, V_{GE}=0V	--	--	500	µA
G-E Leakage Current	I_{GES}	V_{GE}=20V, V_{CE}=0V	--	--	±400	nA
G-E Threshold Voltage	$V_{GE(th)}$	I_C=2.0mA, V_{CE}=V_{GE}	3.5	6.0	7.5	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=20A, V_{GE}=15V	--	1.8	2.2	V
		I_C=20A, V_{GE}=15V, T_C=125°C	--	2.2	--	V
Input Capacitance	C_{ies}	V_{CE}=30V, V_{GE}=0V, f=1MHz	--	1500	--	pF
Output Capacitance	C_{oes}		--	55	--	
Reverse Transfer Capacitance	C_{res}		--	43	--	
Turn-On Delay Time	$T_{d(on)}$	V_{CE}=600V I_C=20A R_g=10Ω V_{GE}=15V Inductive Load	--	20	--	ns
Rise Time	T_r		--	50	--	
Turn-Off Delay Time	$T_{d(off)}$		--	140	--	
Fall Time	T_f		--	260	--	
Turn-On Switching Loss	E_{on}		--	1.8	--	mJ
Turn-Off Switching Loss	E_{off}		--	1	--	
Total Switching Loss	E_{st}		--	2.8	--	
Total Gate Charge	Q_g	V_{CE}=600V, I_C=20A, V_{GE}=15V	--	125	--	nC
Gate to Emitter Charge	Q_{ge}		--	16	--	
Gate to Collector Charge	Q_{gc}		--	80	--	

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

Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Units
Diode Forward Voltage	V_{FM}	I_F=20A, T_C=25°C	--	1.95	2.3	V
		I_F=20A, T_C=125°C	--	2.2	--	
Diode Reverse Recovery Time	T_{rr}	I_{ES}=20A, dI_{ES}/dt =200A/µs	--	360	--	ns
Diode Reverse Recovery Charge	Q_{rr}	I_{ES}=20A, dI_{ES}/dt =200A/µs	--	3.5	--	µC

TYPICAL CHARACTERISTICS CURVE

Figure 1. Typical Output Characteristics

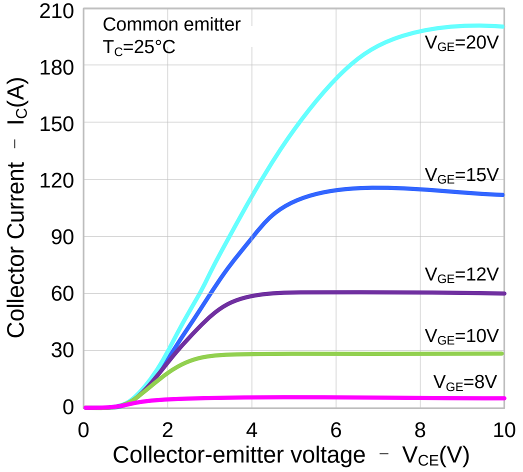


Figure 2. Typical Output Characteristics

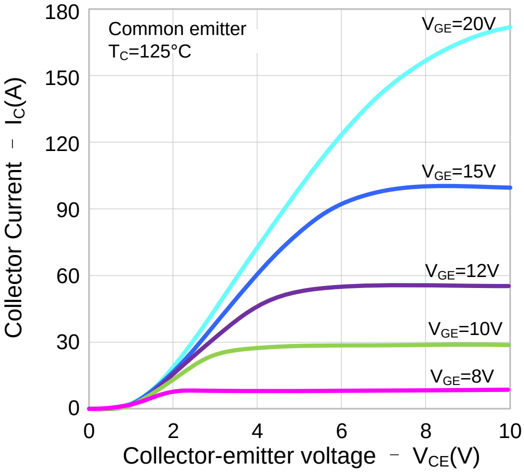


Figure 3. Saturation Voltage Characteristics

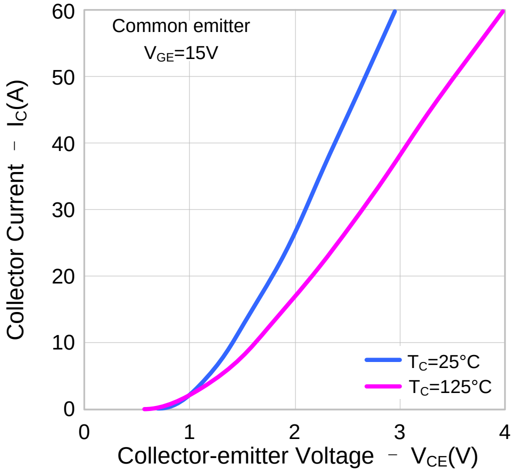


Figure 4. Transmission Characteristics

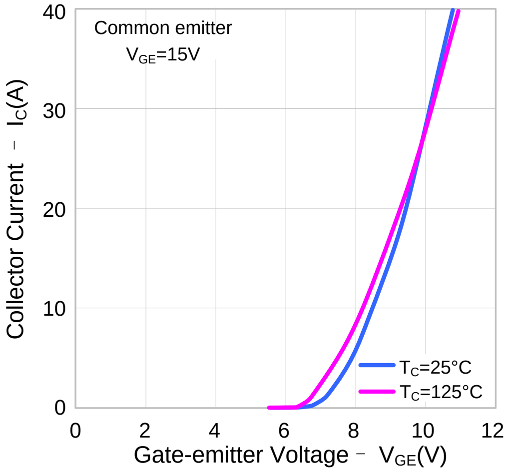


Figure 5. Saturation voltage vs. V_{GE}

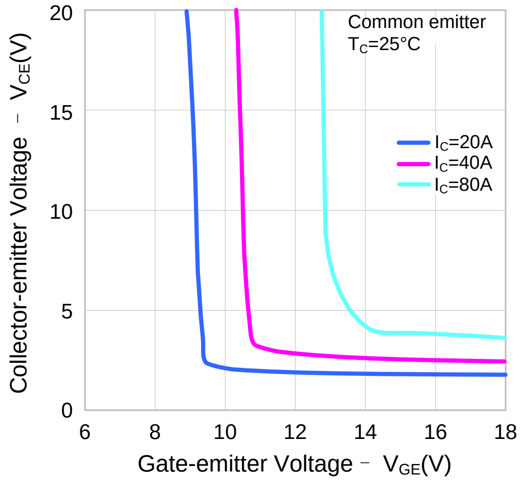
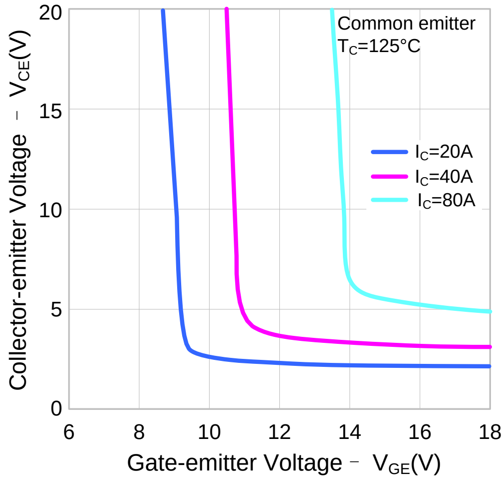


Figure 6. Saturation voltage vs. V_{GE}



TYPICAL CHARACTERISTICS CURVE (CONTINUED)

Figure 7. Capacitance characteristics

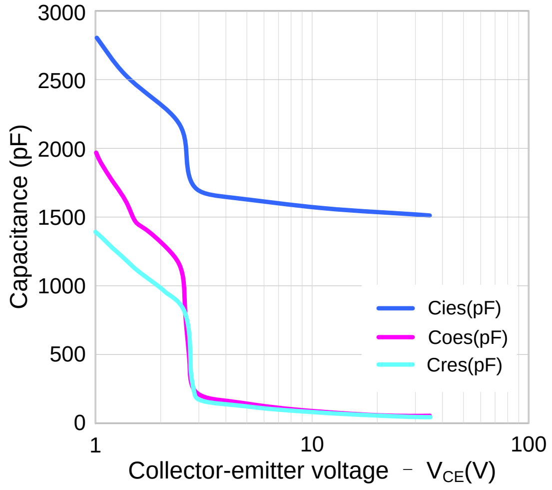


Figure 8. Gate charge characteristics

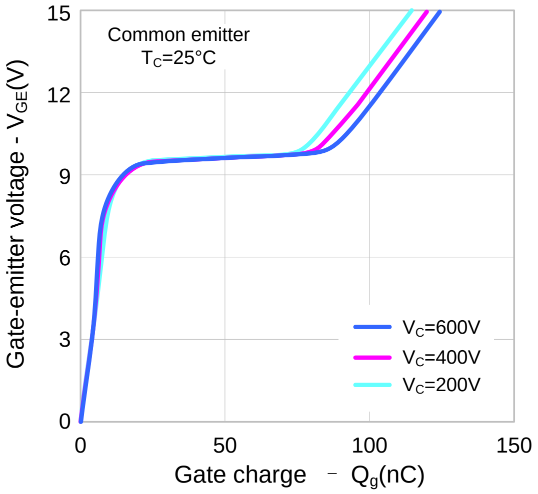


Figure 9. Turn-on characteristics vs. Gate resistance

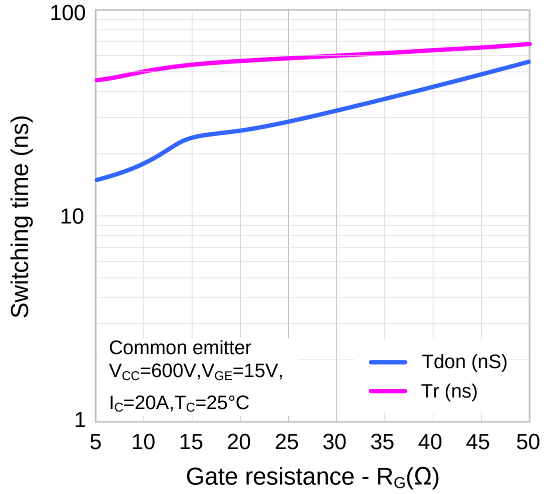


Figure 10. Turn-off characteristics vs. Gate resistance

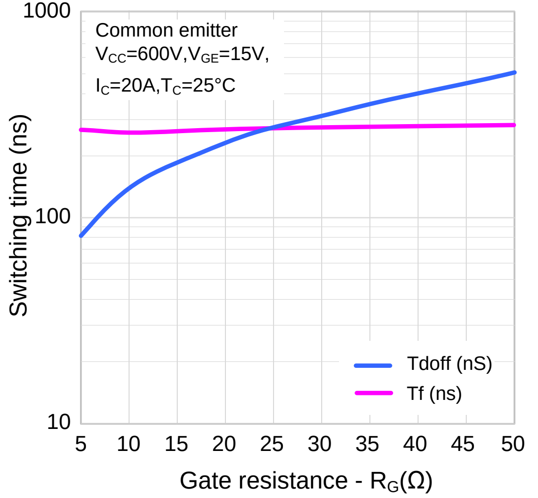


Figure 11. Switching loss vs. Gate resistance

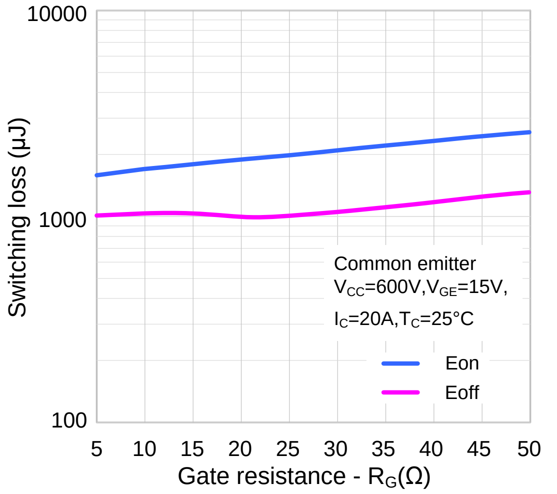
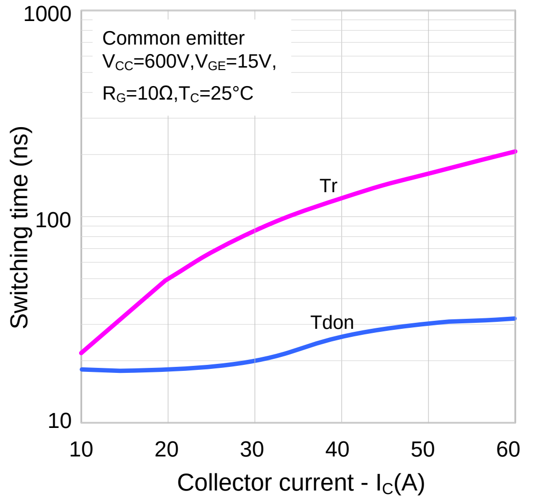


Figure 12. Turn-on characteristics vs. Collector current



TYPICAL CHARACTERISTICS CURVE (CONTINUED)

Figure 13. Turn-off characteristics vs. Collector current

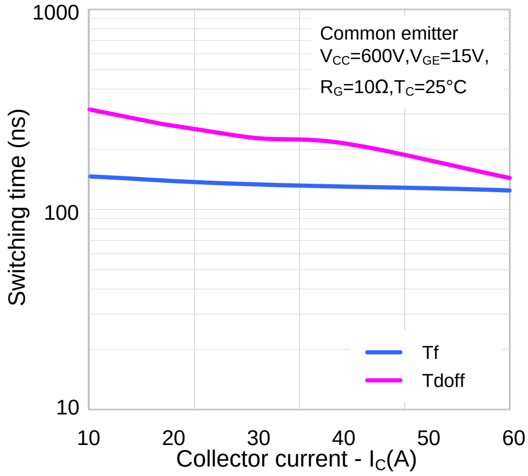


Figure 14. Switching loss vs. Collector current

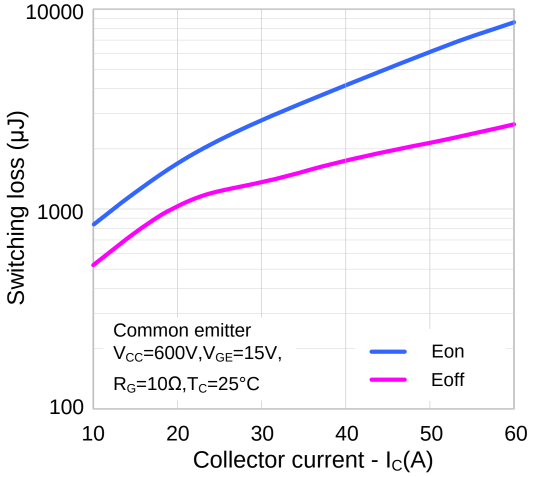


Figure 15. Forward characteristics

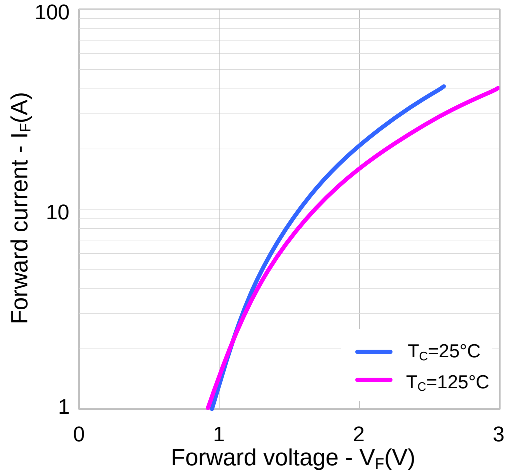


Figure 16. Reverse recovery time vs. Forward current

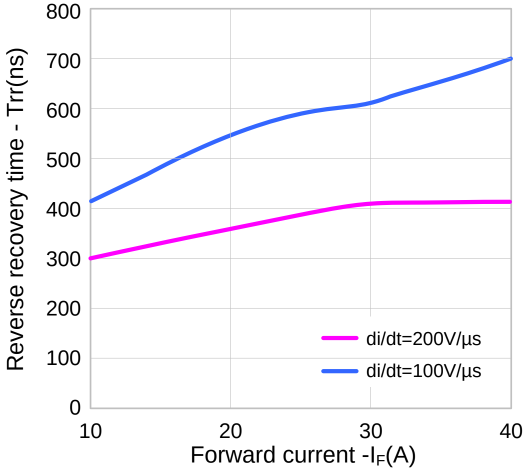


Figure 17. Reverse recovery charge vs. Forward current

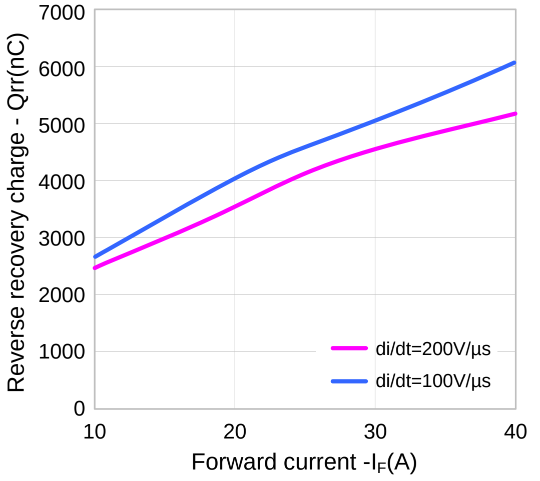
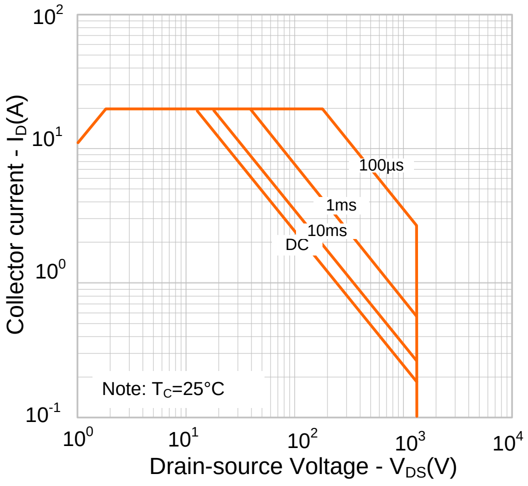
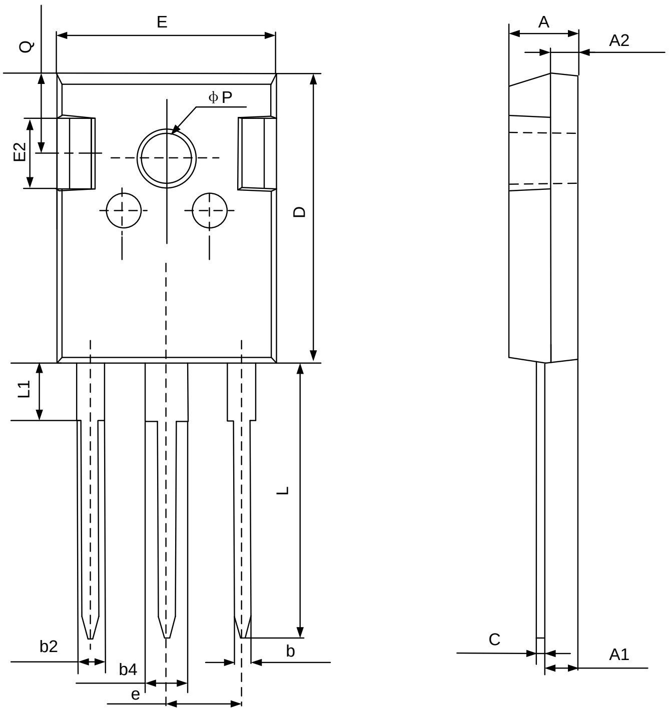


Figure 18. Max. Safe Operating Area



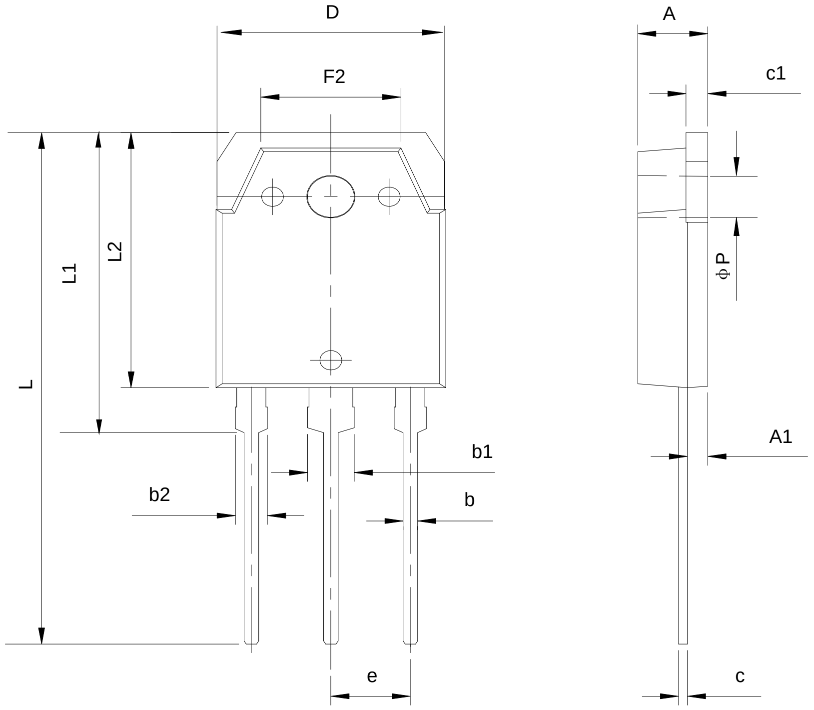
PACKAGE OUTLINE

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

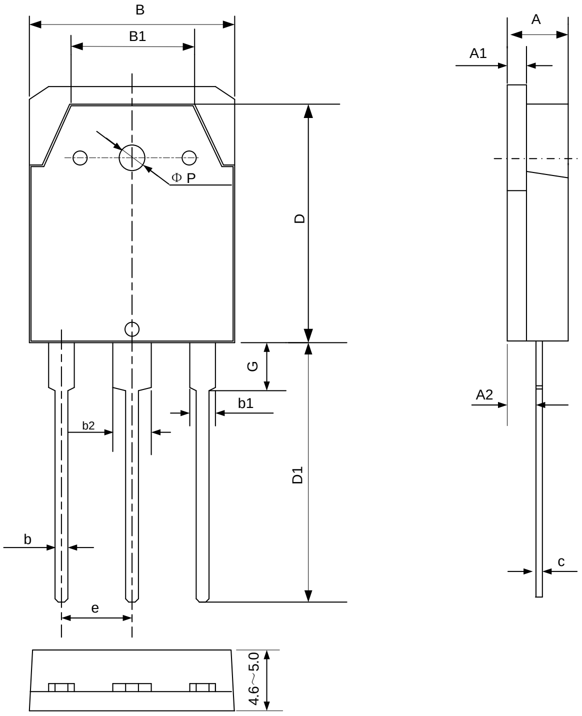
TO-3P **UNIT: mm**



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

PACKAGE OUTLINE (CONTINUED)

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

Important notice :

1. **The instructions are subject to change without notice!**
2. **Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current. Please read the instructions carefully before using our products, including the circuit operation precautions.**
3. **Our products are consumer electronic products or the other civil electronic products.**
4. **When using our products, please do not exceed the maximum rating of the products, otherwise the reliability of the whole machine will be affected. There is a certain possibility of failure or malfunction of any semiconductor product under specific conditions. The buyer is responsible for complying with safety standards and taking safety measures when using our products for system design, sample and whole machine manufacturing, so as to avoid potential failure risk that may cause personal injury or property loss.**
5. **It is strongly recommended to identify the trademark when buying our products. Please contact us if there is any question.**
6. **Product promotion is endless, our company will wholeheartedly provide customers with better products!**
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Rev.: 1.7

Revision History:

1. Update package outline

Rev.: 1.6

Revision History:

1. Add SGT20T135QR1PT(TO-3PN) package
2. Update important notice

Rev.: 1.5

Revision History:

1. Delete SGT20T135QR1PS

Rev.: 1.4

Revision History:

1. Add SGT20T135QR1PS
2. Modify ORDERING INFORMATION
3. Modify Important notice

Rev.: 1.3

Revision History:

1. Update ABSOLUTE MAXIMUM RATINGS
2. Update the package outline of TO-247-3L

Rev.: 1.2

Revision History:

1. Update NOMENCLATURE

Rev.: 1.1

Revision History:

1. Add TO-3P

Rev.: 1.0

Revision History:

1. First release