# گروه فنی مهندسی جوش و برش مقدم

اعتماد از شما کیفیت و تخصص از ما


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مشهد خیام شمالی 63 خیابان پردیس 3

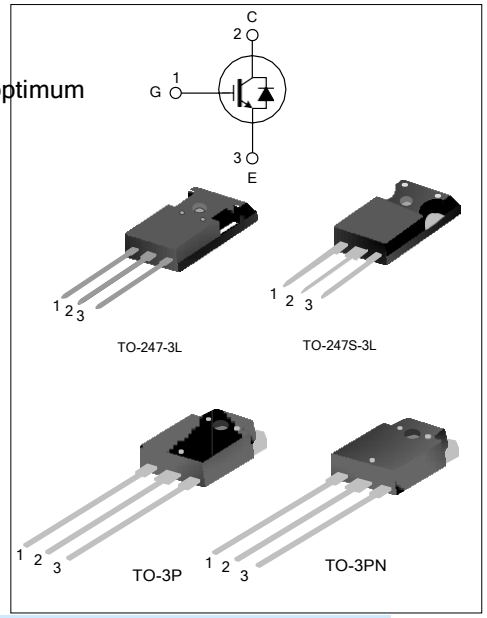

برای کسب اطلاعات بیشتر بر روی لینک ها کلیک کنید

- 7 سال سابقه آموزش تعمیرات تخصصی دستگاه های جوش اینورتری تک فاز و 3 فاز
- 7 سال سابقه فروش قطعات الکترونیکی دستگاه جوش تک فاز و 3 فاز
- آموزش تخصصی تحلیل دستگاه های جوش اینورتری مختص ابراز فروشان
- آموزش تخصصی ابراز آلات شارژی

# 60A, 600V FIELD STOP IGBT

## DESCRIPTION

SGT60N60FD1PN/P7/PS/PT adopts Field Stop IGBT technology, offer the optimum performance for induction Heating,UPS,SMPS and PFC application.




## FEATURES

- 60A, 600V,$V_{CE(sat)(typ.)}$=2.2V@$I_C$=60A
- Low conduction loss
- Fast switching
- High input impedance

## NOMENCLATURE

SGT 60 N 60 F D 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

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 frequency2~20KHz
S : Standard frequency ，recommended frequency5~40KHz
F : Fast switching，recommended frequency10~60KHz
UF : Ultra fast switching，recommended frequency 40KHz~

## ORDERING INFORMATION

| Part No. | Package | Marking | Hazardous Substance Control | Packing Type |
|---|---|---|---|---|
| SGT60N60FD1PN | TO-3P | 60N60FD1 | Pb free | Tube |
| SGT60N60FD1P7 | TO-247-3L | 60N60FD1 | Pb free | Tube |
| SGT60N60FD1PS | TO-247S-3L | 60N60D1 | Pb free | Tube |
| SGT60N60FD1PT | TO-3PN | 60N60FD1 | Pb free | Tube |

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

| Characteristics | | Symbol | Ratings | Units |
|---|---|---|---|---|
| Collector to Emitter Voltage | | $V_{CE}$ | 600 | V |
| Gate to Emitter Voltage | | $V_{GE}$ | ±20 | V |
| Collector Current | $T_C$=25°C | $I_C$ | 120 | A |
| | $T_C$=100°C | | 60 | |
| Pulsed Collector Current | | $I_{CM}$ | 180 | A |
| Maximum Power Dissipation ($T_C$=25°C) | | $P_D$ | 321 | W |
| Operating Junction Temperature | | $T_J$ | -55～+175 | °C |
| Storage Temperature Range | | $T_{stg}$ | -55～+175 | °C |

## THERMAL CHARACTERISTICS

| Characteristics | Symbol | Ratings | Units |
|---|---|---|---|
| Thermal Resistance, Junction to Case(IGBT)(TO-3P) | $R_{\theta JC}$ | 0.39 | °C/W |
| Thermal Resistance, Junction to Case(FRD)(TO-3P) | $R_{\theta JC}$ | 1.10 | °C/W |
| Thermal Resistance, Junction to Ambient(TO-3P) | $R_{\theta JA}$ | 40 | °C/W |

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

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Collector to Emitter Breakdown Voltage | $BV_{CE}$ | $V_{GE}$=0V,$I_C$=250uA | 600 | -- | -- | V |
| C-E Leakage Current | $I_{CES}$ | $V_{CE}$=600V,$V_{GE}$=0V | -- | -- | 200 | μA |
| G-E Leakage Current | $I_{GES}$ | $V_{GE}$=20V,$V_{CE}$=0V | -- | -- | ±400 | nA |
| G-E Threshold Voltage | $V_{GE(th)}$ | $I_C$=250uA,$V_{CE}$=$V_{GE}$ | 4.0 | 5.0 | 6.5 | V |
| Collector to Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$=60A,$V_{GE}$=15V | -- | 2.2 | 2.7 | V |
| | | $I_C$=60A,$V_{GE}$=15V,$T_C$=125°C | -- | 2.6 | -- | V |
| Input Capacitance | $C_{ies}$ | $V_{CE}$=30V | -- | 2850 | -- | pF |
| Output Capacitance | $C_{oes}$ | $V_{GE}$=0V | -- | 294 | -- | |
| Reverse Transfer Capacitance | $C_{res}$ | f=1MHz | -- | 85 | -- | |
| Turn-On Delay Time | $T_{d(on)}$ | $V_{CE}$=400V<br>$I_C$=60A<br>$R_g$=10Ω<br>$V_{GE}$=15V<br>Inductive Load, | -- | 36 | -- | ns |
| Rise Time | $T_r$ | | -- | 142 | -- | |
| Turn-Off Delay Time | $T_{d(off)}$ | | -- | 193 | -- | |
| Fall Time | $T_f$ | | -- | 136 | -- | |
| Turn-On Switching Loss | $E_{on}$ | | -- | 3.72 | -- | mJ |
| Turn-Off Switching Loss | $E_{off}$ | | -- | 1.77 | -- | |
| Total Switching Loss | $E_{st}$ | | -- | 5.49 | -- | |
| Total Gate Charge | $Q_g$ | $V_{CE}$=400V,$I_C$=60A,<br>$V_{GE}$=15V | -- | 179 | -- | nC |
| Gate to Emitter Charge | $Q_{ge}$ | | -- | 23 | -- | |
| Gate to Collector Charge | $Q_{gc}$ | | -- | 100 | -- | |

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

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Diode Forward Voltage | $V_{FM}$ | $I_F$=30A,$T_C$=25°C | -- | 1.9 | 2.6 | V |
| | | $I_F$=30A,$T_C$=125°C | -- | 1.5 | -- | |
| Diode Reverse Recovery Time | $T_{rr}$ | $I_{ES}$=30A,$dI_{ES}$/dt=200A/μs | -- | 38 | -- | ns |
| Diode Reverse Recovery Charge | $Q_{rr}$ | $I_{ES}$=30A,$dI_{ES}$/dt=200A/μs | -- | 85 | -- | nC |

## TYPICAL CHARACTERISTICS CURVE

Figure 1. Typical Output Characteristics

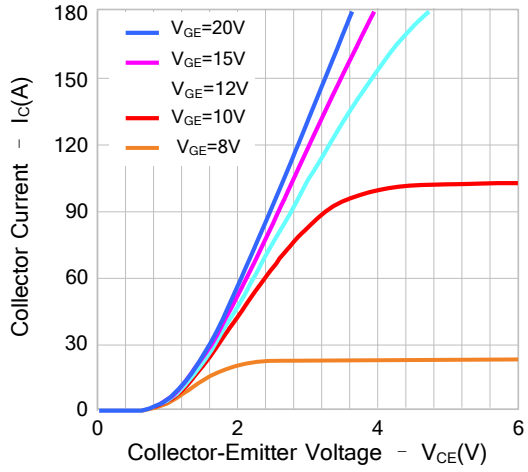



Figure 2. Transfer Characteristic

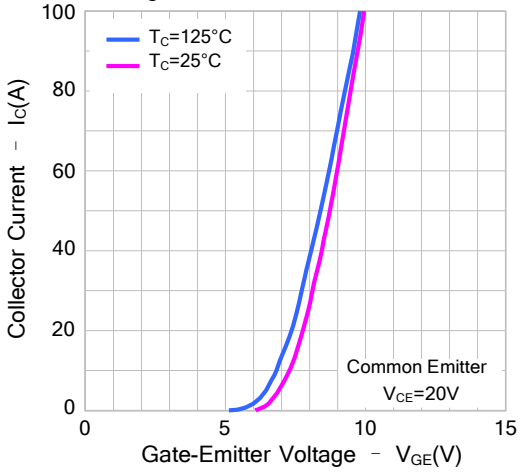



Figure 3. Typical Saturation Voltage Characteristic

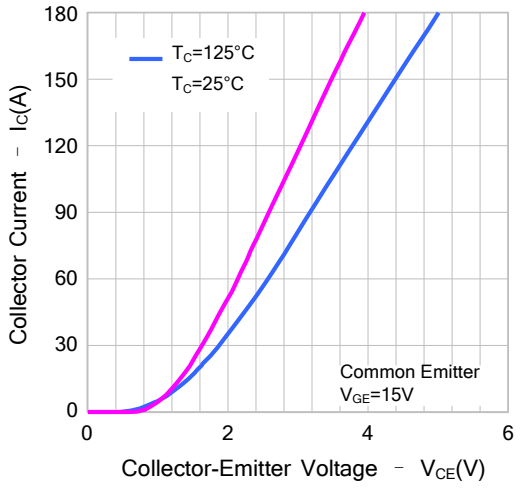



Figure 4. Saturation Voltage vs. $V_{GE}$

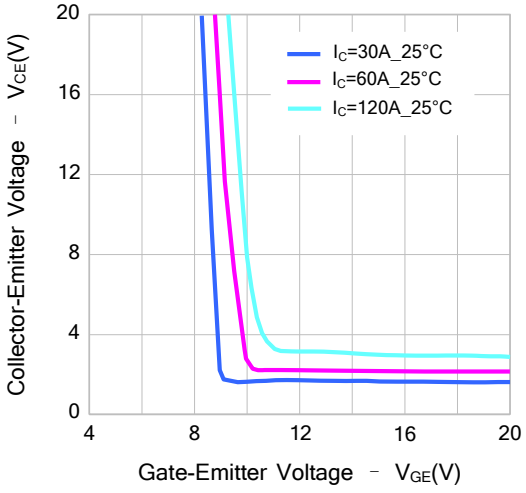



Figure 5. Saturation Voltage vs. $V_{GE}$

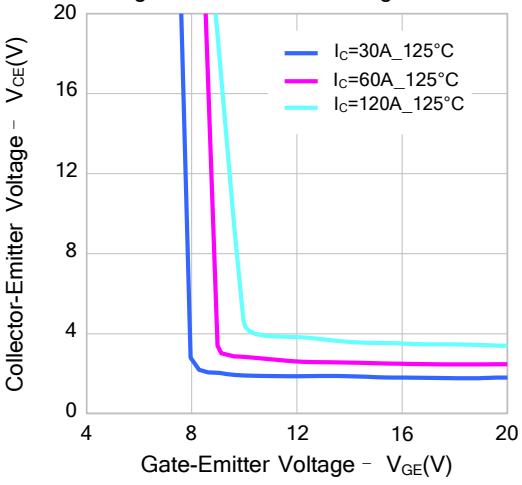
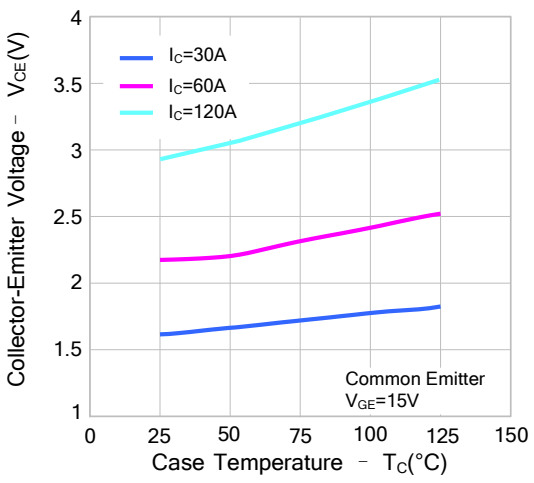



Figure 6. Saturation Voltage vs. Temperature



## TYPICAL CHARACTERISTICS CURVE (CONTINUED)

Figure 7. Capacitance Characteristic

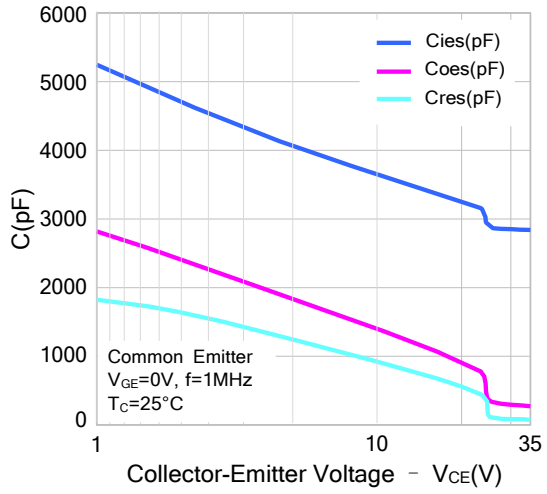



Figure 8. Gate Charge Characteristic

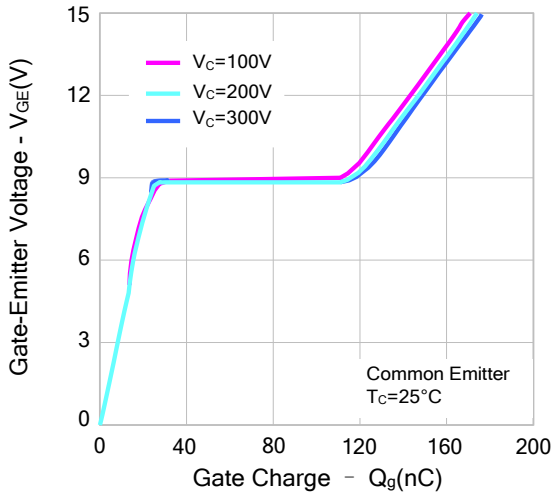



Figure 9. Turn-on Characteristic vs. Gate Resistance

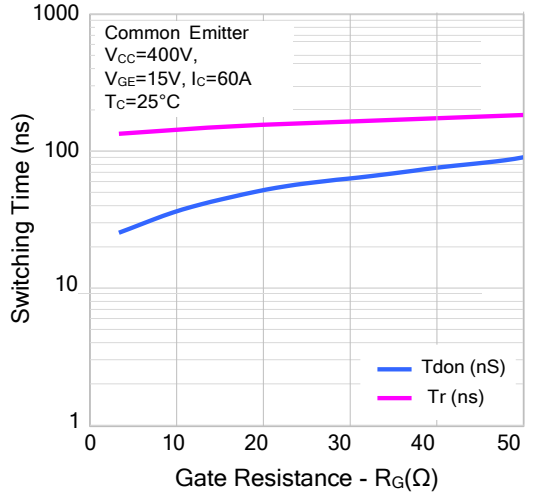



Figure 10. Turn-off Characteristic vs. Gate Resistance

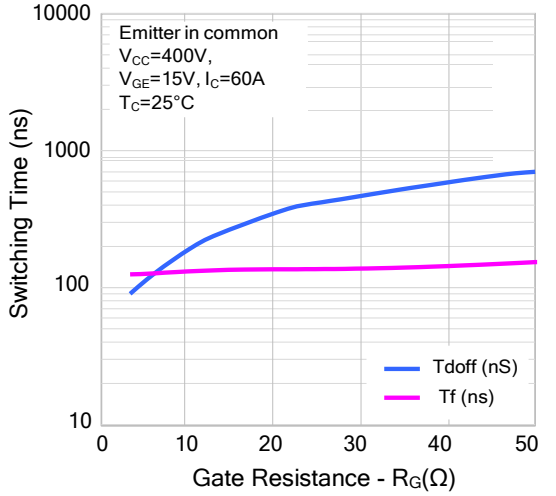



Figure 11. Switching Loss vs. Gate Resistance

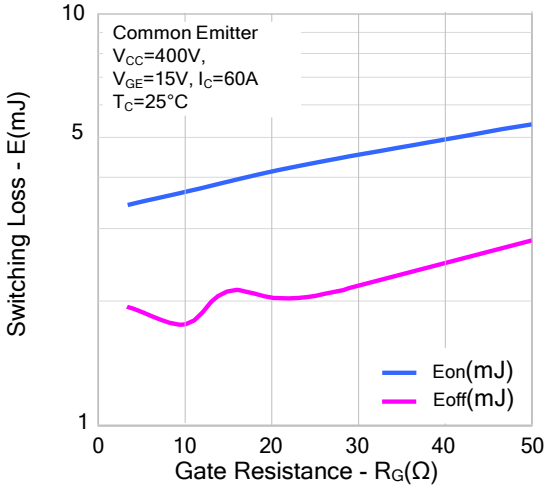
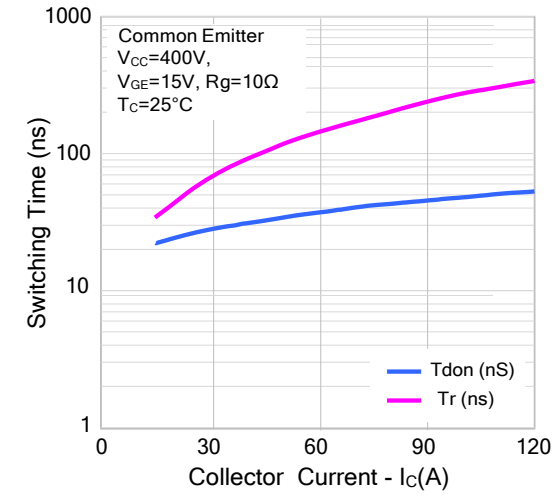



Figure 12. Turn-on Characteristic vs. Collector Current



## TYPICAL CHARACTERISTICS CURVE (CONTINUED)

Figure 13. Turn-off Characteristic vs. Collector Current

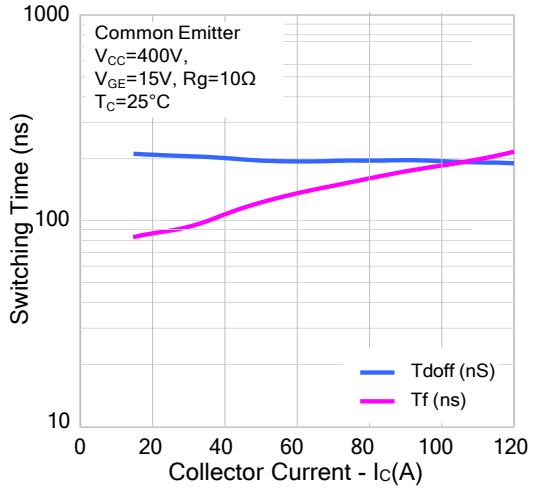



Figure 14. Switching Loss vs. Collector Current

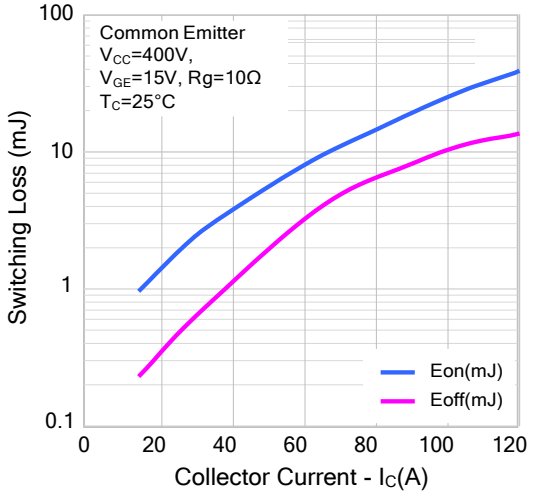



Figure 15. Forward Characteristic

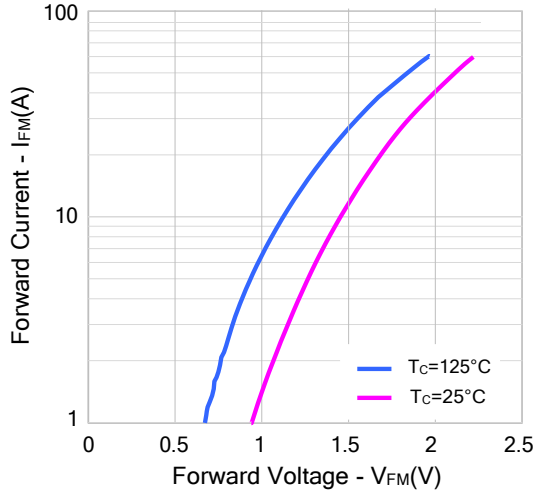



Figure 16. Reverse Recovery Time vs. Forward Current

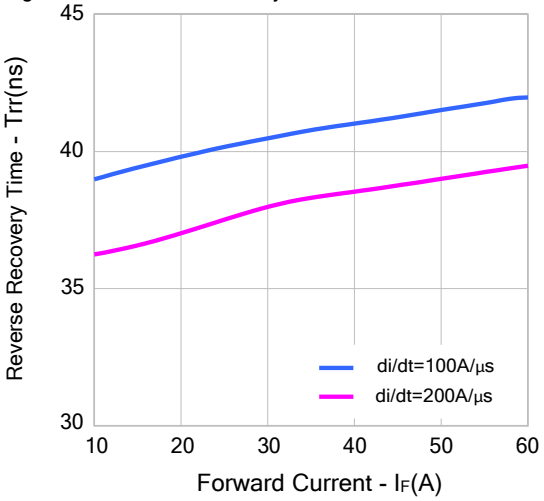



Figure 17. Reverse Recovery Charge vs. Forward Current

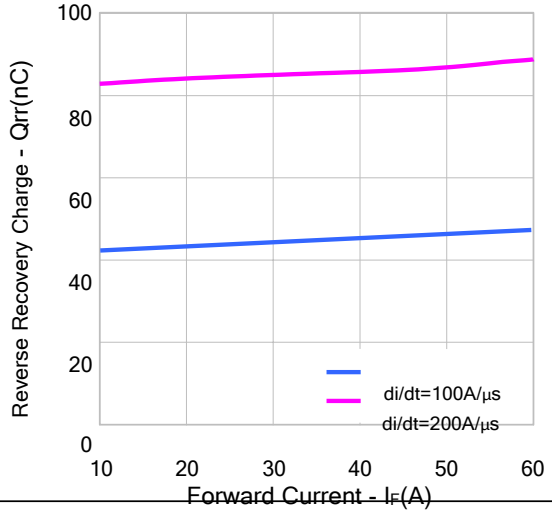
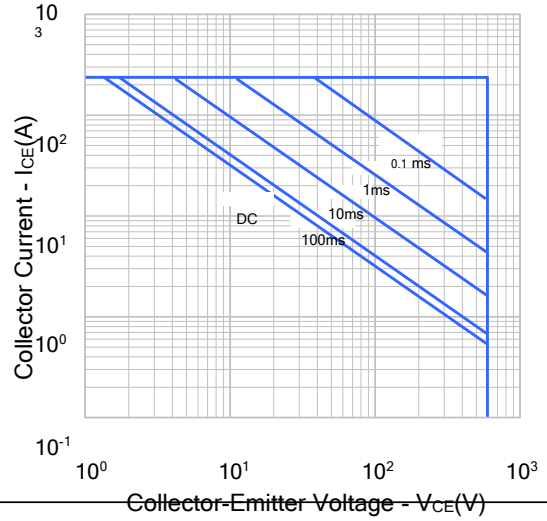



Figure 18. Max. Safe Operating Area



## TYPICAL CHARACTERISTICS CURVE (CONTINUED)

Figure 19. Square Wave Impedance Simulation (IGBT)

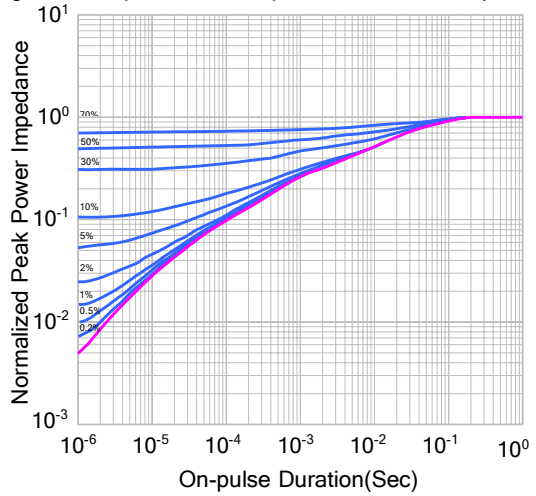
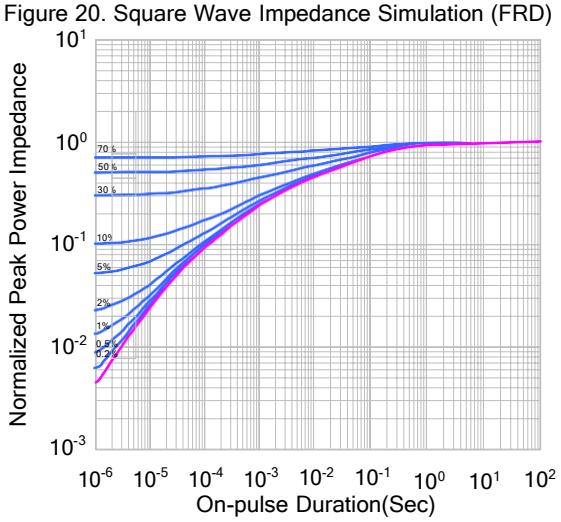


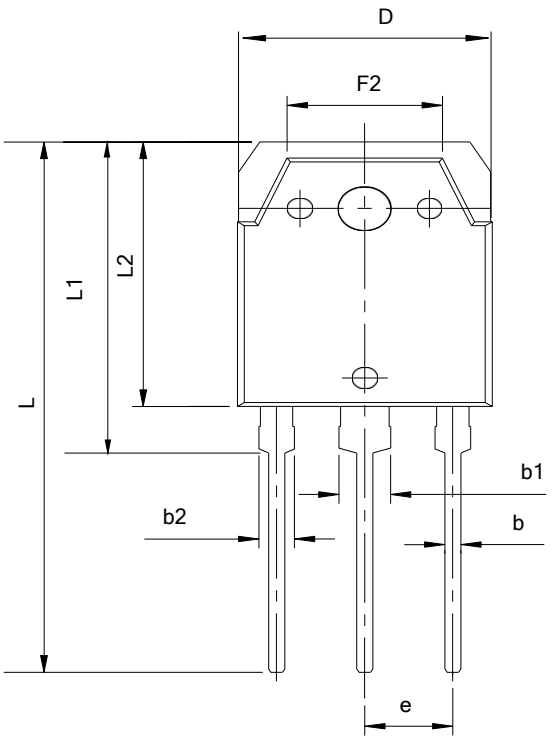

Figure 20. Square Wave Impedance Simulation (FRD)

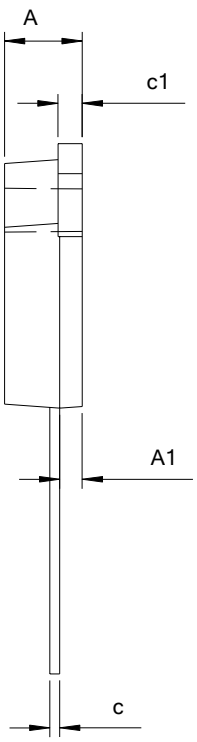


## PACKAGE OUTLINE

### TO-3P

Unit: mm

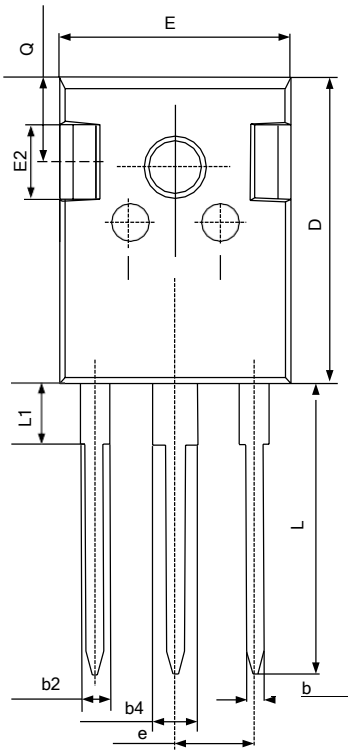


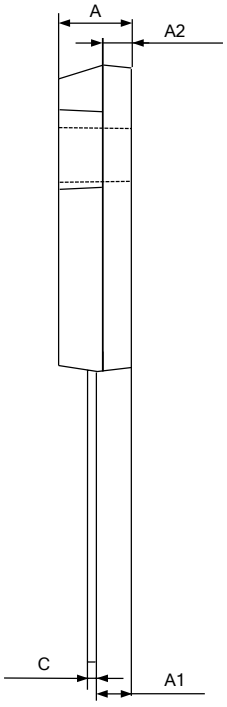




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 4.4 | — | 5.2 |
| C1 | 1.2 | — | 1.8 |
| A1 | 1.2 | — | 2.0 |
| b | 0.7 | 1.0 | 1.3 |
| b1 | 2.7 | 3.0 | 3.3 |
| b2 | 1.7 | 2.0 | 2.3 |
| D | 15.0 | 15.5 | 16.0 |
| C | 0.4 | 0.6 | 0.8 |
| F2 | 8.5 | — | 10.0 |
| e | 5.45 TYP | | |
| L1 | 22.6 | — | 23.6 |
| L | 39.0 | — | 41.5 |
| L2 | 19.5 | — | 21.0 |

### TO-247-3L

Unit: mm



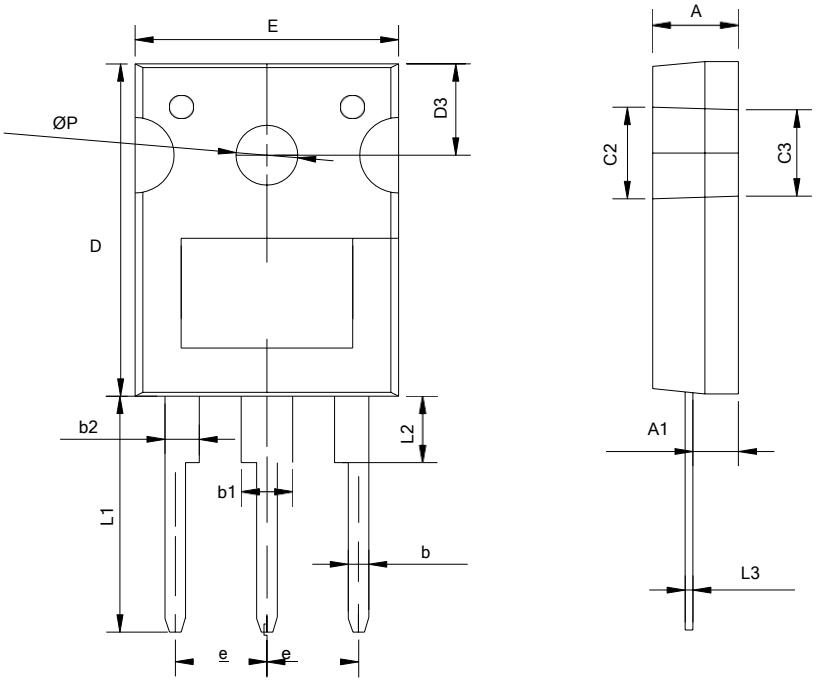




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 4.80 | 5.00 | 5.20 |
| A1 | 2.21 | 2.41 | 2.59 |
| A2 | 1.85 | 2.00 | 2.15 |
| b | 1.11 | – | 1.36 |
| b2 | 1.91 | – | 2.25 |
| b4 | 2.91 | – | 3.25 |
| c | 0.51 | – | 0.75 |
| D | 20.80 | 21.00 | 21.30 |
| E | 15.50 | 15.80 | 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 |

## PACKAGE OUTLINE(CONTINUED)

### TO-247S-3L

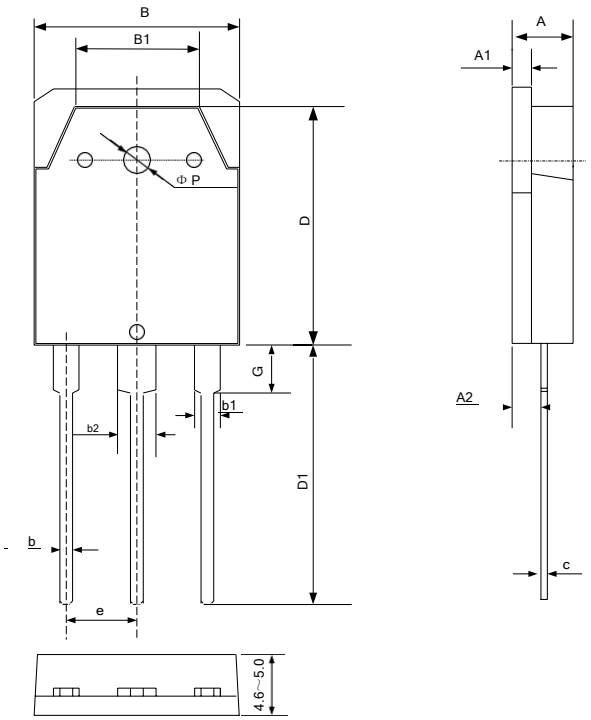
Unit: mm




| 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 |
| ø P | 3.00 | 3.20 | 3.40 |

**Important notice：**

- **The instructions are subject to change without notice！ Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current.**
- **Our products are consumer electronic products, and / or civil electronic products.**
- **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.**
- **It is strongly recommended to identify the trademark when buying our products. Please conatus us if there is any question.**
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| | | | |
|---|---|---|---|
| Part No.: | SGT60N60FD1PN/P7/PS/PT | Document Type: | Datasheet |
| Copyright: | HANGZHOU SILAN MICROELECTRONICS CO.,LTD | Website: | http: //www.silan.com.cn |

Rev.: 1.7

Revision History:

1. Add package outline of TO-3PN

Rev.: 1.6

Revision History:

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

Rev.: 1.5

Revision History:

1. Modify Package stereogram and Important notice

Rev.: 1.4

Revision History:

1. Update the package outline of TO-247-3L

Rev.: 1.3

Revision History:

1. Modify the Max Value of Junction Temperature

Rev.: 1.2

Revision History:

1. Modify annotation of Fig.13

Rev.: 1.1

Revision History:

1. Modify the characteristics

Rev.: 1.0

Revision History:

1. First release