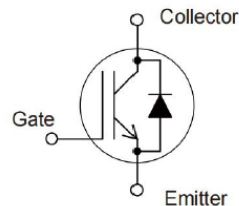


## 1200V 150A CoolFAST™ 7 Technology IGBT

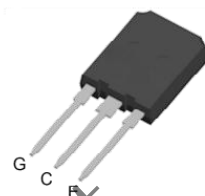
## Features:

- Low switching power loss
- Low switching surge and noise
- Advanced field stop technology
- Low EMI
- Maximum junction temperature 175°C
- Qualified according to JEDEC for target applications
- Pb-free lead plating, halogen-free mold compound, RoHS compliant



## Applications:

- Industrial UPS
- Welding machine
- Solar converters
- EV charger



## Key Performance and Package Parameters

| Type         | VCE   | IC   | VCEsat, Tvj=25°C | Tvjmax | Marking      | Package       |
|--------------|-------|------|------------------|--------|--------------|---------------|
| PCA5N120GD7L | 1200V | 150A | 2.0V             | 175°C  | PCA5N120GD7L | TO-247PLUS-3L |

## Maximum Ratings and Characteristics

## Absolute Maximum Ratings at Tvj= 25°C (unless otherwise specified)

| Parameter                                                                   | Symbols | Value      | Units |
|-----------------------------------------------------------------------------|---------|------------|-------|
| Collector-emitter voltage                                                   | VCE     | 1200       | V     |
| DC collector current, limited by Tvjmax<br>Tc= 25°C<br>Tc= 100°C            | IC      | 175<br>150 | A     |
| Pulsed collector current, tp limited by Tvjmax                              | ICpuls  | 600        | A     |
| Diode forward current, limited by Tvjmax<br>Tc= 25°C<br>Tc= 100°C           | IF      | 180<br>150 | A     |
| Short circuit withstand time, VGE= 15V, VCE≤ 400V                           | TSC     | 10         | μs    |
| Gate-emitter voltage<br>Transient gate-emitter voltage (tp ≤10μs, D <0.010) | VGES    | ±20<br>±30 | V     |
| Operating junction temperature                                              | Tvj     | -40 ~ +175 | °C    |
| Storage temperature                                                         | Tstg    | -55 ~ +175 | °C    |

## Thermal Resistance

| Parameter                                | Symbols  | Value |     |     | Unit  |
|------------------------------------------|----------|-------|-----|-----|-------|
|                                          |          | Min   | Typ | Max |       |
| Rth Characteristics                      |          |       |     |     |       |
| Thermal resistance, junction-ambient     | Rth(j-a) | -     | -   | 50  | °C /W |
| Thermal resistance, IGBT junction-case   | Rth(j-c) | -     | -   | 0.2 |       |
| Thermal resistance, diodes junction-case | Rth(j-c) | -     | -   | 0.3 |       |

**Electrical Characteristics at  $T_{vj}= 25^{\circ}\text{C}$  (unless otherwise specified)**

| Parameter                            | Symbols  | Conditions          | Value |     |      | Unit |
|--------------------------------------|----------|---------------------|-------|-----|------|------|
|                                      |          |                     | Min   | Typ | Max  |      |
| Static Characteristic                |          |                     |       |     |      |      |
| Collector-emitter breakdown voltage  | V(BR)CES | VGE=0V, IC=0.25mA   | 1200  | -   | -    | V    |
| Collector-emitter saturation voltage | VCEsat   | VGE= 15V, IC=150A   | -     | 2.0 | 2.4  | V    |
|                                      |          | Tvj= 25°C           | -     | 2.2 |      |      |
| Diode forward voltage                | VF       | IF= 150A            | -     | 3.5 | 4.0  | V    |
|                                      |          | Tvj= 175°C          | -     | 6.8 |      |      |
| Gate-emitter threshold voltage       | VGE(th)  | VCE= VGE, IC= 150mA | 6.0   | 6.6 | 7.2  | V    |
| Zero gate voltage collector current  | ICES     | VCE=1200V, VGE= 0V  | -     | -   | 200  | μA   |
| Gate-emitter leakage current         | IGES     | VCE= 0V, VGE= ±20V  | -     | -   | ±200 | nA   |

**Electrical Characteristics at  $T_{vj}= 25^{\circ}\text{C}$  (unless otherwise specified)**

| Parameter                    | Symbols | Conditions                    | Value |      |     | Unit |
|------------------------------|---------|-------------------------------|-------|------|-----|------|
|                              |         |                               | Min   | Typ  | Max |      |
| Dynamic Characteristic       |         |                               |       |      |     |      |
| Input capacitance            | Cies    | VCE= 25V, VGE= 0V<br>f= 1MHz  | -     | 40   | -   | pF   |
| Output capacitance           | Coēs    |                               | -     | 330  | -   | pF   |
| Reverse transfer capacitance | Cres    |                               | -     | 195  | -   | pF   |
| Gate charge                  | QG      | VCC= 960V, IC= 150A, VGE= 15V | -     | 1450 | -   | nC   |

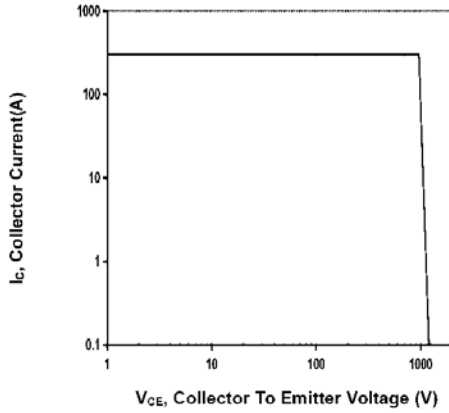
**Switching Characteristics at  $T_{vj}= 25^{\circ}\text{C}$** 

| Parameter              | Symbols      | Conditions                                                                          | Value |      |     | Unit |
|------------------------|--------------|-------------------------------------------------------------------------------------|-------|------|-----|------|
|                        |              |                                                                                     | Min   | Typ  | Max |      |
| IGBT Characteristics   |              |                                                                                     |       |      |     |      |
| Turn-on delay time     | $t_{d(on)}$  | $V_{CC}= 600V$<br>$I_C= 150A$<br>$V_{GE}= 15V$<br>$R_G= 10\Omega$<br>Inductive load | -     | 350  | -   | ns   |
| Rise time              | $t_r$        |                                                                                     | -     | 140  | -   | ns   |
| Turn-off delay time    | $t_{d(off)}$ |                                                                                     | -     | 360  | -   | ns   |
| Fall time              | $t_f$        |                                                                                     | -     | 160  | -   | ns   |
| Turn-on energy         | $E_{on}$     |                                                                                     | -     | 14.5 | -   | mJ   |
| Turn-off energy        | $E_{off}$    |                                                                                     | -     | 7.9  | -   | mJ   |
| Total switching energy | $E_{is}$     |                                                                                     | -     | 22.4 | -   | mJ   |

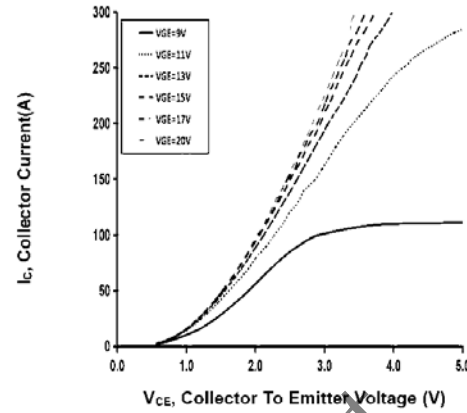
**Switching Characteristics at  $T_{vj}= 25^{\circ}\text{C}$** 

| Parameter                           | Symbols   | Conditions             | Value |      |     | Unit    |
|-------------------------------------|-----------|------------------------|-------|------|-----|---------|
|                                     |           |                        | Min   | Typ  | Max |         |
| Diode Characteristics               |           |                        |       |      |     |         |
| Diode reverse recovery time         | $t_{rr}$  | $V_{CC} = 600V$        | -     | 63   | -   | ns      |
| Diode reverse recovery charge       | $Q_{rr}$  | $I_F = 150A$           | -     | 0.31 | -   | $\mu C$ |
| Diode peak reverse recovery current | $I_{rrm}$ | $di_F/dt = 803A/\mu s$ | -     | 11   | -   | A       |

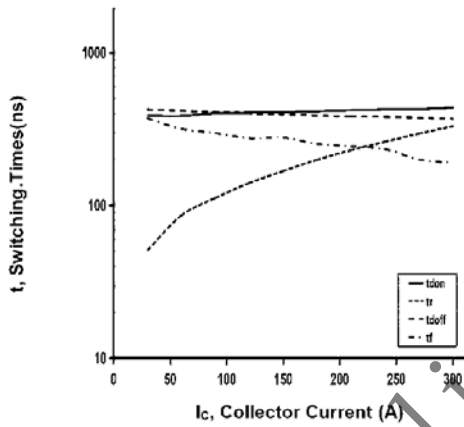
## Typical Characteristics



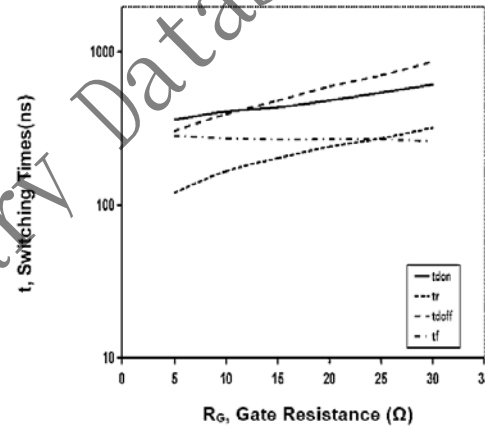
**Fig. 1 Reverse bias safe operating area**  
( $D=0$ ,  $T_c=25^\circ\text{C}$ ,  $T_v\leq 150^\circ\text{C}$ ;  $V_{GE}=15\text{V}$ )



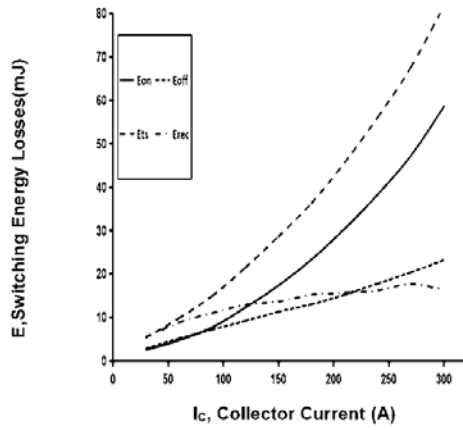
**Fig. 2 Typical output characteristic** ( $T_v=150^\circ\text{C}$ )



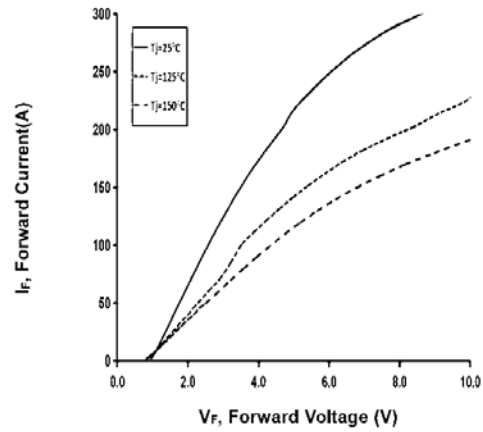
**Fig. 3 Typical switching times vs. collector current**  
(Ind. load,  $T_v=150^\circ\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=15/0\text{V}$ ,  $R_G=10\Omega$ )



**Fig. 4 Typical switching times vs. gate resistor**  
(Ind. Load,  $T_v=150^\circ\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=15/0\text{V}$ ,  $I_c=150\text{A}$ )



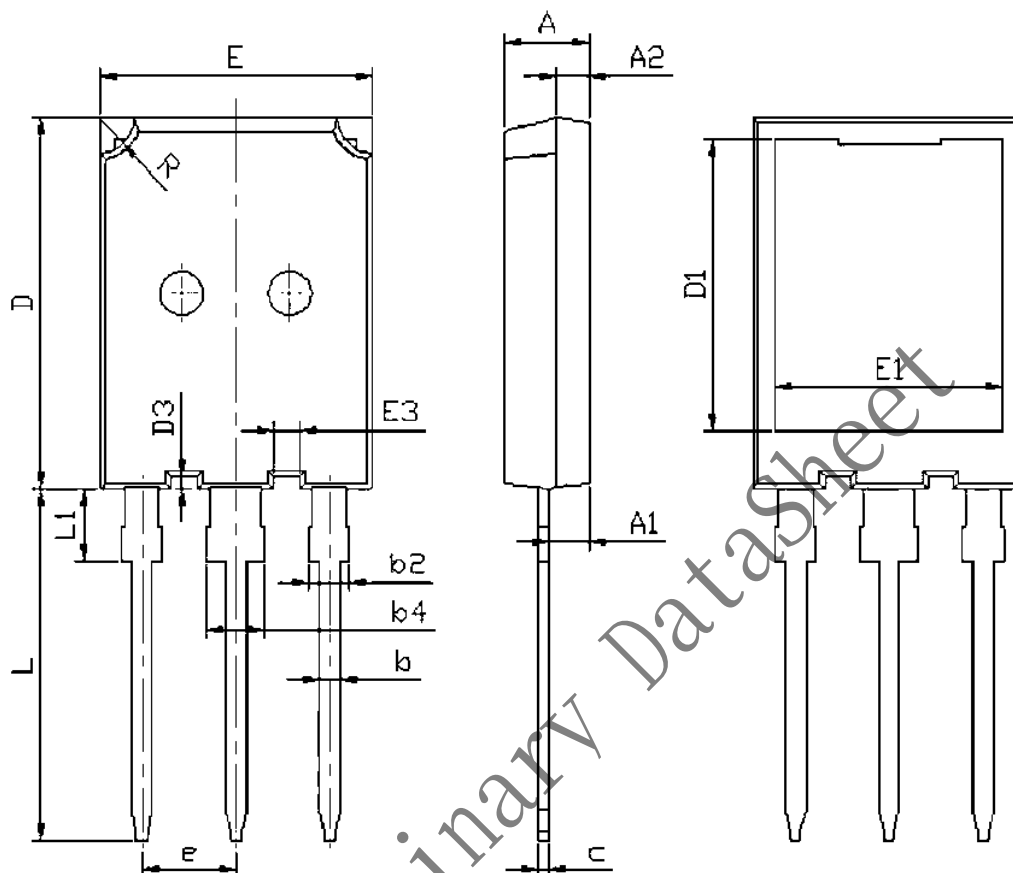
**Fig. 5 Typical switching energy losses vs. collector current** (Ind. load,  $T_J = 150^\circ\text{C}$ ,  $V_{CE} = 600\text{V}$ ,  $V_{GE} = 15/0\text{V}$ ,  $R_G = 10\Omega$ )



**Fig. 6 Typical diode forward current vs. forward voltage**

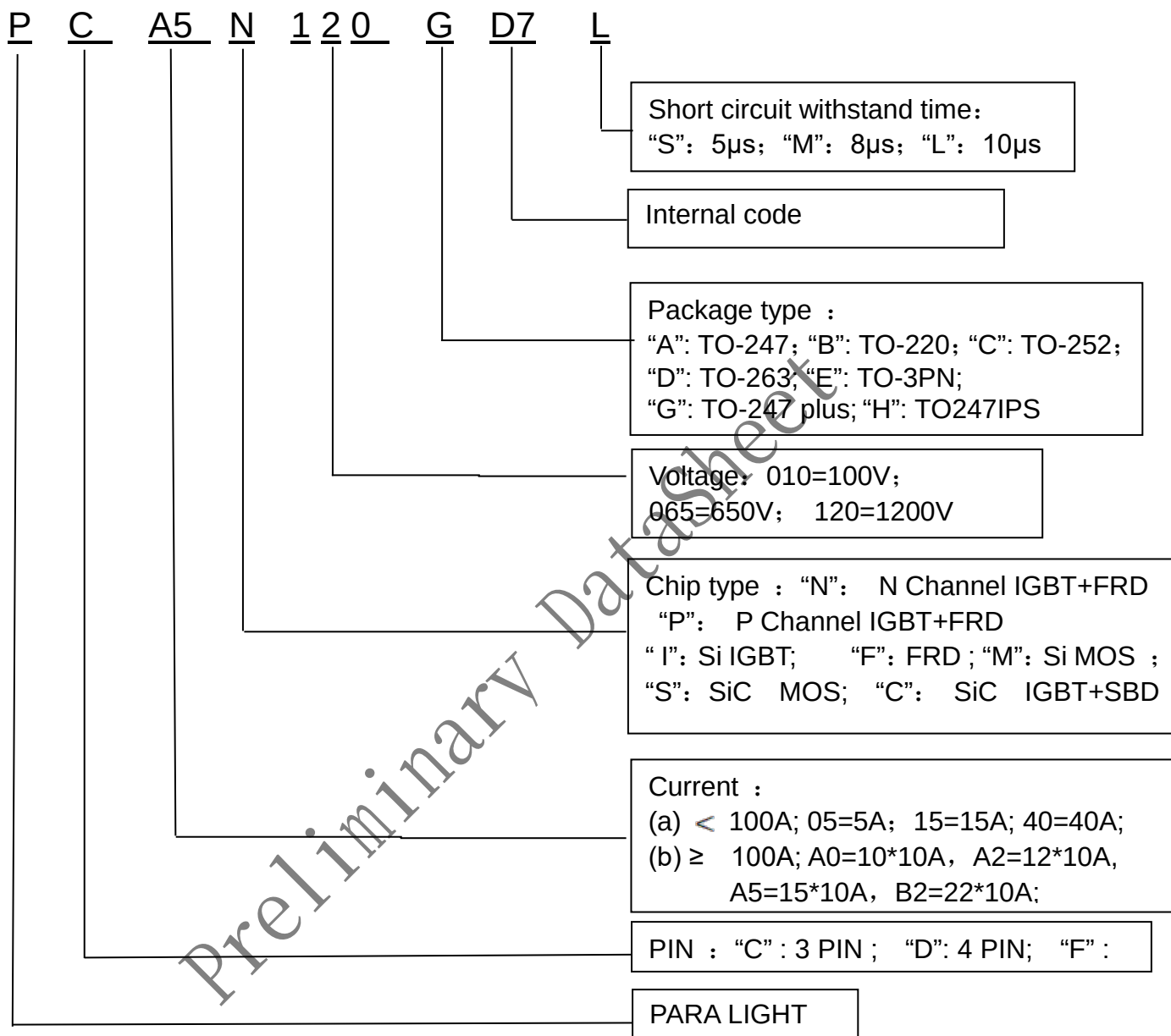
Preliminary DataSheet

## Package Dimensions



| Common dimensions(mm) |       |       |       |        |       |       |       |
|-----------------------|-------|-------|-------|--------|-------|-------|-------|
| Symbol                | Min   | Typ   | Max   | Symbol | Min   | Typ   | Max   |
| A                     | 4.80  | 5.00  | 5.20  | E      | 15.50 | 15.80 | 16.10 |
| A1                    | 2.21  | 2.40  | 2.61  | E1     | 13.10 | 13.30 | 13.50 |
| A2                    | 1.85  |       | 2.15  | E3     | 1.30  | 1.45  | 1.60  |
| b                     | 1.07  | 1.20  | 1.33  | e      |       | 5.44  |       |
| b2                    | 1.90  |       | 2.16  | L      | 19.62 | 19.92 | 20.22 |
| b4                    | 2.90  |       | 3.20  | L1     |       |       | 4.30  |
| c                     | 0.52  | 0.60  | 0.68  | R      | 1.85  | 2.00  | 2.15  |
| D                     | 20.70 | 21.00 | 21.30 |        |       |       |       |
| D1                    | 16.25 | 16.55 | 16.85 |        |       |       |       |
| D3                    | 0.53  | 0.68  | 0.83  |        |       |       |       |

**PART NO. SYSTEM :**



## Revision history

### Document revision history

| Date       | Version | Changes        |
|------------|---------|----------------|
| 2024.06.22 | A / 0   | First release. |
|            |         |                |
|            |         |                |
|            |         |                |
|            |         |                |

Preliminary DataSheet