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**DATA SHEET**

**PART NO. : PC50H120AA**

**REV : A / 0**

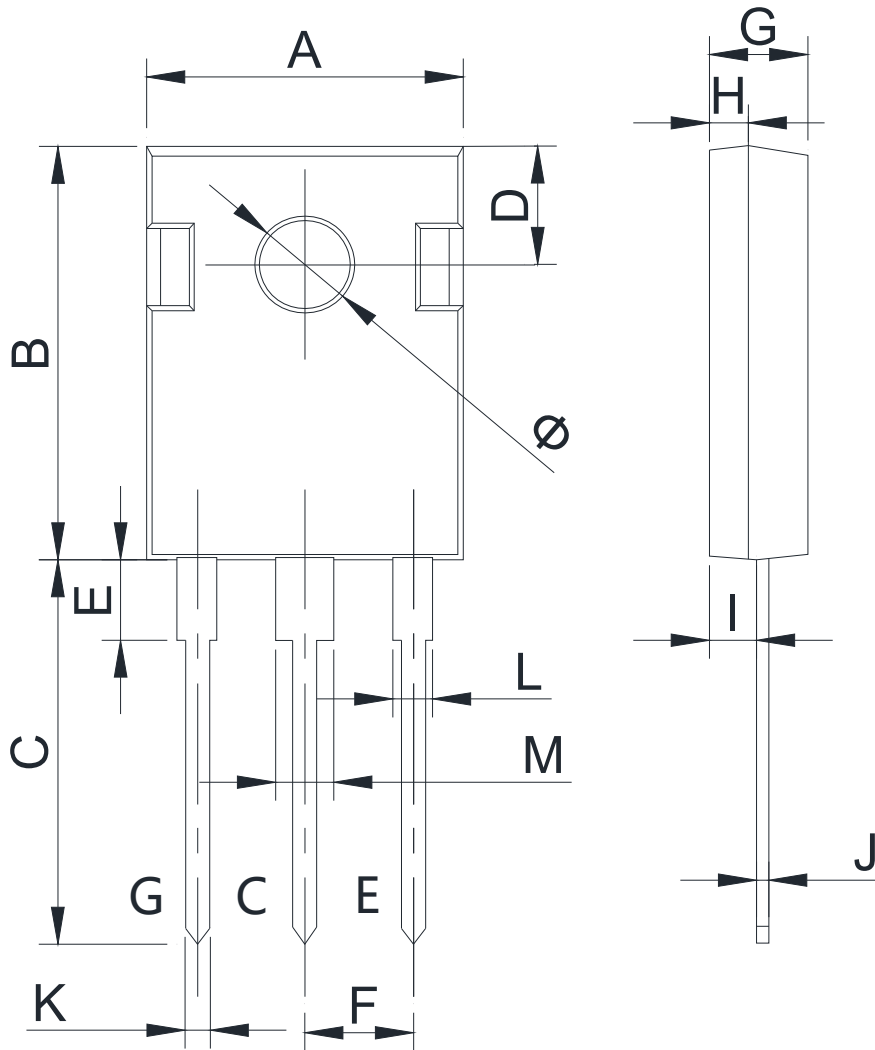
CUSTOMER'S APPROVAL : \_\_\_\_\_ DCC : \_\_\_\_\_

DRAWING NO. : DS-91P-23-0004

DATE : 2023-06-07

Page : 1

Package Dimensions



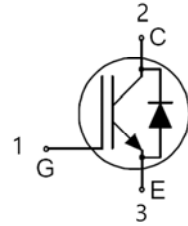
| DIM    | MILLIMETERS |       |
|--------|-------------|-------|
|        | MIN         | MAX   |
| A      | 15.75       | 15.85 |
| B      | 20.9        | 21.05 |
| C      | 19.85       | 20.05 |
| D      | 5.75        | 5.85  |
| E      | 4.15        | 4.25  |
| F      | 5.44BSC.    |       |
| G      | 4.95        | 5.05  |
| H      | 1.97        | 2.03  |
| I      | 2.35        | 2.45  |
| J      | 0.6         | 0.65  |
| K      | 1.17        | 1.25  |
| L      | 1.95        | 2.05  |
| M      | 2.85        | 3.11  |
| $\phi$ | 3.5         | 3.7   |

### Features

1200V, 50A

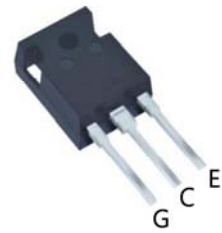
$V_{CE(sat)(typ.)} = 1.75V, I_C = 50A$

Maximum Junction Temperature 175°C



### Applications

Induction cooker



### Key Performance and Package Parameters

| $V_{CE}$ | $I_C$ | $V_{CEsat}, T_{vj}=25^{\circ}C$ | $T_{vjmax}$ |
|----------|-------|---------------------------------|-------------|
| 1200V    | 50A   | 1.75V                           | 175°C       |

### Absolute Maximum Ratings

| Symbol    | Parameter  | Value      | Unit |
|-----------|--|------------|------|
| $V_{CES}$ | Collector-Emitter Voltage( $T_{vj}=25^{\circ}C$ )                | 1200       | V    |
| $V_{GES}$ | Gate-Emitter Voltage( $T_{vj}=25^{\circ}C$ )                     | $\pm 30$   | V    |
| $I_C$     | Continuous Collector Current( $T_C = 25^{\circ}C$ )              | 90         | A    |
|           | Continuous Collector Current ( $T_C = 100^{\circ}C$ )            | 50         | A    |
| $I_{CM}$  | Pulsed Collector Current (Note 1) ( $T_{vj} \leq 175^{\circ}C$ ) | 200        | A    |
| $I_F$     | Diode Forward Current ( $T_C = 25^{\circ}C$ )                    | 90         | A    |
|           | Diode Forward Current ( $T_C = 100^{\circ}C$ )                   | 50         | A    |
| $I_{FRM}$ | Diode pulsed current( $T_{vj} \leq 175^{\circ}C$ )               | 200        | A    |
| $P_D$     | Maximum Power Dissipation ( $T_C = 25^{\circ}C$ )                | 642        | W    |
| $T_J$     | Operating Junction Temperature Range                             | -40 to 175 | °C   |
| $T_{STG}$ | Storage Temperature Range  | -50 to 150 | °C   |

### Thermal Data

| Symbol          | Parameter                                      | Max. | Unit |
|-----------------|--|------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case for IGBT  | 0.23 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case for Diode | 0.4  | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient        | 40   | °C/W |

### Electrical Characteristics (Tc=25°C unless otherwise noted.)

| Symbol        | Parameter   | Conditions  | Min. | Typ. | Max. | Unit    |
|---------------|---|---|------|------|------|---------|
| $BV_{CES}$    | Collector-Emitter Breakdown Voltage               | $V_{GE} = 0V,$<br>$I_c = 0.5mA, T_{vj} = 25^\circ C$  | 1200 | ---  | ---  | V       |
| $I_{CES}$     | Collector-Emitter Leakage Current                 | $V_{CE} = 1200V, V_{GE} = 0V,$<br>$T_{vj} = 175^\circ C$  | ---  | ---  | 500  | $\mu A$ |
| $I_{GES}$     | Gate Leakage Current, Forward                     | $V_{GE} = 30V, V_{CE} = 0V,$<br>$T_{vj} = 175^\circ C$  | ---  | ---  | 200  | nA      |
| $V_{GE(th)}$  | Gate Threshold Voltage                            | $V_{GE} = V_{CE}, I_c = 5mA,$<br>$T_{vj} = 25^\circ C$  | 4.7  | 5.6  | 6.2  | V       |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage              | $V_{GE} = 15V, I_c = 50A,$<br>$T_{vj} = 25^\circ C$   | ---  | 1.7  | 2.1  | V       |
|               |   | $V_{GE} = 15V, I_c = 50A,$<br>$T_{vj} = 175^\circ C$  | ---  | 2.2  | ---  | V       |
| $Q_G$         | Total Gate Charge                                 | $I_c = 50A, V_{CE} = 960V,$<br>$V_{GE} = 15V, T_{vj} = 25^\circ C$  | ---  | 172  | ---  | nC      |
| $Q_{GE}$      | Gate-Emitter Charge                               |   | ---  | 32   | ---  | nC      |
| $Q_{GC}$      | Gate-Collector Charge                             |   | ---  | 95   | ---  | nC      |
| $I_{sc}$      | Short circuit collector current                   | $T_{vj} = 25^\circ C, V_{CC} = 600V,$<br>$V_{GE} = 15V$   | ---  | 210  | ---  | A       |
| $t_{d(on)}$   | Turn-on Delay Time( $T_{vj} = 25^\circ C$ )       | $V_{cc} = 600V,$<br>$I_c = 50A,$<br>$R_G(on) = 15\Omega$<br>$R_G(off) = 15\Omega$<br>$C = 0nF$<br>$V_{GE} = 15V$<br>$L_{load} = 150\mu H$ | ---  | 127  | ---  | ns      |
|               | Turn-on Delay Time( $T_{vj} = 175^\circ C$ )      |   | ---  | 123  | ---  | ns      |
| $t_r$         | Turn-on Rise Time( $T_{vj} = 25^\circ C$ )        |   | ---  | 43   | ---  | ns      |
|               | Turn-on Rise Time( $T_{vj} = 175^\circ C$ )       |   | ---  | 51   | ---  | ns      |
| $t_{d(off)}$  | Turn-off Delay Time( $T_{vj} = 25^\circ C$ )      |   | ---  | 409  | ---  | ns      |
|               | Turn-off Delay Time( $T_{vj} = 175^\circ C$ )     |   | ---  | 452  | ---  | ns      |
| $t_f$         | Turn-off Fall Time( $T_{vj} = 25^\circ C$ )       |   | ---  | 40   | ---  | ns      |
|               | Turn-off Fall Time( $T_{vj} = 175^\circ C$ )      |   | ---  | 72   | ---  | ns      |
| $E_{on}$      | Turn-on Switching Loss( $T_{vj} = 25^\circ C$ )   |   | ---  | 3.5  | ---  | mJ      |
|               | Turn-on Switching Loss( $T_{vj} = 175^\circ C$ )  |   | ---  | 6    | ---  | mJ      |
| $E_{off}$     | Turn-off Switching Loss( $T_{vj} = 25^\circ C$ )  | ---   | 2.2  | ---  | mJ   |         |
|               | Turn-off Switching Loss( $T_{vj} = 175^\circ C$ ) | ---   | 5    | ---  | mJ   |         |

### Electrical Characteristics (Tc=25°C unless otherwise noted.)

| Symbol           | Parameter                    | Conditions   | Min. | Typ. | Max. | Unit |
|------------------|------------------------------|--|------|------|------|------|
| C <sub>ies</sub> | Input Capacitance            | V <sub>GE</sub> = 0V, V <sub>CE</sub> = 25V,<br>f = 1MHz, T <sub>vj</sub> = 25°C | ---  | 3620 | ---  | pF   |
| C <sub>oes</sub> | Output Capacitance           |  | ---  | 244  | ---  | pF   |
| C <sub>res</sub> | Reverse Transfer Capacitance |  | ---  | 121  | ---  | pF   |
| R <sub>g</sub>   | Internal gate resistor       |  | ---  | 0    | ---  | Ω    |

### Diode Characteristics (TC=25°C unless otherwise noted)

| Symbol               | Parameter   | Conditions   | Min. | Typ. | Max. | Unit |
|----------------------|---|--|------|------|------|------|
| V <sub>F</sub>       | Diode Forward Voltage                                       | V <sub>GE</sub> =0V, I <sub>F</sub> =50A,<br>T <sub>vj</sub> =25°C             | ---  | 2.2  | 2.5  | V    |
|                      |   | V <sub>GE</sub> =0V, I <sub>F</sub> =50A,<br>T <sub>vj</sub> =175°C            | ---  | 1.8  | ---  | V    |
| t <sub>rr</sub>      | Diode Reverse Recovery Time(T <sub>vj</sub> =25°C)          | I <sub>F</sub> = 50A,<br>V <sub>R</sub> =600V,<br>di <sub>F</sub> /dt=-650A/μs | ---  | 273  | ---  | ns   |
|                      | Diode Reverse Recovery Time(T <sub>vj</sub> =175°C)         |  | ---  | 456  | ---  | ns   |
| I <sub>rr</sub>      | Diode peak Reverse Recovery Current(T <sub>vj</sub> =25°C)  |  | ---  | 20   | ---  | A    |
|                      | Diode peak Reverse Recovery Current(T <sub>vj</sub> =175°C) |  | ---  | 35   | ---  | A    |
| di <sub>rr</sub> /dt | Peak rate of i <sub>rr</sub> (T <sub>vj</sub> =25°C)        |  | ---  | 240  | ---  | A/μs |
|                      | Peak rate of i <sub>rr</sub> (T <sub>vj</sub> =175°C)       |  | ---  | 310  | ---  | A/μs |
| E <sub>rec</sub>     | Reverse recovery energy(T <sub>vj</sub> =25°C)              |  | ---  | 1.3  | ---  | mJ   |
|                      | Reverse recovery energy(T <sub>vj</sub> =175°C)             |  | ---  | 3.5  | ---  | mJ   |

Note1: Repetitive rating, pulse width limited by maximum junction temperature

### Typical Characteristics

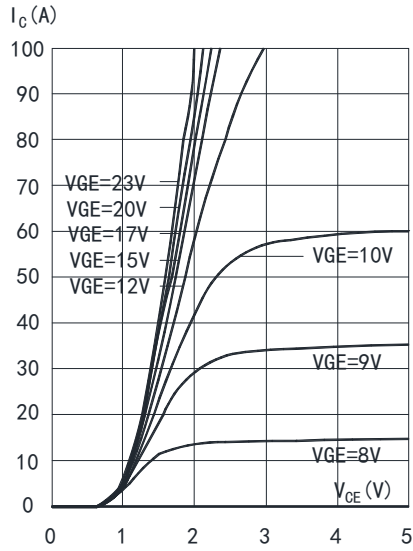


Fig. 1 Typical Output Characteristic ( $T_c = 25^\circ\text{C}$ )

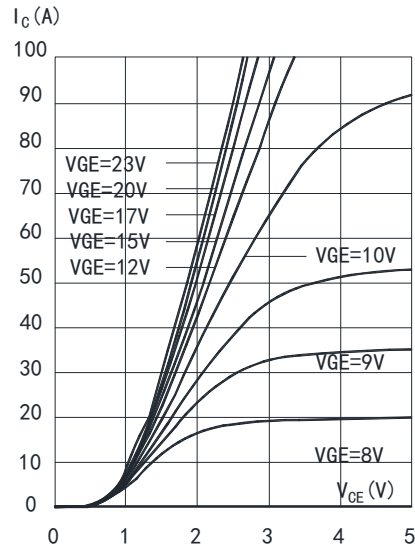


Fig. 2 Typical Output Characteristic ( $T_c = 175^\circ\text{C}$ )

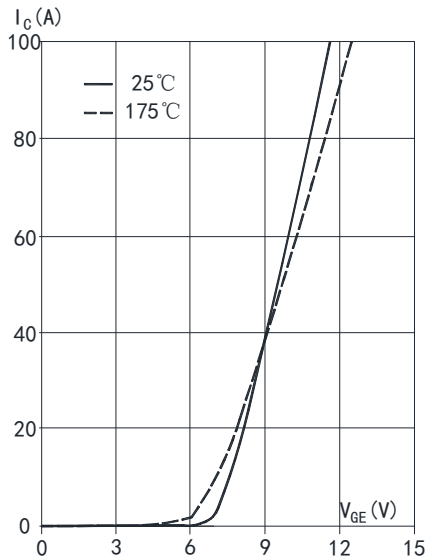


Fig. 3 Typical transfer characteristic

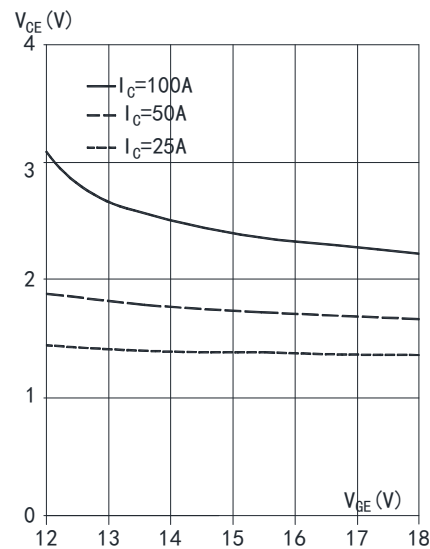


Fig. 4 Typical  $V_{CE}$  as a function of  $V_{GE}$

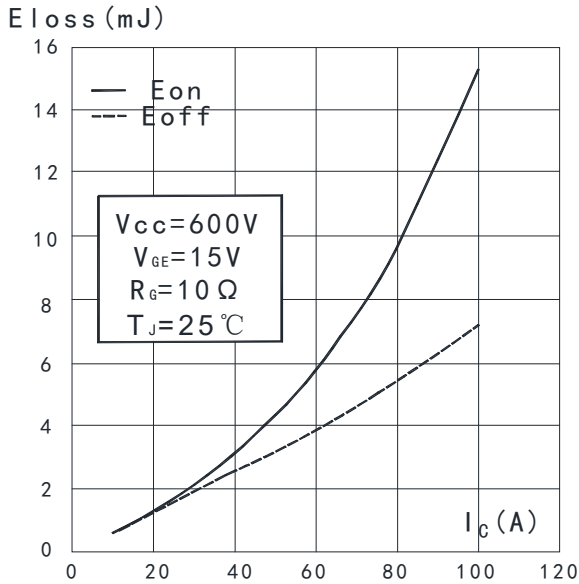


Fig. 5 Typical switching losses as Ic

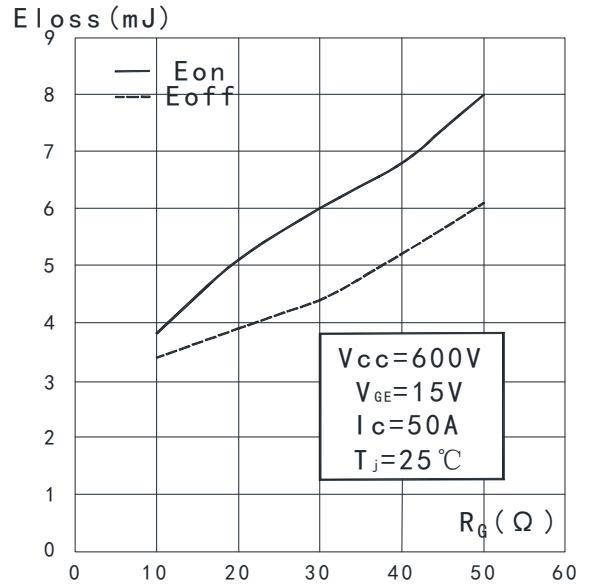


Fig. 6 Typical switching losses as R<sub>G</sub>

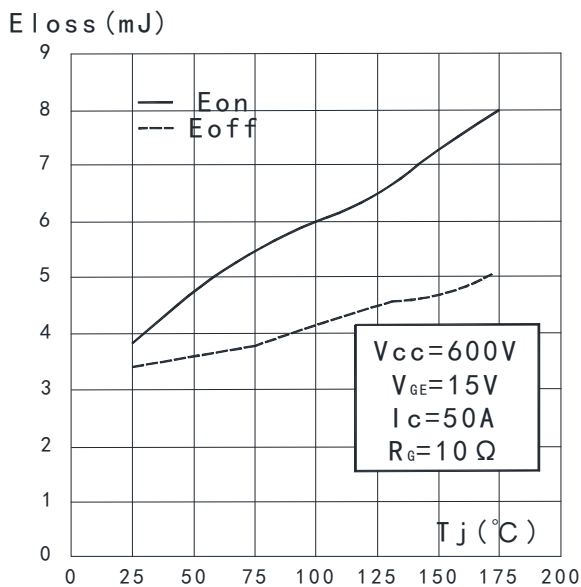


Fig. 7 Typical switching losses as T<sub>J</sub>

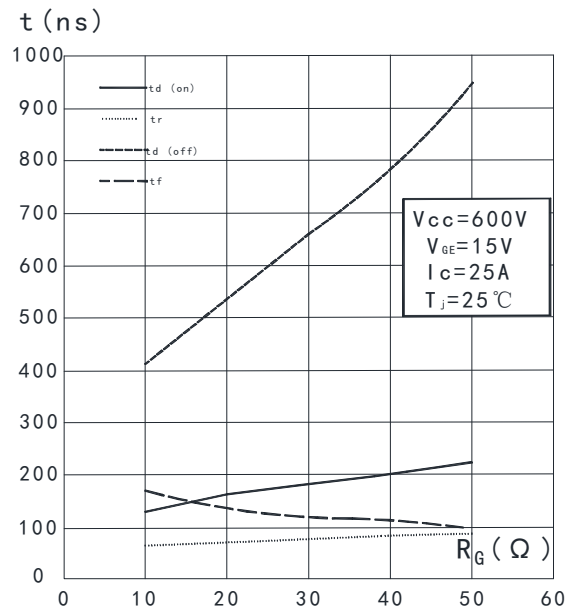


Fig. 8 Switching times as R<sub>G</sub>

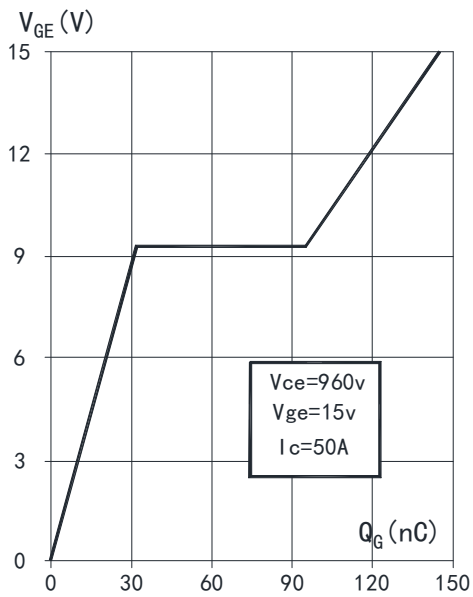


Fig. 5 Typical gate charge

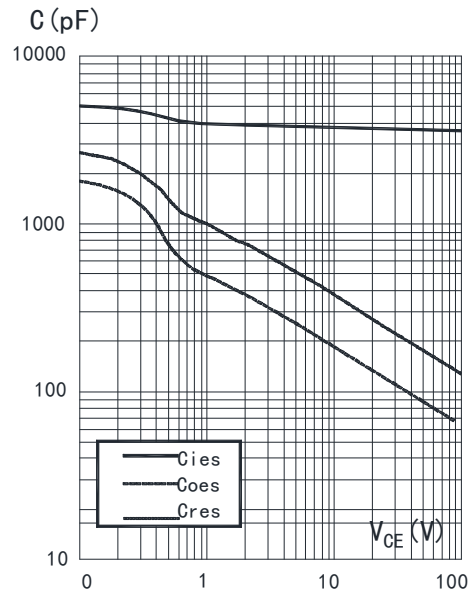


Fig. 6 Capacitance as a function of  $V_{ce}$

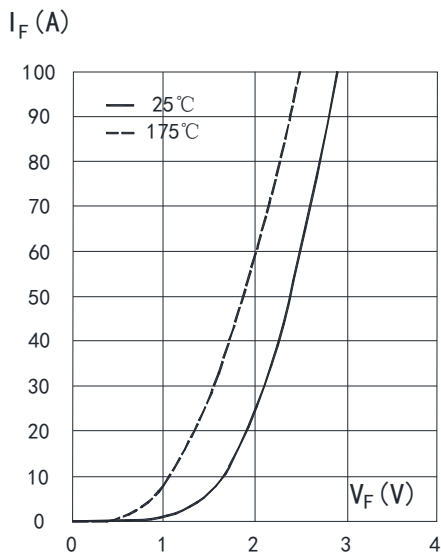


Fig. 7 Typical  $I_F$  as a function of  $V_F$

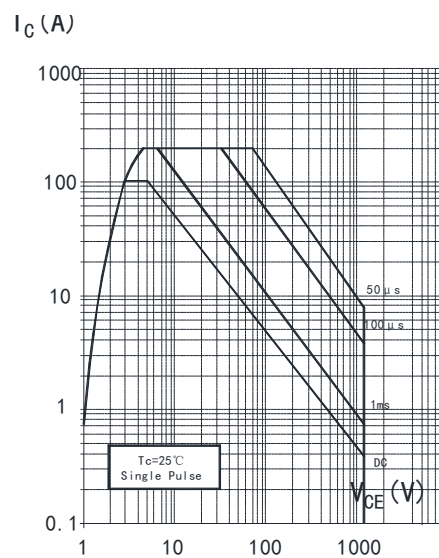


Fig. 8 Forward bias safe operating area





# Trench Field-Stop Technology IGBT

PC50H120AA

REV:A / 0

## ● PART NO. SYSTEM :

P C 15 H 120 A C

