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## DATA SHEET

PART NO. : PC40H120AB

REV : A / 0

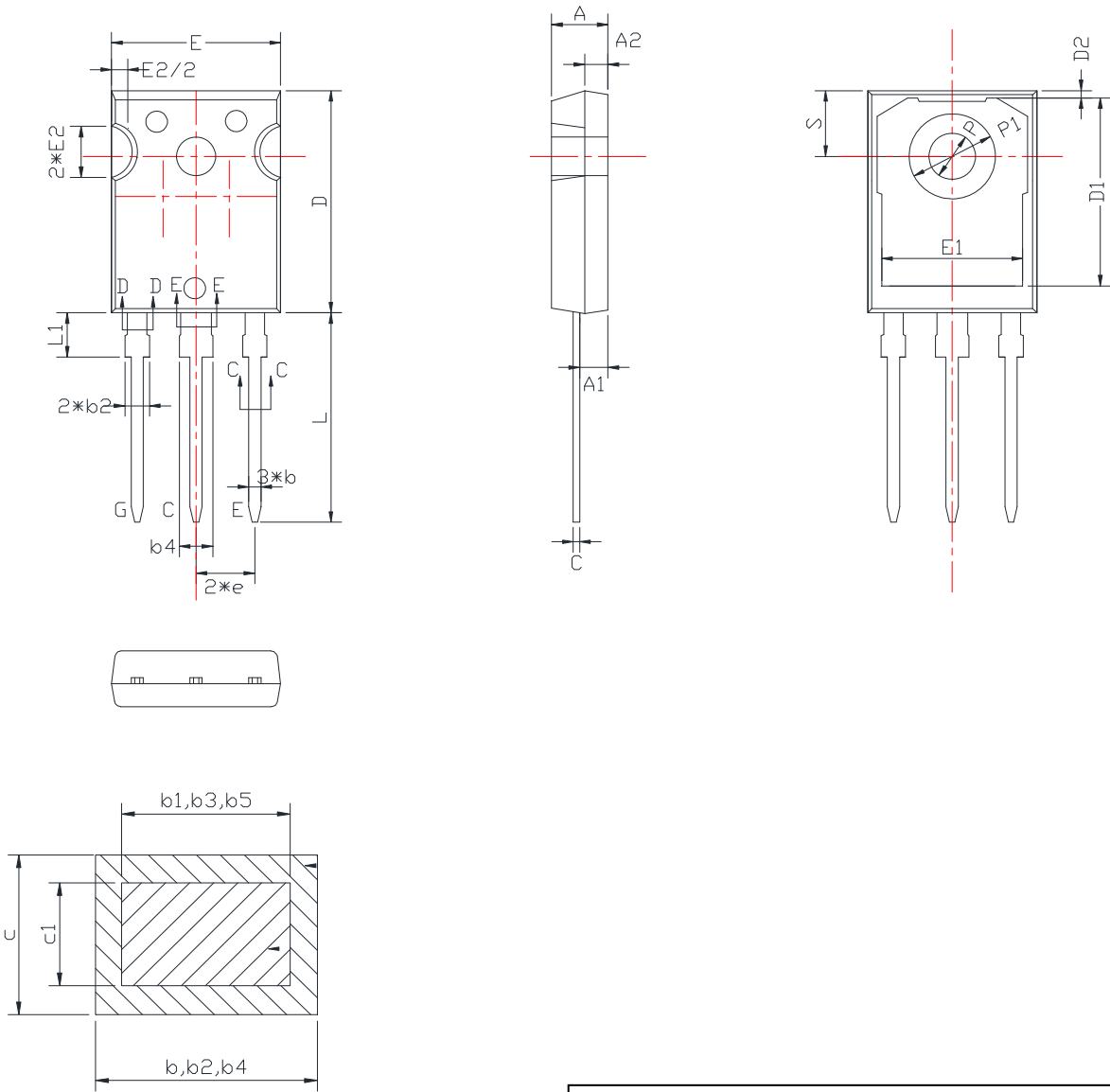
CUSTOMER'S APPROVAL : \_\_\_\_\_ DCC : \_\_\_\_\_

DRAWING NO. : DS-91P-22-0008

DATE : 2023-06-07

Page : 1

### Package Dimensions



SECTION C-C, D-D & E-E

| Common dimensions(mm) |      |      |      |        |          |       |       |
|-----------------------|------|------|------|--------|----------|-------|-------|
| Symbol                | Min  | Typ  | Max  | Symbol | Min      | Typ   | Max   |
| A                     | 4.9  | 5.0  | 5.1  | D1     | 16.25    | 16.55 | 16.85 |
| A1                    | 2.31 | 2.41 | 2.51 | D2     | 1.05     | 1.17  | 1.35  |
| A2                    | 1.9  | 2.0  | 2.1  | E      | 15.7     | 15.8  | 15.9  |
| b                     | 1.16 | -    | 1.26 | E1     | 13.2     | -     | -     |
| b1                    | 1.15 | 1.2  | 1.22 | E2     | 4.9      | 5.0   | 5.1   |
| b2                    | 1.96 | -    | 2.06 | e      | 5.436BSC |       |       |
| b3                    | 1.95 | 2.0  | 2.02 | L      | 19.8     | 19.92 | 20.1  |
| b4                    | 2.96 | -    | 3.06 | L1     | -        | -     | 4.3   |
| b5                    | 2.95 | 3.0  | 3.02 | P      | 3.5      | 3.6   | 3.7   |
| c                     | 0.59 | -    | 0.66 | P1     | -        | -     | 7.4   |
| c1                    | 0.58 | 0.6  | 0.62 | S      | 6.05     | 6.15  | 6.25  |
| D                     | 20.9 | 21.0 | 21.1 | t      | 0.00     | -     | 0.15  |

### Features

1200V, 40A

$V_{CE(sat)(typ.)} = 2.1V @ V_{GE} = 15V, I_C = 40A$

Maximum Junction Temperature 155°C

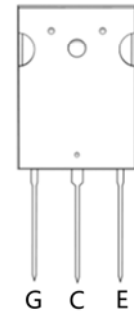
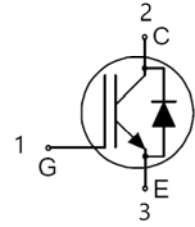
### Applications

Solar Converters

Uninterrupted Power Supply

Welding Converters

Mid to High Range Switching Frequency Converters



### Key Performance and Package Parameters

| $V_{CE}$ | $I_C$ | $V_{CEsat}, T_{vj}=25^{\circ}C$ | $T_{vjmax}$ |
|----------|-------|---------------------------------|-------------|
| 1200V    | 40A   | 2.1V                            | 155°C       |

### Absolute Maximum Ratings

| Symbol    | Parameter   | Value       | Units |
|-----------|---|-------------|-------|
| $V_{CES}$ | Collector-Emitter Voltage                           | 1200        | V     |
| $V_{GES}$ | Gate-Emitter Voltage                                | $\pm 30$    | V     |
| $I_C$     | Continuous Collector Current ( $T_C=25^{\circ}C$ )  | 80          | A     |
|           | Continuous Collector Current ( $T_C=100^{\circ}C$ ) | 40          | A     |
| $I_{CM}$  | Pulsed Collector Current (Note 1)                   | 120         | A     |
| $P_D$     | Maximum Power Dissipation ( $T_C=25^{\circ}C$ )     | 300         | W     |
|           | Maximum Power Dissipation ( $T_C=100^{\circ}C$ )    | 110         | W     |
| $T_J$     | Operating Junction Temperature Range                | -55 to +150 | °C    |
| $T_{STG}$ | Storage Temperature Range                           | -55 to +150 | °C    |

### Thermal Data

| Symbol        | Parameter                                      | Max. | Units |
|---------------|--|------|-------|
| $R_{th\ j-c}$ | Thermal Resistance, Junction to case for IGBT  | 0.42 | °C/W  |
| $R_{th\ j-c}$ | Thermal Resistance, Junction to case for Diode | 0.8  | °C/W  |
| $R_{th\ j-a}$ | Thermal Resistance, Junction to Ambient        | 40   | °C/W  |

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

| Symbol   | Parameter                            | Test Conditions  | Min.              | Typ. | Max. | Units |
|----------|--------------------------------------|--|-------------------|------|------|-------|
| BVCES    | Collector-Emitter Breakdown Voltage  | VGE= 0V, IC= 250uA   | 1200              | -    | -    | V     |
| ICES     | Collector-Emitter Leakage Current    | VCE= 1200V, VGE= 0V  | -                 | -    | 100  | uA    |
| IGES     | Gate Leakage Current, Forward        | VGE=30V, VCE= 0V   | -                 | -    | 100  | nA    |
|          | Gate Leakage Current, Reverse        | VGE= -30V, VCE= 0V   | -                 | -    | 100  | nA    |
| VGE(th)  | Gate Threshold Voltage               | VGE= VCE, IC= 250uA  | 4.0               | -    | 6.0  | V     |
| VCE(sat) | Collector-Emitter Saturation Voltage | VGE=15V, IC= 40A   | -                 | 2.1  |      | V     |
| Qg       | Total Gate Charge                    | VCC=600V<br>VGE=15V<br>IC=40A  | -                 | 107  |      | nC    |
| Qge      | Gate-Emitter Charge                  |  | -                 | 36   |      | nC    |
| Qgc      | Gate-Collector Charge                |  | -                 | 58   |      | nC    |
| t d(on)  | Turn-on Delay Time                   | VCC=600V<br>VGE=15V<br>IC=40A<br>RG=10<br>Inductive Load<br>TC=25 °C | -                 | 45   | -    | ns    |
| t r      | Turn-on Rise Time                    |  | -                 | 76   | -    | ns    |
| t d(off) | Turn-off Delay Time                  |  | -                 | 270  | -    | ns    |
| t f      | Turn-off Fall Time                   |  | -                 | 40   | -    | ns    |
| Eon      | Turn-on Switching Loss               |  | -                 | 4.5  | -    | mJ    |
| Eoff     | Turn-off Switching Loss              |  | -                 | 2.5  | -    | mJ    |
| Ets      | Total Switching Loss                 |  | -                 | 7.0  | -    | mJ    |
| Cies     | Input Capacitance                    |  | VCE=30V<br>VGE=0V | -    | 3000 | -     |
| Coes     | Output Capacitance                   | f = 1MHz   | -                 | 80   | -    | pF    |
| Cres     | Reverse Transfer Capacitance         |  | -                 | 30   | -    | pF    |



# Trench Field-Stop Technology IGBT

## PC40H120AB

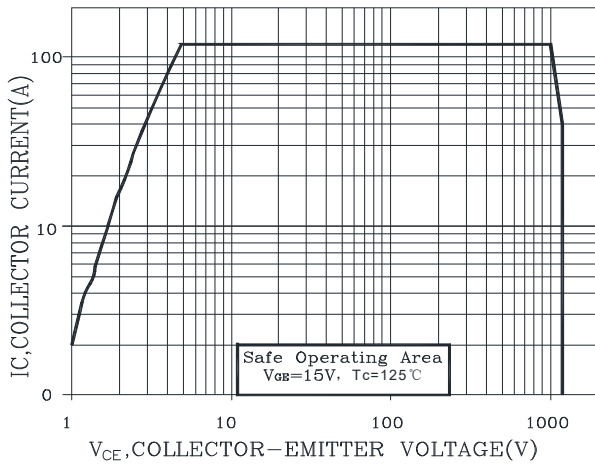
REV:A / 0

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

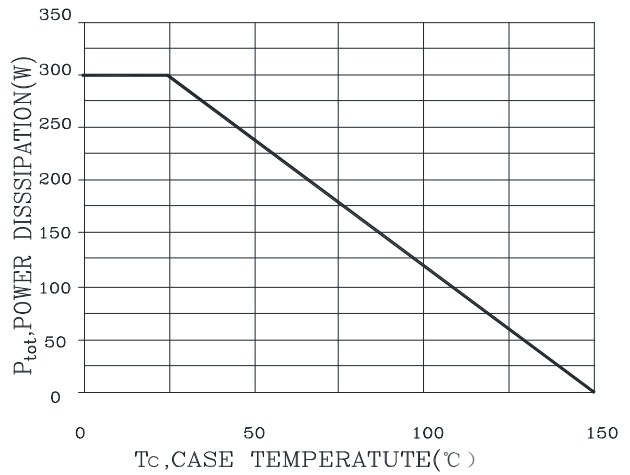
| Symbol   | Parameter                           | Test Conditions                                       | Min. | Typ. | Max. | Units |
|----------|-------------------------------------|---|------|------|------|-------|
| $V_F$    | Diode Forward Voltage               | $I_F=40A$   | -    | 2.2  | 3.2  | V     |
| $t_{rr}$ | Diode Reverse Recovery Time         | $V_{CE} = 600V$<br>$I_F = 40A$<br>$dI_F/dt = 200A/us$ | -    | 250  |      | ns    |
| $I_{rr}$ | Diode peak Reverse Recovery Current |   | -    | 10   |      | A     |
| $Q_{rr}$ | Diode Reverse Recovery Charge       |   | -    | 1350 |      | nC    |

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

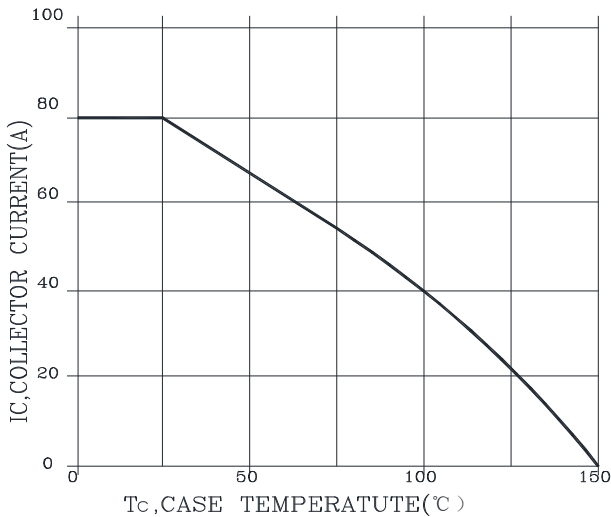
### Typical Characteristics



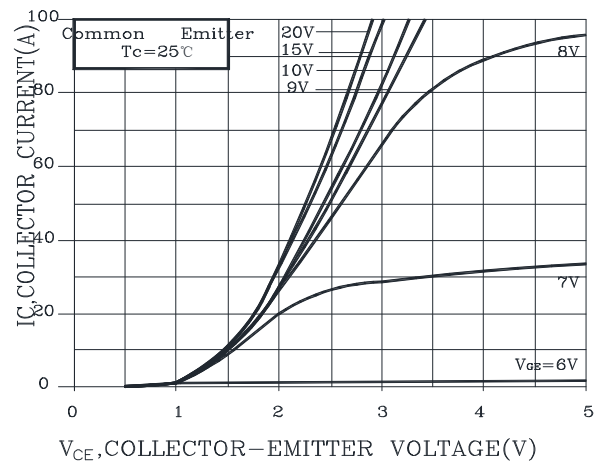
**Fig. 1 Forward bias safe operating area**  
(Tj=125°C; VGE=15V)



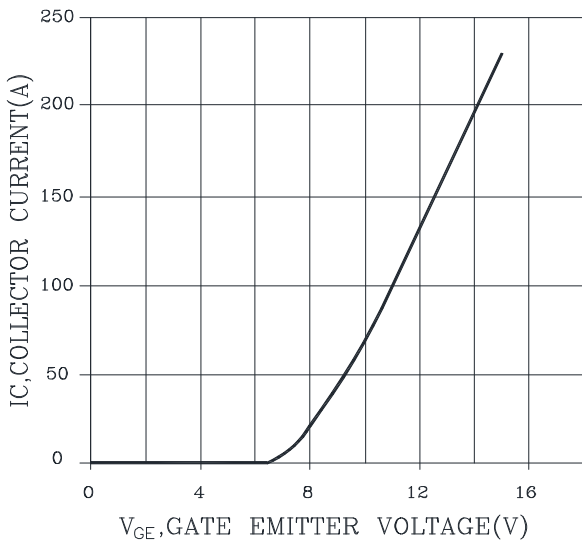
**Fig. 2 Power dissipation as a function of case temperature**



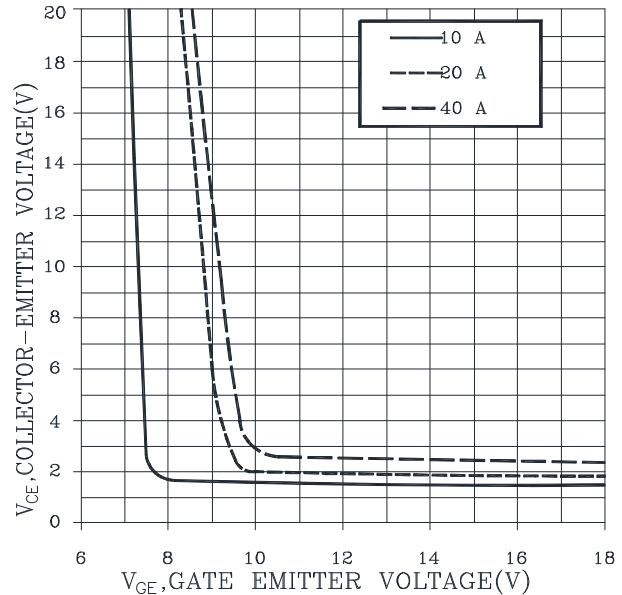
**Fig. 3 Collector current as a function of case temperature**



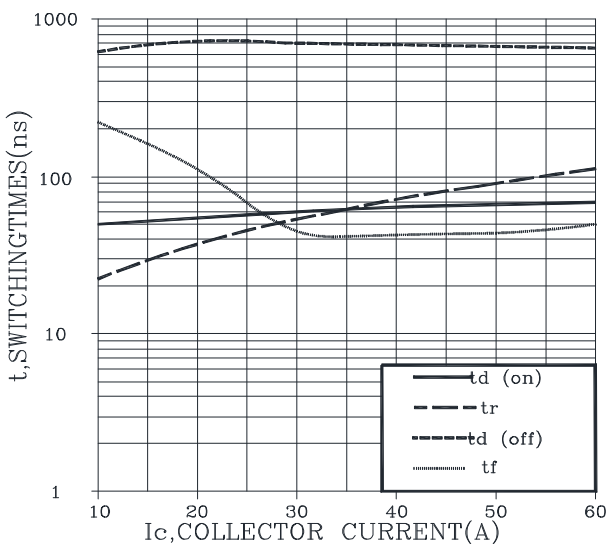
**Fig. 4 Typical output characteristic**  
(Tj=25°C; tp=300us)



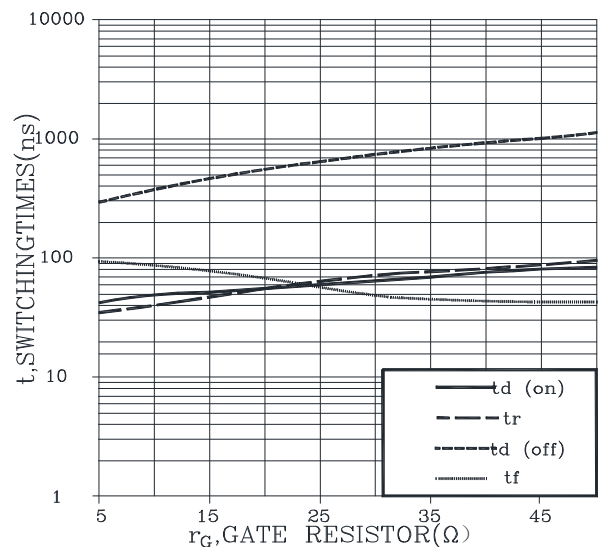
**Fig. 5 Typical transfer characteristics ( $V_{CE}=20V$ ,  $t_p=20\mu s$ )**



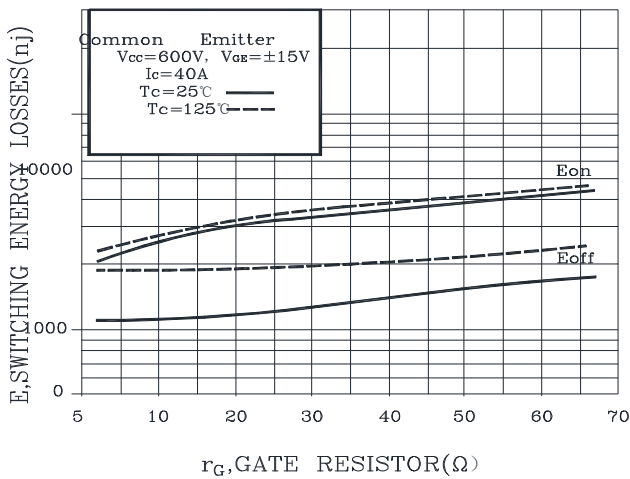
**Fig. 6 Typical  $V_{CE}$  VS.  $V_{GE}$  ( $T_J=25^\circ C$ )**



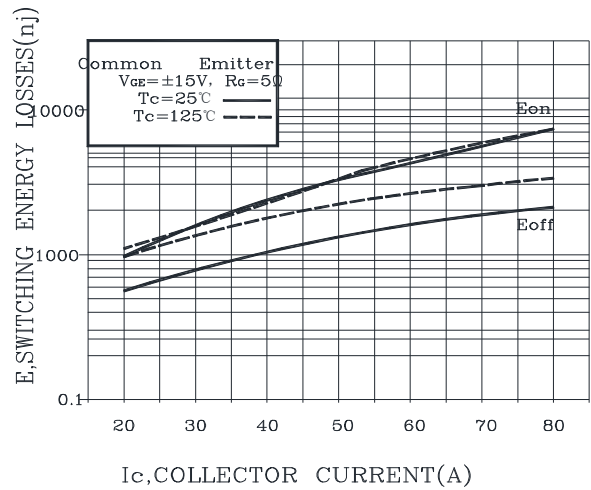
**Fig. 7 Typical switching times as a function of collector current (inductive load,  $T_C=25^\circ C$ ,  $L=500\mu H$ ,  $V_{CE}=600V$ ,  $V_{GE}=15V$ ,  $R_g=28\Omega$ )**



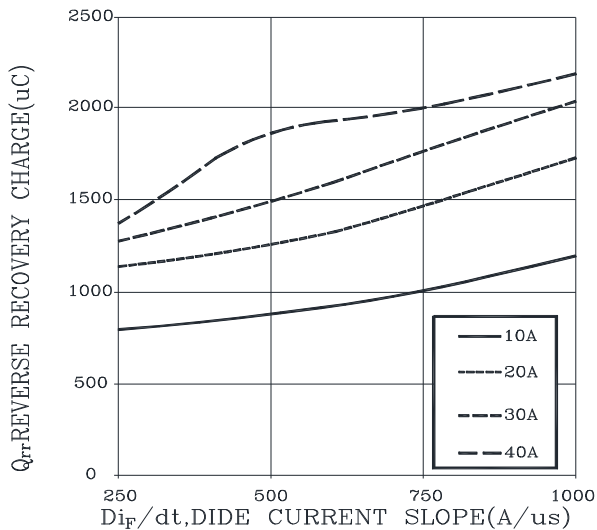
**Fig. 8 Typical switching times as a function of gate resistance (inductive load,  $T_C=25^\circ C$ ,  $L=500\mu H$ ,  $V_{CE}=600V$ ,  $V_{GE}=15V$ ,  $I_C=20A$ )**



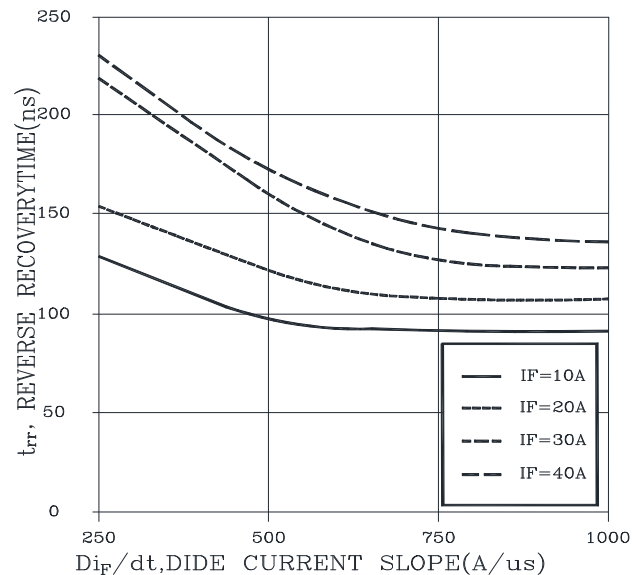
**Fig. 9 Typical energy loss VS.  $R_g$ ,**  
 (inductive load,  $T_C=25^\circ C, L=500\mu H,$   
 $V_{CE}=600V, V_{GE}=15V, I_C=40A$ )



**Fig. 10 Typical switching energy losses as a function**  
**of collector current (inductive load,  $T_C=25^\circ C,$**   
 **$L=500\mu H, V_{CE}=600V, V_{GE}=15V, R_g=5\Omega$ )**

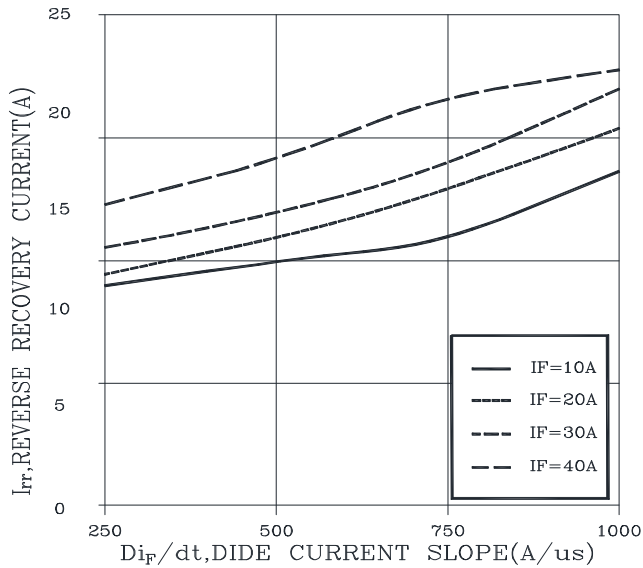


**Fig. 11 Typical Diode  $Q_{rr}$  VS.  $dI_F/dt$**   
 ( $V_{CC}=600V, V_{GE}=15V$ )

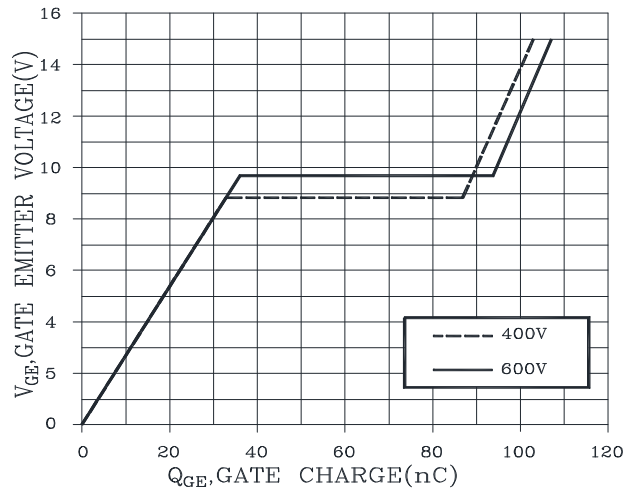


**Fig. 12 Typical reverse recovery time as a**  
**function of diode current**  
**slope ( $V_{CC}=600V, V_{GE}=15V$ )**

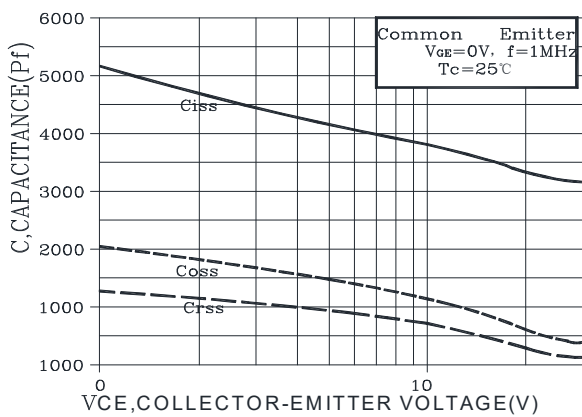




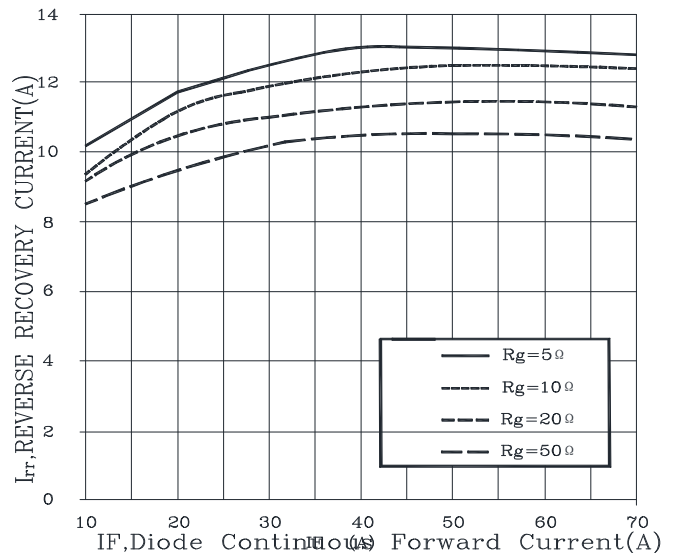
**Fig. 13 Typical Diode  $I_{rr}$  VS.  $dI_F/dt$**   
( $V_{CC}=600V, V_{GE}=15V$ )



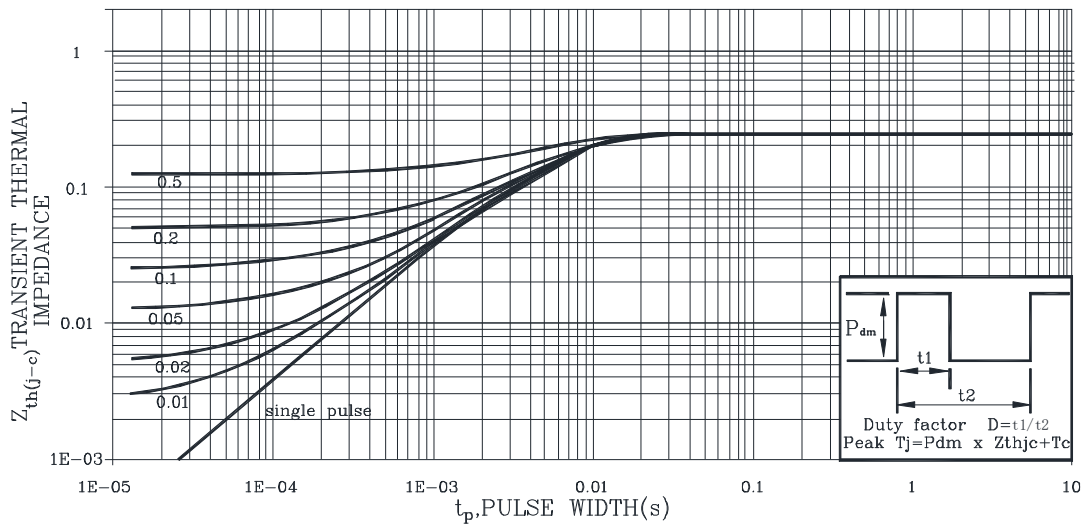
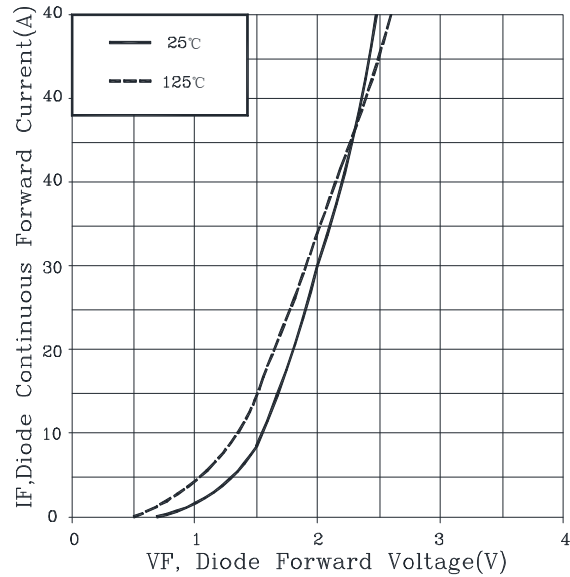
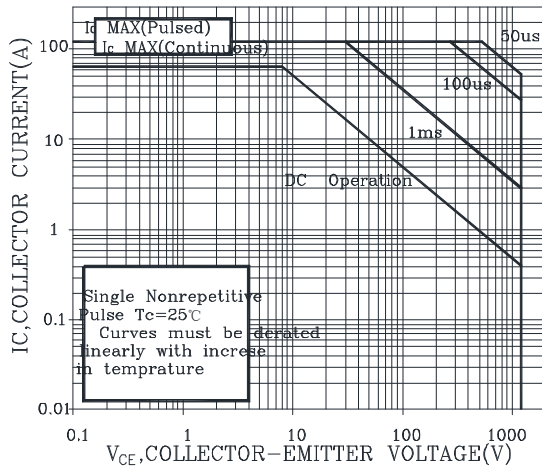
**Fig. 14 Typical gate charge ( $I_c=40A$ )**



**Fig. 15 Typical capacitance as a function of collector-emitter voltage ( $V_{GE}=0V, f=100kHz$ )**



**Fig. 16 Typical Diode  $I_{rr}$  VS.  $I_F$**   
( $T_c=25^\circ C, V_{CC}=600V, V_{GE}=15V$ )





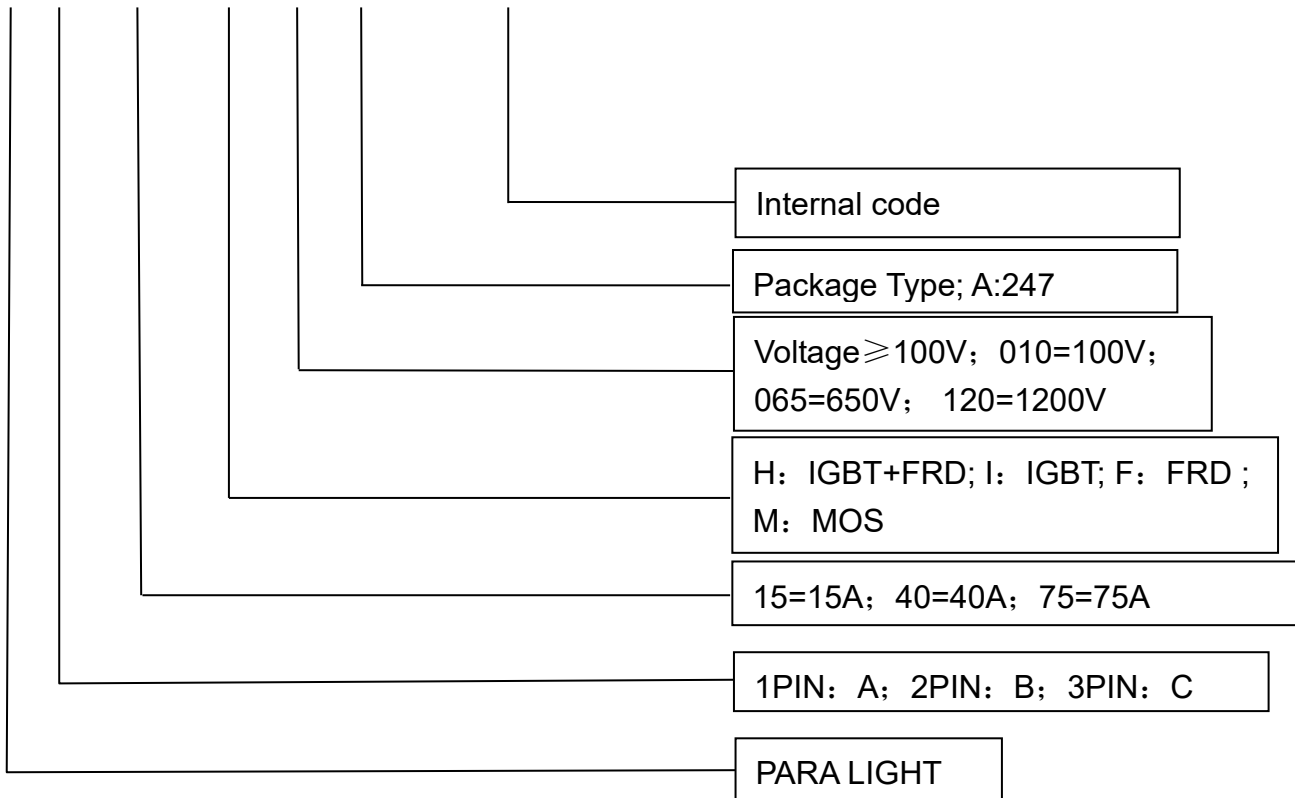
# Trench Field-Stop Technology IGBT

PC40H120AB

REV:A / 0

● PART NO. SYSTEM :

P C 15 H 120 A C



Internal code

Package Type; A:247

Voltage  $\geq$  100V; 010=100V;  
065=650V; 120=1200V

H: IGBT+FRD; I: IGBT; F: FRD ;  
M: MOS

15=15A; 40=40A; 75=75A

1PIN: A; 2PIN: B; 3PIN: C

PARA LIGHT