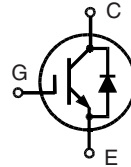


# High Voltage IGBT with optional Diode

Short Circuit SOA Capability  
Square RBSOA

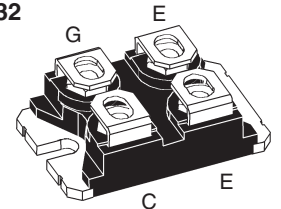


$$V_{CES} = 1200 \text{ V}$$

$$I_{C25} = 100 \text{ A}$$

$$V_{CE(sat) \text{ typ}} = 2.3 \text{ V}$$

miniBLOC, SOT-227 B  
E153432



E = Emitter ①, C = Collector  
G = Gate, E = Emitter ①

① Either Emitter terminal can be used as Main or Kelvin Emitter

### Features

- NPT IGBT technology
- low saturation voltage
- low switching losses
- square RBSOA, no latch up
- high short circuit capability
- positive temperature coefficient for easy paralleling
- MOS input, voltage controlled
- optional ultra fast diode
- International standard package miniBLOC

### Advantages

- Space savings
- Easy to mount with 2 screws
- High power density

### Typical Applications

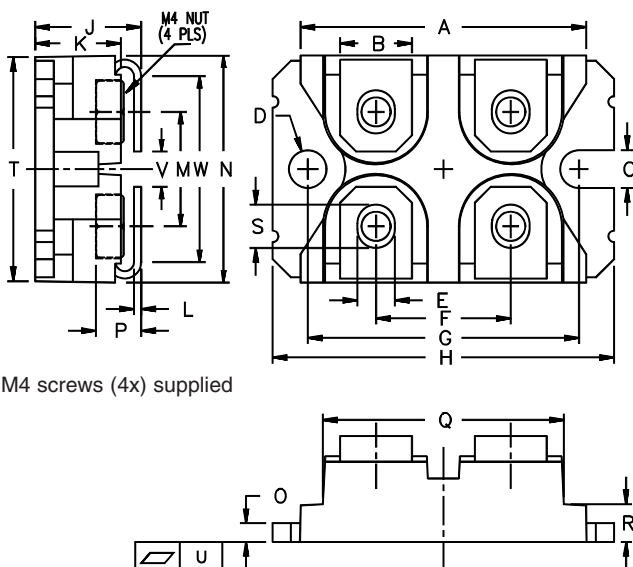
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

| Symbol                     | Conditions  | Maximum Ratings                       |                        |
|----------------------------|---|---------------------------------------|------------------------|
| $V_{CES}$                  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$   | 1200                                  | V                      |
| $V_{CGR}$                  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 20 \text{ k}\Omega$   | 1200                                  | V                      |
| $V_{GES}$                  | Continuous  | $\pm 20$                              | V                      |
| $V_{GEM}$                  | Transient   | $\pm 30$                              | V                      |
| $I_{C25}$                  | $T_C = 25^\circ\text{C}$  | 100                                   | A                      |
| $I_{C90}$                  | $T_C = 90^\circ\text{C}$  | 62                                    | A                      |
| $I_{CM}$                   | $T_C = 90^\circ\text{C}$ , $t_p = 1 \text{ ms}$   | 124                                   | A                      |
| <b>RBSOA</b>               | $V_{GE} = \pm 15 \text{ V}$ , $T_J = 125^\circ\text{C}$ , $R_G = 22 \Omega$<br>Clamped inductive load, $L = 30 \mu\text{H}$ | $I_{CM} = 100$<br>$V_{CEK} < V_{CES}$ | A                      |
| $t_{SC}$<br><b>(SCSOA)</b> | $V_{GE} = \pm 15 \text{ V}$ , $V_{CE} = V_{CES}$ , $T_J = 125^\circ\text{C}$<br>$R_G = 22 \Omega$ , non repetitive          | 10                                    | $\mu\text{s}$          |
| $P_C$                      | $T_C = 25^\circ\text{C}$  | IGBT<br>Diode                         | 450<br>220<br>W<br>W   |
| $V_{ISOL}$                 | 50/60 Hz; $I_{ISOL} \leq 1 \text{ mA}$  | 2500                                  | V~                     |
| $T_J$                      |   | -40 ... +150                          | $^\circ\text{C}$       |
| $T_{stg}$                  |   | -40 ... +150                          | $^\circ\text{C}$       |
| $M_d$                      | Mounting torque<br>Terminal connection torque (M4)  | 1.5/13<br>1.5/13                      | Nm/lb.in.<br>Nm/lb.in. |
| <b>Weight</b>              |   | 30                                    | g                      |

| Symbol        | Conditions  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                      |
|---------------|---|---|------|----------------------|
|               |   | min.  | typ. | max.                 |
| $V_{(BR)CES}$ | $V_{GE} = 0 \text{ V}$  | 1200  |      | V                    |
| $V_{GE(th)}$  | $I_C = 2 \text{ mA}$ , $V_{CE} = V_{GE}$                                    | 4.5   |      | 6.5 V                |
| $I_{CES}$     | $V_{CE} = V_{CES}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$ |   | 6    | 3.8 mA<br>mA         |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$                        |   |      | $\pm 500 \text{ nA}$ |
| $V_{CE(sat)}$ | $I_C = 55 \text{ A}$ , $V_{GE} = 15 \text{ V}$                              | 2.3   | 2.8  | V                    |

| Symbol       | Conditions   | Characteristic Values  |      |          |
|--------------|--|--|------|----------|
|              |  | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ |      |          |
|              |  | min.   | typ. | max.     |
| $C_{ies}$    | } $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$  |  | 3300 | pF       |
| $C_{oes}$    |  |  | 500  | pF       |
| $C_{res}$    |  |  | 220  | pF       |
| $Q_g$        | $I_C = 50\text{ A}, V_{GE} = 15\text{ V}, V_{CE} = 0.5 V_{CES}$  |  | 240  | nC       |
| $t_{d(on)}$  | } <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 55\text{ A}, V_{GE} = \pm 15\text{ V},$<br>$V_{CE} = 600\text{ V}, R_G = 22\ \Omega$ |  | 100  | ns       |
| $t_r$        |  |  | 70   | ns       |
| $t_{d(off)}$ |  |  | 500  | ns       |
| $t_f$        |  |  | 70   | ns       |
| $E_{on}$     |  |  | 8.4  | mJ       |
| $E_{off}$    |  |  | 6.2  | mJ       |
| $R_{thJC}$   |  |  |      | 0.28 K/W |
| $R_{thCK}$   | Package with heatsink compound   |  | 0.1  | K/W      |

| Symbol     | Conditions  | Characteristic Values  |      |         |
|------------|---|--|------|---------|
|            |   | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ |      |         |
|            |   | min.   | typ. | max.    |
| $V_F$      | $I_F = 55\text{ A}, V_{GE} = 0\text{ V}$  |  | 2.4  | V       |
|            | $I_F = 55\text{ A}, V_{GE} = 0\text{ V}, T_J = 125^\circ\text{C}$                               |  | 1.9  | V       |
| $I_F$      | $T_C = 25^\circ\text{C}$  |  |      | 110 A   |
|            | $T_C = 90^\circ\text{C}$  |  |      | 60 A    |
| $I_{RM}$   | $I_F = 55\text{ A}, -di_F/dt = 400\text{ A}/\mu\text{s}, V_R = 600\text{ V}$                    |  | 40   | A       |
| $t_{rr}$   | $V_{GE} = 0\text{ V}, T_J = 125^\circ\text{C}$  |  | 200  | ns      |
| $t_{rr}$   | $I_F = 1\text{ A}, -di_F/dt = 100\text{ A}/\mu\text{s}, V_R = 30\text{ V}, V_{GE} = 0\text{ V}$ |  | 40   | ns      |
| $R_{thJC}$ |   |  |      | 0.6 K/W |

**miniBLOC, SOT-227 B**


| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 31.50      | 31.88 | 1.240  | 1.255 |
| B    | 7.80       | 8.20  | 0.307  | 0.323 |
| C    | 4.09       | 4.29  | 0.161  | 0.169 |
| D    | 4.09       | 4.29  | 0.161  | 0.169 |
| E    | 4.09       | 4.29  | 0.161  | 0.169 |
| F    | 14.91      | 15.11 | 0.587  | 0.595 |
| G    | 30.12      | 30.30 | 1.186  | 1.193 |
| H    | 37.80      | 38.20 | 1.489  | 1.505 |
| J    | 11.68      | 12.22 | 0.460  | 0.481 |
| K    | 8.92       | 9.60  | 0.351  | 0.378 |
| L    | 0.76       | 0.84  | 0.030  | 0.033 |
| M    | 12.60      | 12.85 | 0.496  | 0.506 |
| N    | 25.15      | 25.42 | 0.990  | 1.001 |
| O    | 1.98       | 2.13  | 0.078  | 0.084 |
| P    | 4.95       | 5.97  | 0.195  | 0.235 |
| Q    | 26.54      | 26.90 | 1.045  | 1.059 |
| R    | 3.94       | 4.42  | 0.155  | 0.174 |
| S    | 4.72       | 4.85  | 0.186  | 0.191 |
| T    | 24.59      | 25.07 | 0.968  | 0.987 |
| U    | -0.05      | 0.1   | -0.002 | 0.004 |
| V    | 3.30       | 4.57  | 0.130  | 0.180 |
| W    | 0.780      | 0.830 | 0.031  | 0.033 |

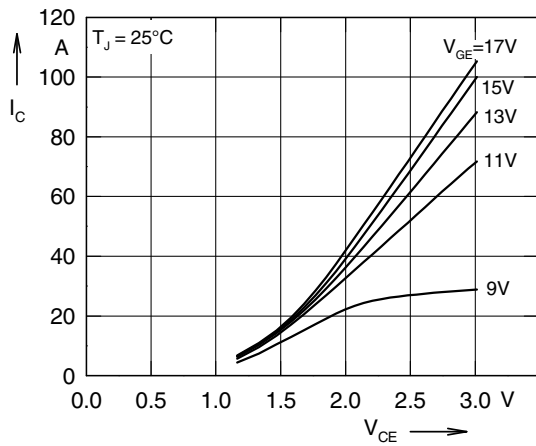


Fig. 1 Typ. output characteristics

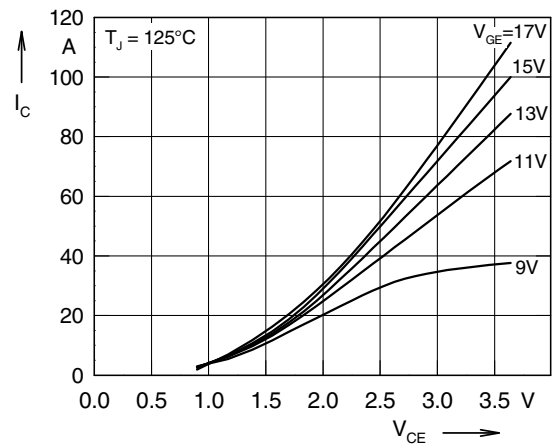


Fig. 2 Typ. output characteristics

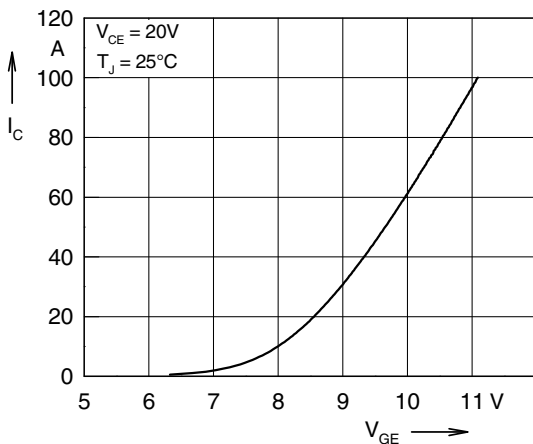


Fig. 3 Typ. transfer characteristics

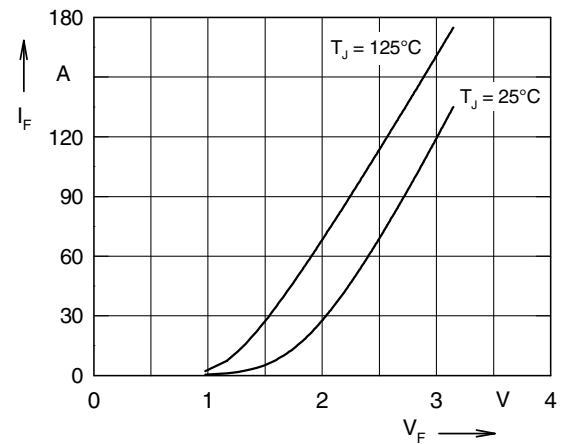


Fig. 4 Typ. forward characteristics of free wheeling diode

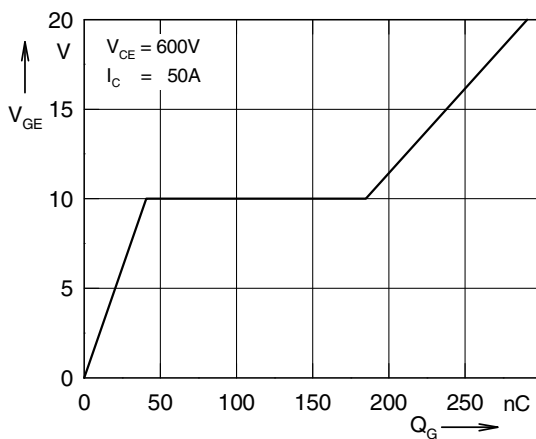


Fig. 5 Typ. turn on gate charge

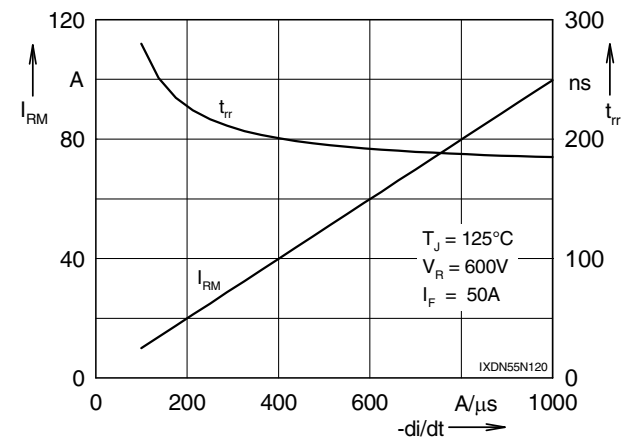


Fig. 6 Typ. turn off characteristics of free wheeling diode

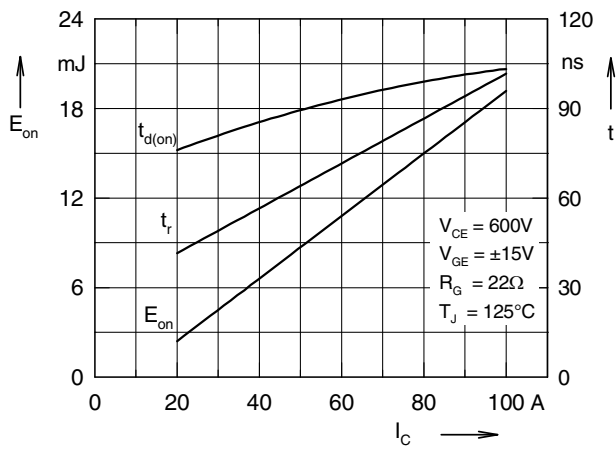


Fig. 7 Typ. turn on energy and switching times versus collector current

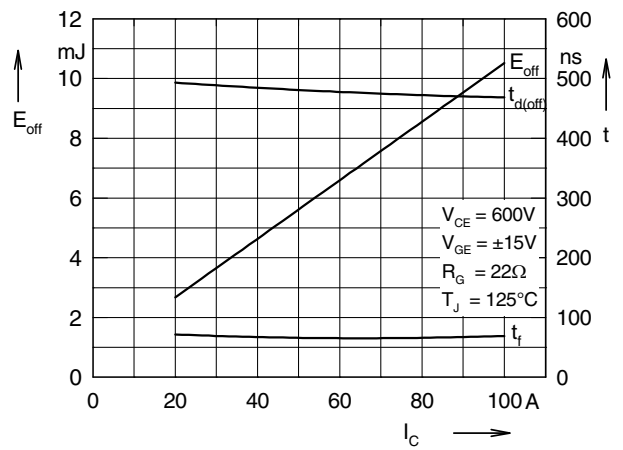


Fig. 8 Typ. turn off energy and switching times versus collector current

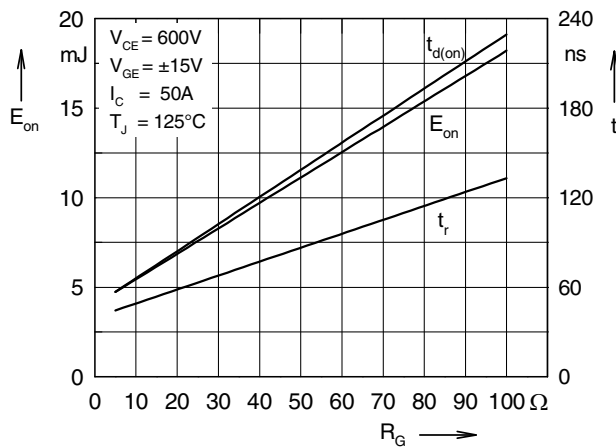


Fig. 9 Typ. turn on energy and switching times versus gate resistor

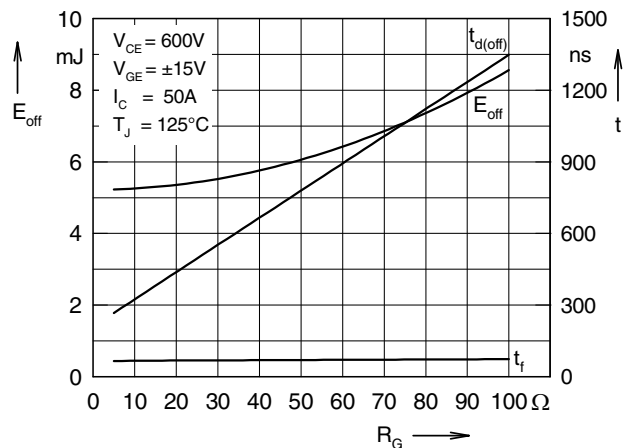


Fig.10 Typ. turn off energy and switching times versus gate resistor

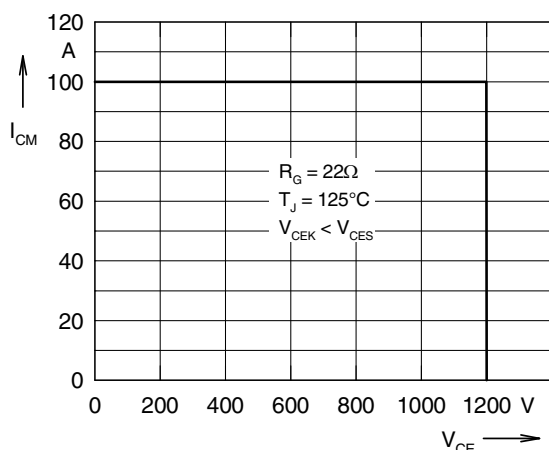


Fig. 11 Reverse biased safe operating area RBSOA

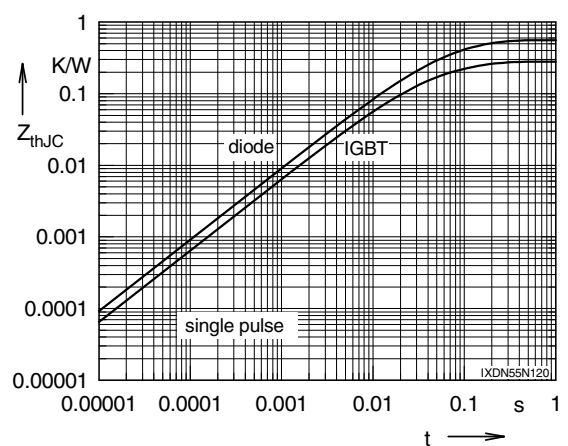


Fig. 12 Typ. transient thermal impedance