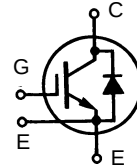


# IGBT with Diode

## IXSN 80N60AU1

$$\begin{aligned} V_{CES} &= 600 \text{ V} \\ I_{C25} &= 160 \text{ A} \\ V_{CE(sat)} &= 3 \text{ V} \end{aligned}$$

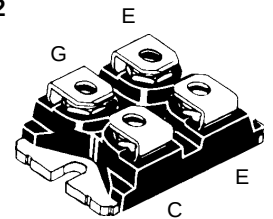
### Short Circuit SOA Capability



| Symbol                             | Test Conditions                                                                                                      | Maximum Ratings                   |                  |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------|
| $V_{CES}$                          | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                                                                       | 600                               | V                |
| $V_{CGR}$                          | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$                                           | 600                               | A                |
| $V_{GES}$                          | Continuous                                                                                                           | $\pm 20$                          | V                |
| $V_{GEM}$                          | Transient                                                                                                            | $\pm 30$                          | V                |
| $I_{C25}$                          | $T_C = 25^\circ\text{C}$                                                                                             | 160                               | A                |
| $I_{C90}$                          | $T_C = 90^\circ\text{C}$                                                                                             | 80                                | A                |
| $I_{CM}$                           | $T_C = 25^\circ\text{C}, 1 \text{ ms}$                                                                               | 320                               | A                |
| <b>SSOA (RBSOA)</b>                | $V_{GE} = 15 \text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 22 \Omega$<br>Clamped inductive load, $L = 30 \mu\text{H}$ | $I_{CM} = 160$<br>@ $0.8 V_{CES}$ | A                |
| <b><math>t_{SC}</math> (SCSOA)</b> | $V_{GE} = 15 \text{ V}, V_{CE} = 360 \text{ V}, T_J = 125^\circ\text{C}$<br>$R_G = 22 \Omega$ , non repetitive       | 10                                | $\mu\text{s}$    |
| $P_C$                              | $T_C = 25^\circ\text{C}$                                                                                             | 500                               | W                |
| $V_{ISOL}$                         | 50/60 Hz                                                                                                             | $t = 1 \text{ min}$               | 2500 V~          |
|                                    | $I_{ISOL} \leq 1 \text{ mA}$                                                                                         | $t = 1 \text{ s}$                 | 3000 V~          |
| $T_J$                              |                                                                                                                      | -55 ... +150                      | $^\circ\text{C}$ |
| $T_{JM}$                           |                                                                                                                      | 150                               | $^\circ\text{C}$ |
| $T_{stg}$                          |                                                                                                                      | -55 ... +150                      | $^\circ\text{C}$ |
| $M_d$                              | Mounting torque                                                                                                      | 1.5/13                            | Nm/lb.in.        |
|                                    | Terminal connection torque (M4)                                                                                      | 1.5/13                            | Nm/lb.in.        |
| <b>Weight</b>                      |                                                                                                                      | 30                                | g                |

### 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

- International standard package miniBLOC
- Aluminium-nitride isolation
  - high power dissipation
- Isolation voltage 3000 V~
- UL registered E 153432
- Low  $V_{CE(sat)}$ 
  - for minimum on-state conduction losses
- Fast Recovery Epitaxial Diode
  - short  $t_{rr}$  and  $I_{RM}$
- Low collector-to-case capacitance ( $< 60 \text{ pF}$ )
  - reduced RFI
- Low package inductance ( $< 10 \text{ nH}$ )
  - easy to drive and to protect

### Applications

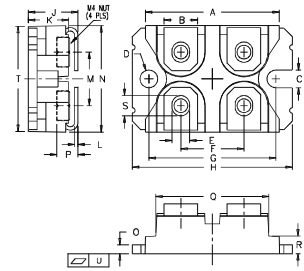
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

### Advantages

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

| Symbol        | Test Conditions                                        | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                      |
|---------------|--------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------------------|
|               |                                                        | min.                                                                              | typ. | max.                 |
| $BV_{CES}$    | $I_C = 3 \text{ mA}, V_{GE} = 0 \text{ V}$             | 600                                                                               |      | V                    |
| $V_{GE(th)}$  | $I_C = 8 \text{ mA}, V_{CE} = V_{GE}$                  | 4                                                                                 |      | 8 V                  |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$<br>$V_{GE} = 0 \text{ V}$ | $T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$                             |      | 1 mA                 |
|               |                                                        |                                                                                   |      | 15 mA                |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$      |                                                                                   |      | $\pm 100 \text{ ns}$ |
| $V_{CE(sat)}$ | $I_C = I_{C90}, V_{GE} = 15 \text{ V}$                 |                                                                                   |      | 3 V                  |

| Symbol       | Test Conditions                                                                                                                                                                                                                                                                                                                | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |          |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------|
|              |                                                                                                                                                                                                                                                                                                                                | min.                                                                              | typ. | max.     |
| $g_{fs}$     | $I_C = 60\text{ A}$ ; $V_{CE} = 10\text{ V}$ ,<br>Pulse test, $t \leq 300\text{ }\mu\text{s}$ , duty cycle $d \leq 2\%$                                                                                                                                                                                                        |                                                                                   | 46   | S        |
| $C_{ies}$    | $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                                                                                                                                            |                                                                                   | 8500 | pF       |
| $C_{oes}$    |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 650  | pF       |
| $C_{res}$    |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 120  | pF       |
| $Q_g$        | $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$                                                                                                                                                                                                                                                              |                                                                                   | 335  | nC       |
| $Q_{ge}$     |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 88   | nC       |
| $Q_{gc}$     |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 158  | nC       |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\text{ }\mu\text{H}$ ,<br>$V_{CE} = 0.8 V_{CES}$ , $R_G = 2.7\text{ }\Omega$<br>Remarks: Switching times may increase<br>for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or<br>increased $R_G$  |                                                                                   | 140  | ns       |
| $t_{ri}$     |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 220  | ns       |
| $t_{d(off)}$ |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 300  | 600 ns   |
| $t_{fi}$     |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 450  | 600 ns   |
| $E_{off}$    |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 10   | mJ       |
| $t_{d(on)}$  |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 140  | ns       |
| $t_{ri}$     | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\text{ }\mu\text{H}$ ,<br>$V_{CE} = 0.8 V_{CES}$ , $R_G = 2.7\text{ }\Omega$<br>Remarks: Switching times may increase<br>for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or<br>increased $R_G$ |                                                                                   | 220  | ns       |
| $E_{on}$     |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 8    | mJ       |
| $t_{d(off)}$ |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 520  | ns       |
| $t_{fi}$     |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 550  | ns       |
| $E_{off}$    |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 13   | mJ       |
| $R_{thJC}$   |                                                                                                                                                                                                                                                                                                                                |                                                                                   |      | 0.25 K/W |
| $R_{thCK}$   |                                                                                                                                                                                                                                                                                                                                |                                                                                   | 0.05 | K/W      |

**miniBLOC, SOT-227 B**


M4 screws (4x) supplied

| 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    | 38.00      | 38.23 | 1.496  | 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 |

| Reverse Diode (FRED) |                                                                                                                                                                                                                                                    | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |          |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------|
| Symbol               | Test Conditions                                                                                                                                                                                                                                    | min.                                                                              | typ. | max.     |
| $V_F$                | $I_F = 50\text{ A}$ , $V_{GE} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\text{ }\mu\text{s}$ , duty cycle $d \leq 2\%$                                                                                                                             |                                                                                   |      | 1.8 V    |
| $I_{RM}$             | $I_F = 50\text{ A}$ , $V_{GE} = 0\text{ V}$ , $-di_F/dt = 480\text{ A}/\mu\text{s}$<br>$V_R = 360\text{ V}$ $T_J = 125^\circ\text{C}$<br>$I_F = 1\text{ A}$ ; $-di_F/dt = 200\text{ A}/\mu\text{s}$ ; $V_R = 30\text{ V}$ $T_J = 25^\circ\text{C}$ |                                                                                   | 19   | A        |
| $t_{rr}$             |                                                                                                                                                                                                                                                    |                                                                                   | 175  | ns       |
|                      |                                                                                                                                                                                                                                                    |                                                                                   | 35   | 50 ns    |
| $R_{thJC}$           |                                                                                                                                                                                                                                                    |                                                                                   |      | 0.80 K/W |

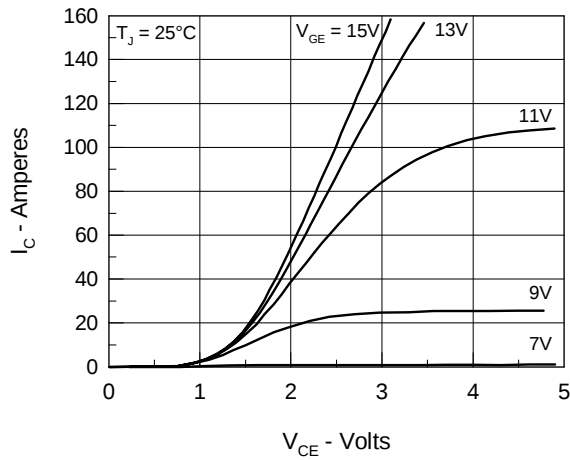
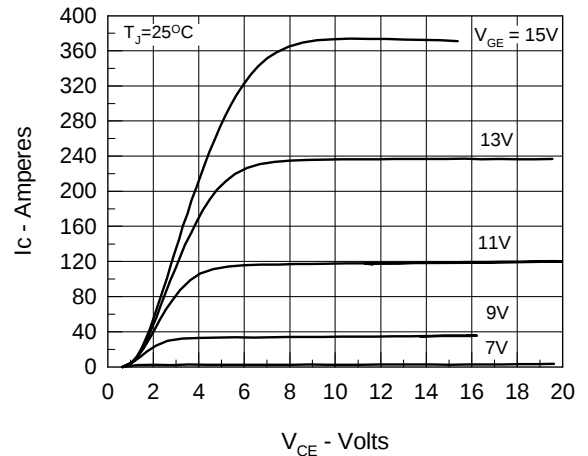
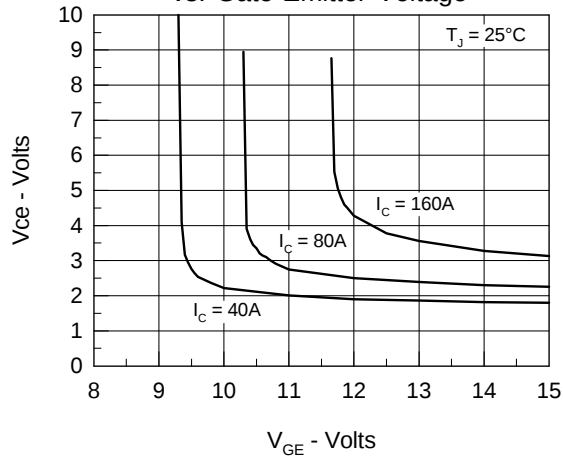
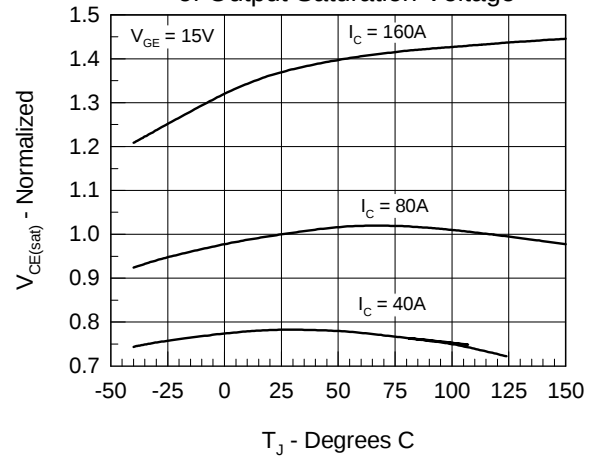
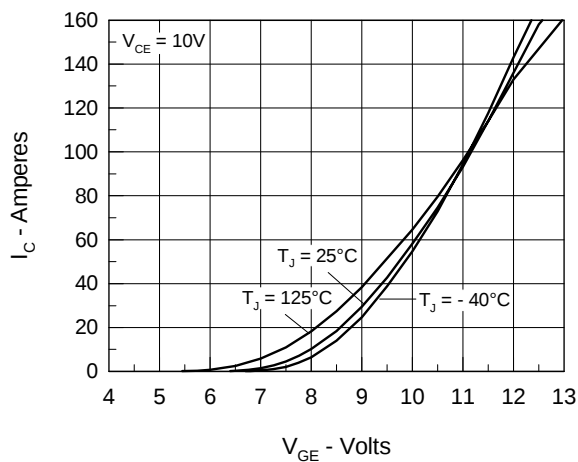
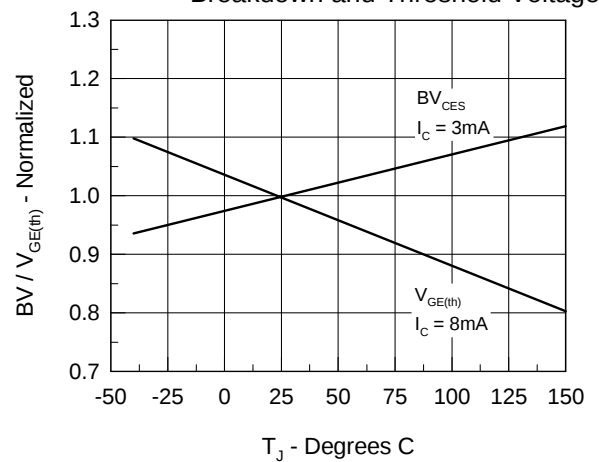
**Fig.1 Saturation Characteristics**

**Fig.2 Output Characteristics**

**Fig.3 Collector-Emitter Voltage vs. Gate-Emmitter Voltage**

**Fig.4 Temperature Dependence of Output Saturation Voltage**

**Fig.5 Input Admittance**

**Fig.6 Temperature Dependence of Breakdown and Threshold Voltage**


Fig.7 Turn-Off Energy per Pulse and Fall Time on Collector Current

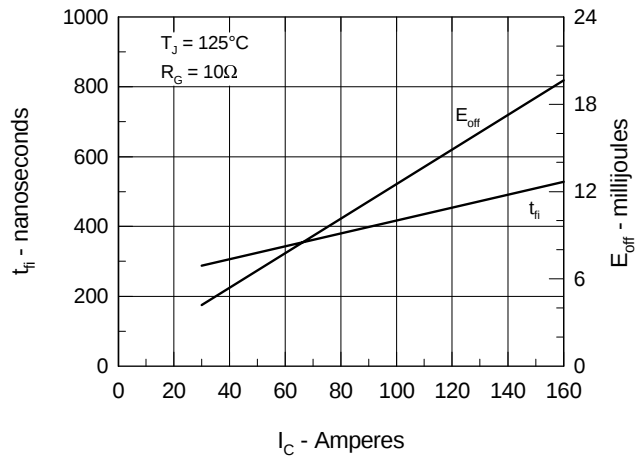


Fig.8 Dependence of Turn-Off Energy Per Pulse and Fall Time on  $R_G$

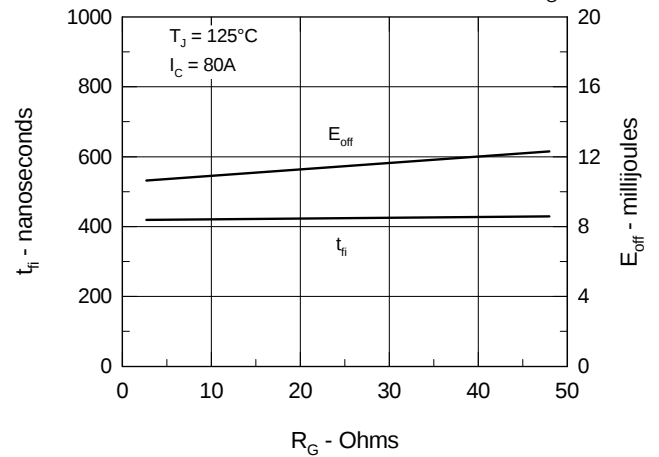


Fig.9 Gate Charge Characteristic Curve

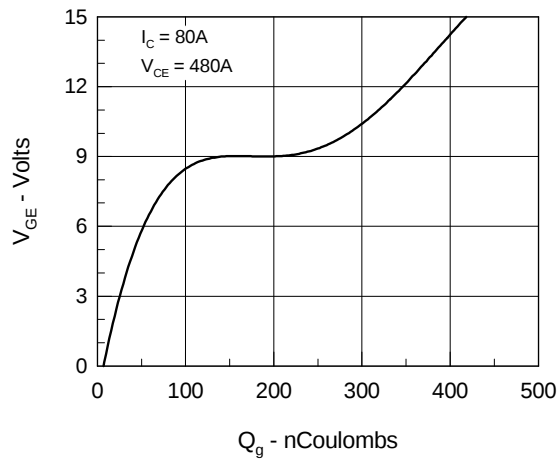


Fig.10 Turn-Off Safe Operating Area

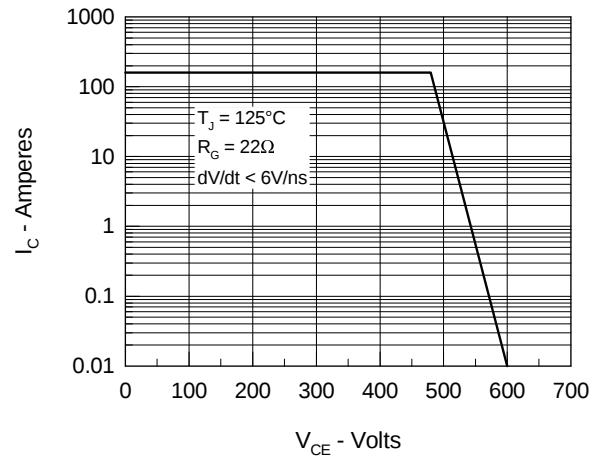


Fig.11 Transient Thermal Impedance

