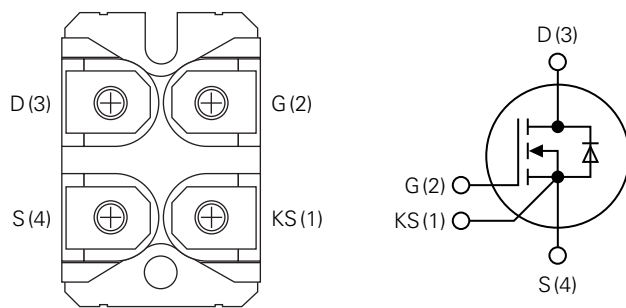


**IXFN55N120SK**

1200 V, 32 mΩ, 54 A SiC Power MOSFET

E72873

**Pinout Diagram** (SOT-227B miniBLOC)**D:** Drain; **G:** Gate; **S:** Source; **KS:** Kelvin Source; **Backside:** Isolated**Features & Benefits:**

- Latest Generation SiC MOSFET with Low  $R_{DS(on)}$
- Ideal for High Frequency Switching Applications
- Compatible with 15 V Gate Drive Voltage
- Real Kelvin Source Connection

**Applications:**

- Solar Inverters
- DC/DC Converters
- Motor Drives
- Switch Mode Power Supplies
- UPS
- Battery Chargers
- Induction Heating

**Package:**

- Isolation Voltage: 2500 V AC
- RoHS Compliant
- Epoxy Meets UL 94V-0
- Baseplate with Aluminum Nitride Isolation

**Product Summary**

| Characteristic  | Value | Unit |
|-----------------|-------|------|
| $I_{D25}$       | 54    | A    |
| $V_{DSS}$       | 1200  | V    |
| $R_{DS(on)typ}$ | 32    | mΩ   |

## MOSFET

| Symbol       | Characteristic                       | Conditions  | Value                                |      |      | Unit             |               |
|--------------|--------------------------------------|---|--------------------------------------|------|------|------------------|---------------|
|              |                                      |   | Min.                                 | Typ. | Max. |                  |               |
| $BV_{DSS}$   | Drain-Source Breakdown Voltage       | $V_{GS} = 0\text{ V}, I_D = 19\text{ }\mu\text{A}, T_{VJ} = 25\text{ }^\circ\text{C}$   | 1200                                 | –    | –    | V                |               |
| $V_{GS}$     | Gate-Source Voltage                  | Continuous  | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –4   | –    | 15               | V             |
|              |                                      | Transient   |                                      | –8   | –    | 19               | V             |
| $I_{D25}$    | Continuous Drain Current             | $V_{GS} = 15\text{ V}$  | $T_C = 25\text{ }^\circ\text{C}$     | –    | –    | 54               | A             |
| $I_{D80}$    |                                      |   | $T_C = 80\text{ }^\circ\text{C}$     | –    | –    | 43               |               |
| $I_{D100}$   |                                      |   | $T_C = 100\text{ }^\circ\text{C}$    | –    | –    | 38               |               |
| $R_{DS(on)}$ | Static Drain-Source on Resistance    | $I_D = 40\text{ A}, V_{GS} = 15\text{ V}$   | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | 32   | 42               | m $\Omega$    |
|              |                                      |   | $T_{VJ} = 150\text{ }^\circ\text{C}$ | –    | 53   | –                |               |
| $V_{GS(th)}$ | Gate Threshold Voltage               | $I_D = 12\text{ mA}, V_{GS} = V_{DS}$   | $T_{VJ} = 25\text{ }^\circ\text{C}$  | 1.8  | 2.5  | 3.6              | V             |
|              |                                      |   | $T_{VJ} = 150\text{ }^\circ\text{C}$ | –    | 2.1  | –                |               |
| $I_{DSS}$    | Drain-Source Leakage Current         | $V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$   | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | 1    | 20               | $\mu\text{A}$ |
| $I_{GSS}$    | Gate-Source Leakage Current          | $V_{DS} = 0\text{ V}, V_{GS} = 15\text{ V}$   | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | –    | 250              | nA            |
| $R_{G(int)}$ | Internal Gate Resistance             | $f = 1\text{ MHz}, V_{AC} = 25\text{ mV}, \text{ESR of } C_{iss}$   | –                                    | 1.7  | –    | $\Omega$         |               |
| $T_{VJ,op}$  | Virtual Junction Temperature         | –   | –40                                  | –    | 150  | $^\circ\text{C}$ |               |
| $T_{VJ,max}$ | Maximum Virtual Junction Temperature | –   | –                                    | –    | 175  | $^\circ\text{C}$ |               |
| $C_{iss}$    | Input Capacitance                    | $V_{DS} = 1000\text{ V}, V_{GS} = 0\text{ V},$<br>$f = 100\text{ kHz}$  | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | 3360 | –                | pF            |
| $C_{oss}$    | Output Capacitance                   |   |                                      | –    | 130  | –                | pF            |
| $C_{rss}$    | Reverse Transfer Capacitance         |   |                                      | –    | 8    | –                | pF            |
| $Q_g$        | Total Gate Charge                    | $V_{DS} = 800\text{ V}, I_D = 40\text{ A},$<br>$V_{GS} = -4 / 15\text{ V}$  | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | 107  | –                | nC            |
| $Q_{gs}$     | Gate-Source Charge                   |   |                                      | –    | 37   | –                | nC            |
| $Q_{gd}$     | Gate-Drain Charge                    |   |                                      | –    | 33   | –                | nC            |
| $t_{d(on)}$  | Turn-on Delay Time                   | <b>Inductive Switching</b><br>$V_{DS} = 800\text{ V}, V_{GS} = -4 / 15\text{ V},$<br>$I_D = 40\text{ A}, R_{G,ext} = 5\text{ }\Omega,$<br>Free Wheeling Diode: Body Diode | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | 24   | –                | ns            |
|              |                                      |   | $T_{VJ} = 150\text{ }^\circ\text{C}$ | –    | 22   | –                |               |
| $t_r$        | Current Rise Time                    |   | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | 23   | –                | ns            |
|              |                                      |   | $T_{VJ} = 150\text{ }^\circ\text{C}$ | –    | 27   | –                |               |
| $t_{d(off)}$ | Turn-off Delay Time                  |   | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | 41   | –                | ns            |
|              |                                      |   | $T_{VJ} = 150\text{ }^\circ\text{C}$ | –    | 46   | –                |               |
| $t_f$        | Current Fall Time                    |   | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | 11   | –                | ns            |
|              |                                      |   | $T_{VJ} = 150\text{ }^\circ\text{C}$ | –    | 16   | –                |               |
| $E_{on}$     | Turn-on Energy per Pulse             |   | $T_{VJ} = 25\text{ }^\circ\text{C}$  | –    | 562  | –                | $\mu\text{J}$ |
|              |                                      |   | $T_{VJ} = 150\text{ }^\circ\text{C}$ | –    | 813  | –                |               |
| $E_{off}$    | Turn-off Energy per Pulse            | $T_{VJ} = 25\text{ }^\circ\text{C}$   | –                                    | 162  | –    | $\mu\text{J}$    |               |
|              |                                      | $T_{VJ} = 150\text{ }^\circ\text{C}$  | –                                    | 166  | –    |                  |               |
| $E_{rec}$    | Reverse Recovery Losses at Turn-off  | $T_{VJ} = 25\text{ }^\circ\text{C}$   | –                                    | 110  | –    | $\mu\text{J}$    |               |
|              |                                      | $T_{VJ} = 150\text{ }^\circ\text{C}$  | –                                    | 372  | –    |                  |               |

## Thermal Characteristics

| Symbol      | Characteristic                           | Conditions  | Value |      |      | Unit |
|-------------|--|---|-------|------|------|------|
|             |  |   | Min.  | Typ. | Max. |      |
| $R_{th,JC}$ | Thermal Resistance, Junction-to-Case     | $T_{VJ} = 125\text{ }^\circ\text{C}$                | –     | –    | 0.71 | K/W  |
| $R_{th,JH}$ | Thermal Resistance, Junction-to-Heatsink | With heatsink compound $\lambda = 0.67\text{ W/mK}$ | –     | 0.79 | –    | K/W  |

## Source-Drain Diode

| Symbol    | Characteristic                            | Conditions   | Value                                 |      |      | Unit |                  |
|-----------|---|--|---------------------------------------|------|------|------|------------------|
|           |   |  | Min.                                  | Typ. | Max. |      |                  |
| $V_{SD}$  | Forward Voltage Drop                      | $I_F = 20 \text{ A}; V_{GS} = -4 \text{ V}$  | $T_{VJ} = 25 \text{ }^\circ\text{C}$  | -    | 4.6  | -    | V                |
|           |   |  | $T_{VJ} = 150 \text{ }^\circ\text{C}$ | -    | 4.2  | -    | V                |
| $t_{rr}$  | Reverse Recovery Time                     |  | $T_{VJ} = 25 \text{ }^\circ\text{C}$  | -    | 15   | -    | ns               |
|           |   |  | $T_{VJ} = 150 \text{ }^\circ\text{C}$ | -    | 20   | -    |                  |
| $Q_{rm}$  | Reverse Recovery Charge (Intrinsic Diode) | $V_{GS} = -4 \text{ V}; I_F = 40 \text{ A}; V_R = 800 \text{ V}$<br>MOSFET Gate Drive:<br>$V_{GS} = -4 / +15 \text{ V}; R_G = 5 \text{ } \Omega$ | $T_{VJ} = 25 \text{ }^\circ\text{C}$  | -    | 337  | -    | $\mu\text{C}$    |
|           |   |  | $T_{VJ} = 150 \text{ }^\circ\text{C}$ | -    | 721  | -    |                  |
| $I_{rm}$  | Max. Reverse Recovery Current             |  | $T_{VJ} = 25 \text{ }^\circ\text{C}$  | -    | 39   | -    | A                |
|           |   |  | $T_{VJ} = 150 \text{ }^\circ\text{C}$ | -    | 65   | -    |                  |
| $dl_f/dt$ | Current Slew Rate                         |  | $T_{VJ} = 25 \text{ }^\circ\text{C}$  | -    | 5257 | -    | A/ $\mu\text{s}$ |
|           |   |  | $T_{VJ} = 150 \text{ }^\circ\text{C}$ | -    | 5758 | -    |                  |

**Note:** When using SiC Body Diode the maximum recommended  $V_{GS} = -4\text{V}$

## Package SOT-227B (miniBLOC)

| Symbol                         | Characteristic                 | Conditions   | Value              |      |      | Unit             |    |
|--------------------------------|--------------------------------|--|--------------------|------|------|------------------|----|
|                                |                                |  | Min.               | Typ. | Max. |                  |    |
| $I_{RMS}$                      | RMS Current                    | Per Terminal   | -                  | -    | 100  | A                |    |
| $T_{stg}$                      | Storage Temperature            | -  | -40                | -    | 150  | $^\circ\text{C}$ |    |
| $T_{op}$                       | Operation Temperature          | -  | -40                | -    | 150  | $^\circ\text{C}$ |    |
| $M_D$                          | Mounting Torque <sup>1</sup>   | Screws to Heatsink   | -                  | -    | 1.5  | Nm               |    |
|                                |                                | Terminal Connection Screws                                       | -                  | -    | 1.3  | Nm               |    |
| $V_{ISOL}$                     | Isolation Voltage              | $I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}, 1 \text{ sec.}$   | 3000               | -    | -    | V                |    |
|                                |                                | $I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}, 1 \text{ minute}$ | 2500               | -    | -    | V                |    |
| $d_{Spp/APP}$<br>$d_{Spb/APb}$ | Clearance Distance Through Air | Terminal to Terminal   | Between Pin 1 to 2 | 7.1  | -    | -                | mm |
|                                |                                |  | Between Pin 3 to 4 |      |      |                  |    |
|                                |                                |  | Between Pin 2 to 3 | 3.2  | -    | -                | mm |
|                                |                                |  | Between Pin 4 to 1 |      |      |                  |    |
|                                | Creepage Distance on Surface   | Terminal to Terminal<br>(With Nut)                               | Between Pin 1 to 2 | 9.6  | -    | -                | mm |
|                                |                                |  | Between Pin 3 to 4 |      |      |                  |    |
|                                |                                |  | Between Pin 2 to 3 | 10.5 | -    | -                | mm |
|                                |                                |  | Between Pin 4 to 1 |      |      |                  |    |
| Clearance Distance Through Air | Terminal to Backside Plane     | For All Terminals  | 8.6                | -    | -    | mm               |    |
| Creepage Distance on Surface   | Terminal to Backside Tab       |  | 10.5               | -    | -    |                  |    |
| W                              | Weight                         | -  | -                  | 30   | -    | g                |    |

1) For further information see application note "[Handling and Mounting Littelfuse miniBLOC - SOT227B](#)"

Characteristic Curves

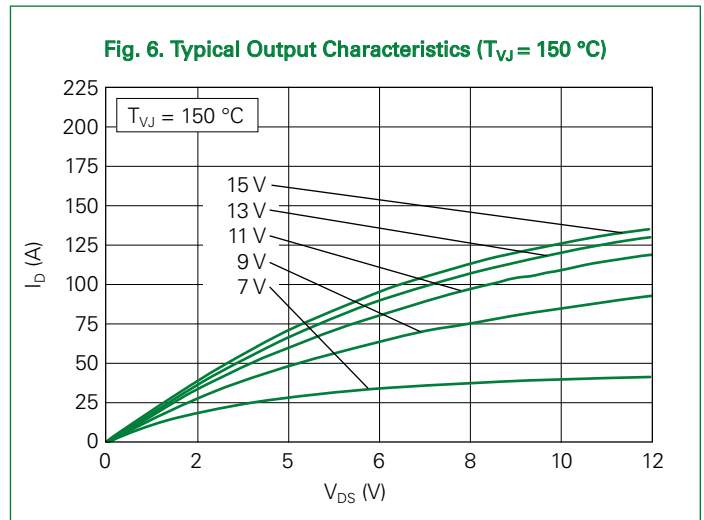
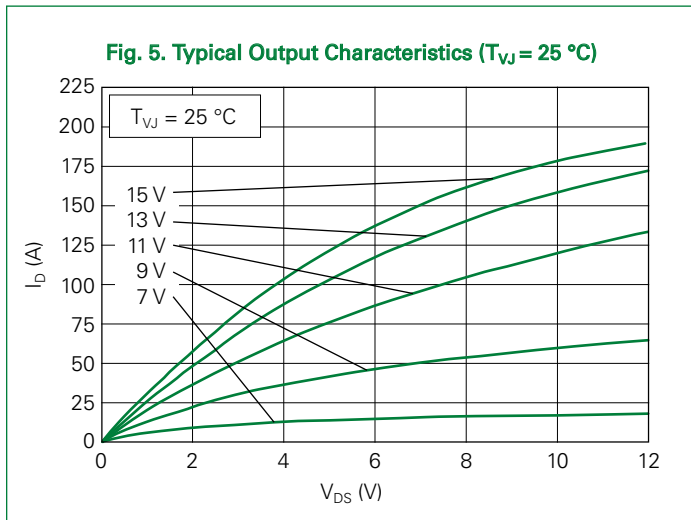
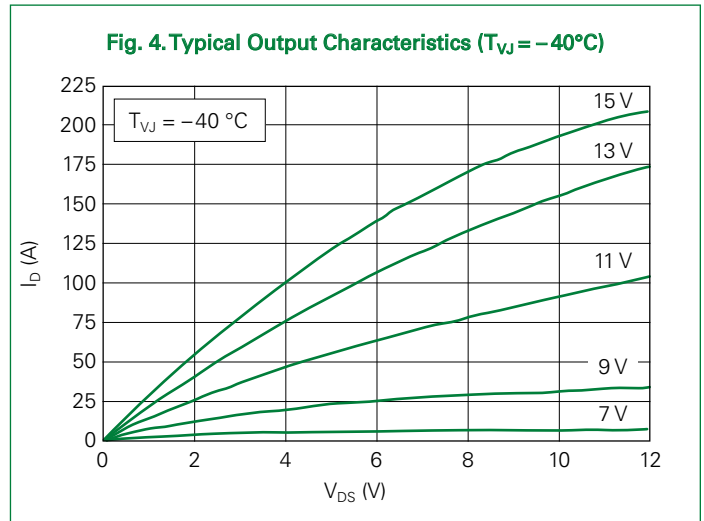
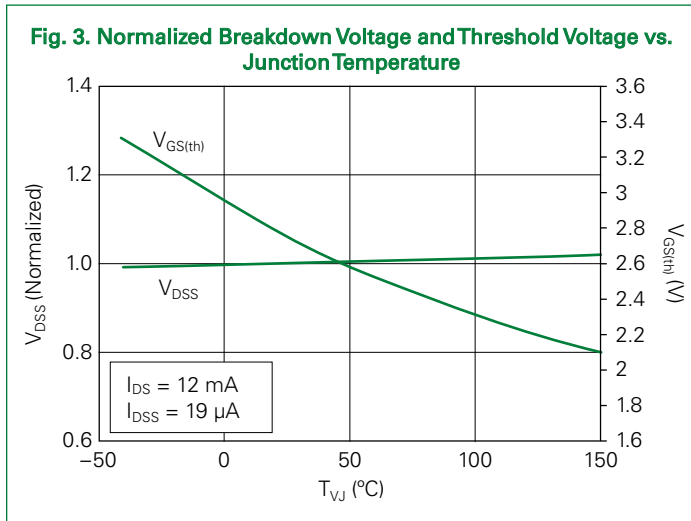
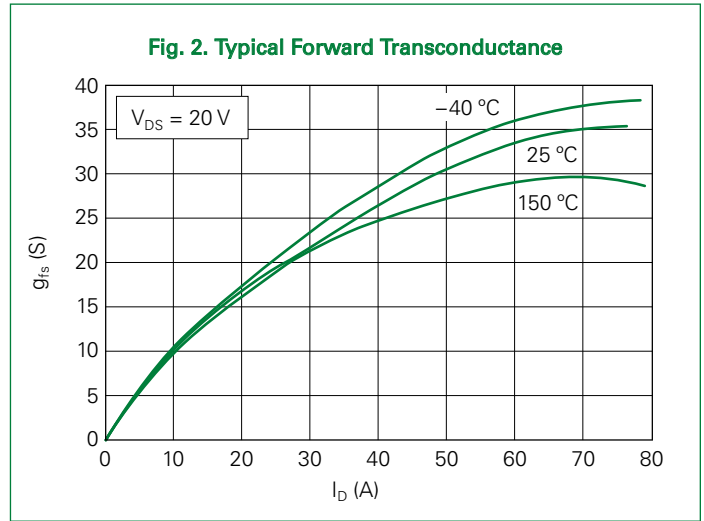
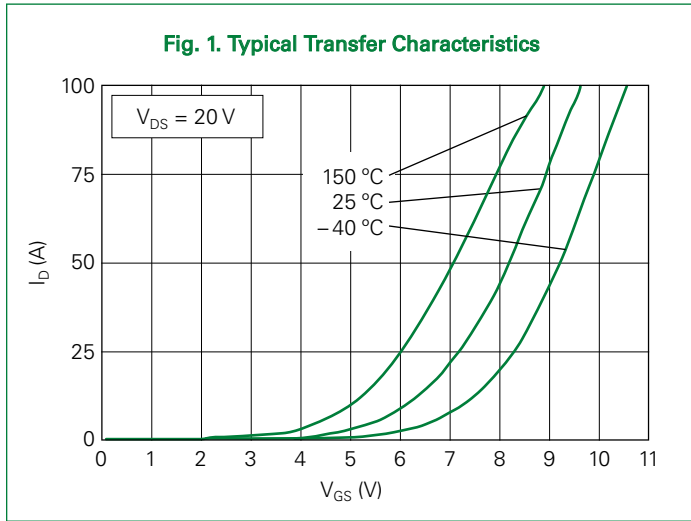


Fig. 7.  $R_{DS(on)}$  vs. Junction Temperature

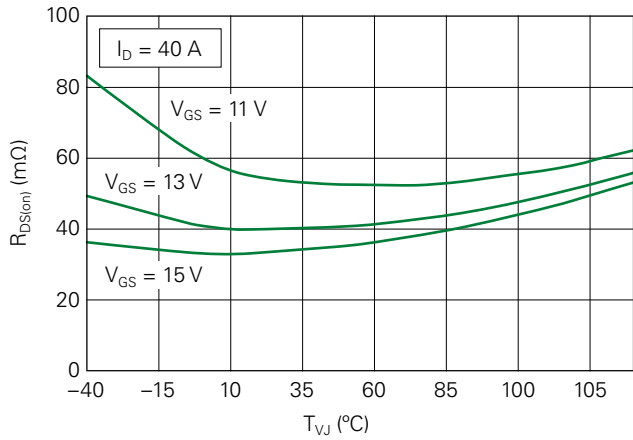


Fig. 8.  $R_{DS(on)}$  Normalised vs. Junction Temperature

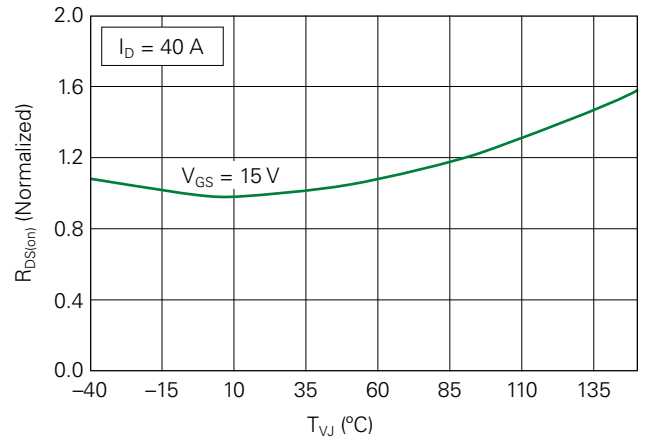


Fig. 9.  $R_{DS(on)}$  vs. Drain Current

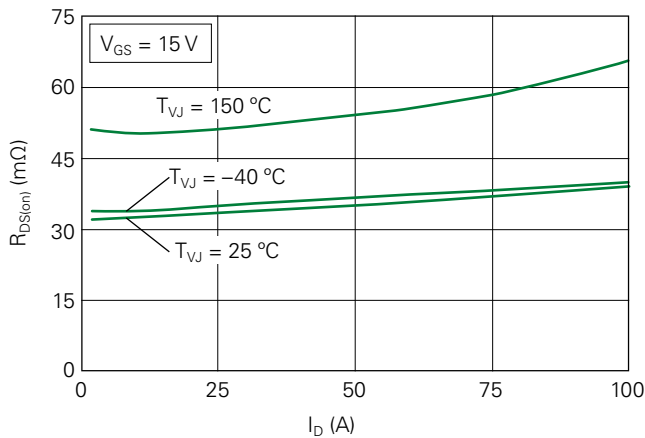


Fig. 10. Typical Reverse Conduction Characteristics ( $T_{VJ} = -40^\circ\text{C}$ )

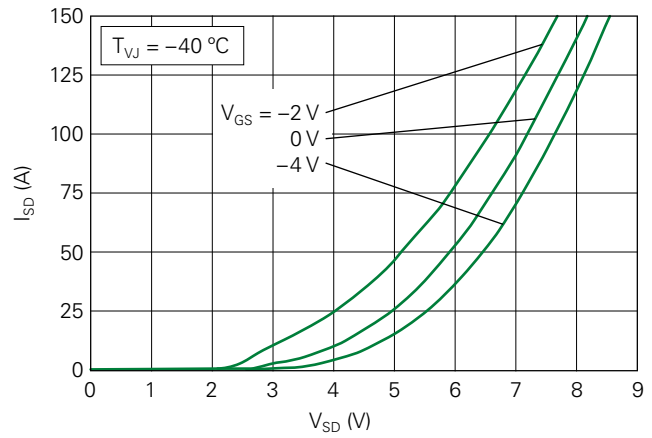


Fig. 11. Typical Reverse Conduction Characteristics ( $T_{VJ} = 25^\circ\text{C}$ )

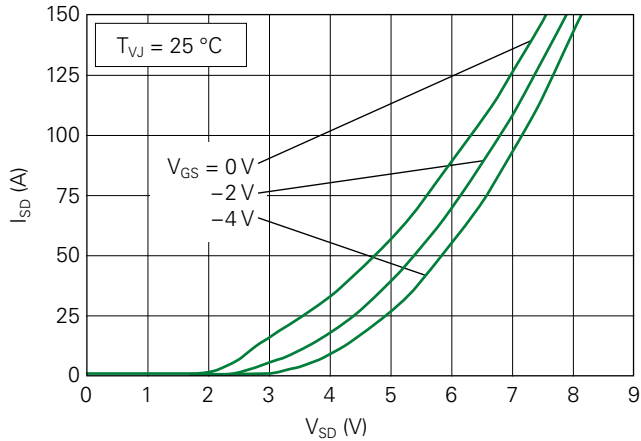
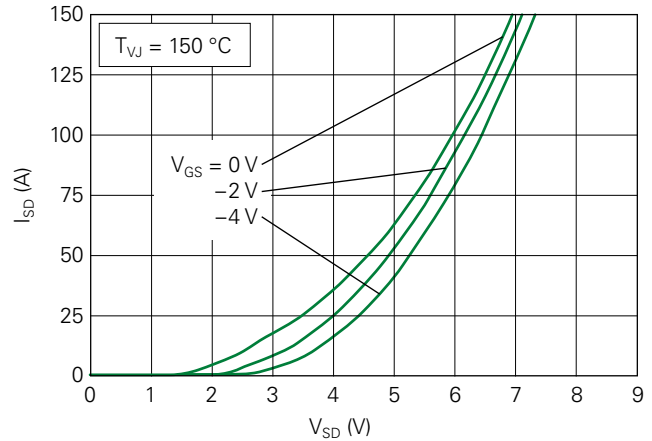
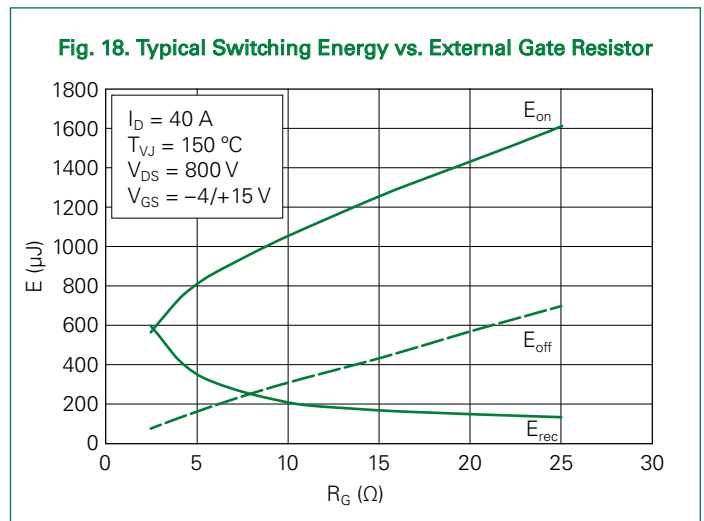
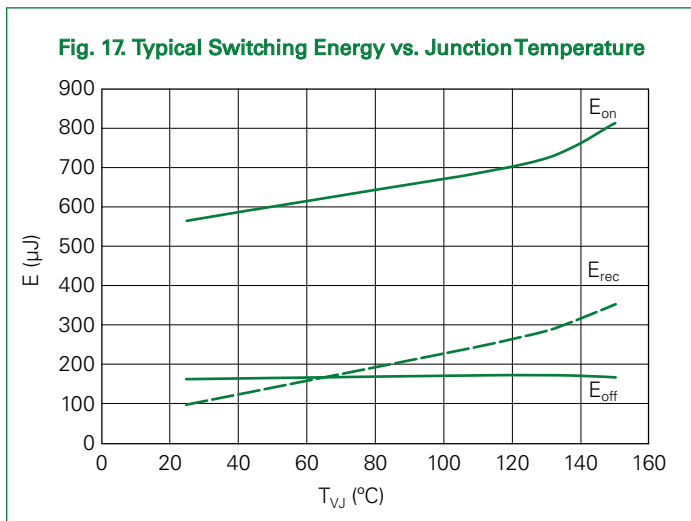
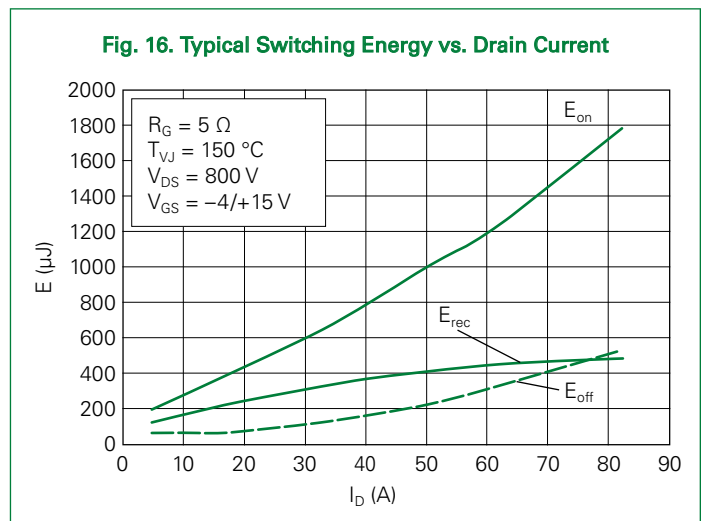
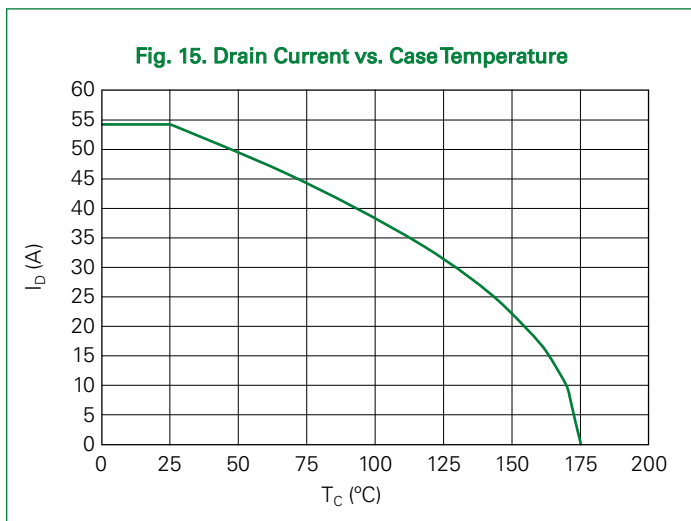
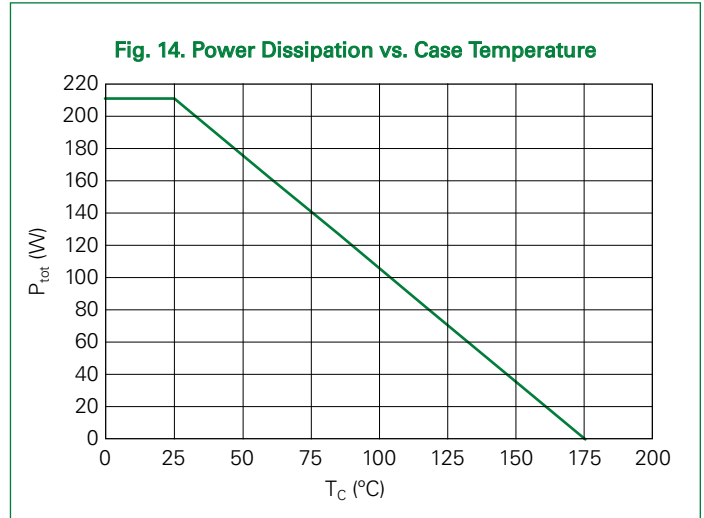
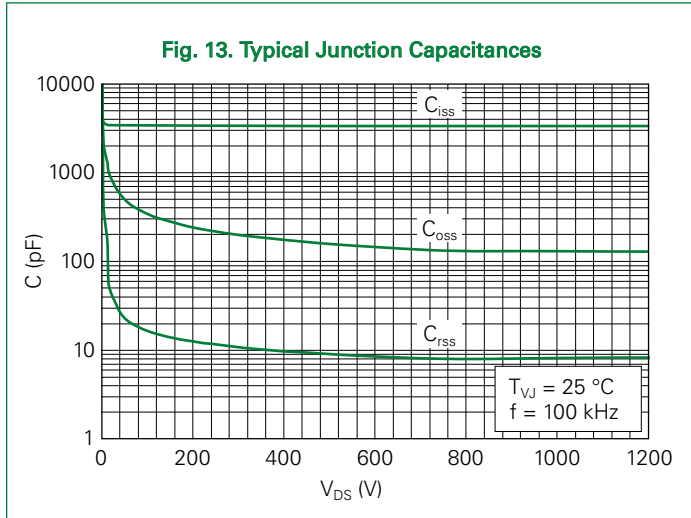
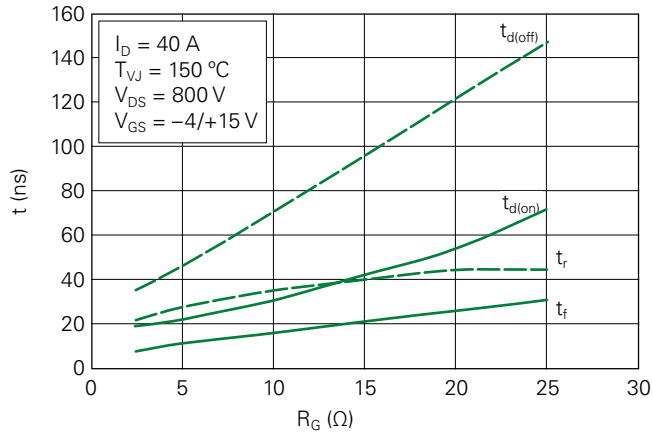


Fig. 12. Typical Reverse Conduction Characteristics ( $T_{VJ} = 150^\circ\text{C}$ )

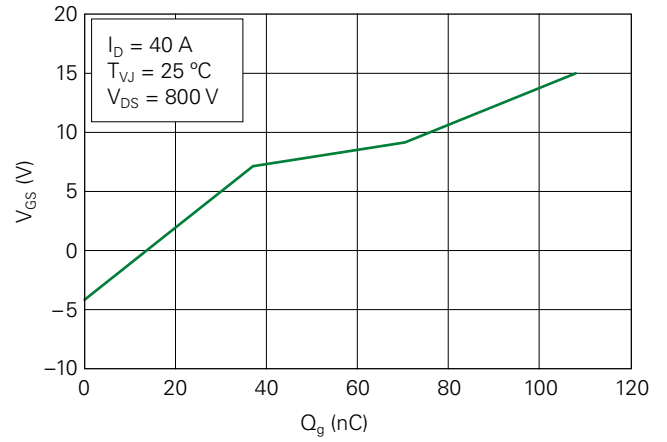




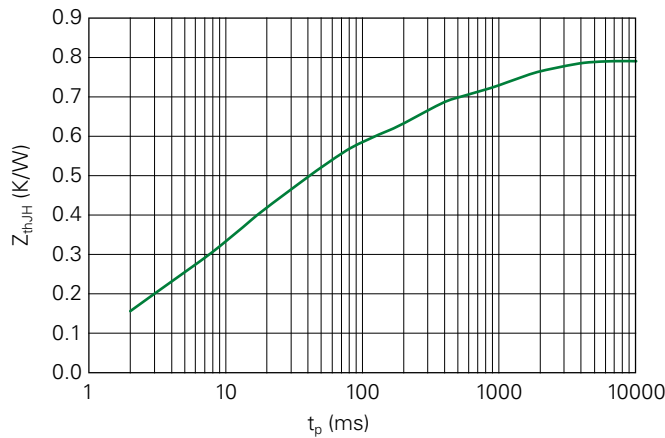
**Fig. 19. Typical Switching Time vs. External Gate Resistor**



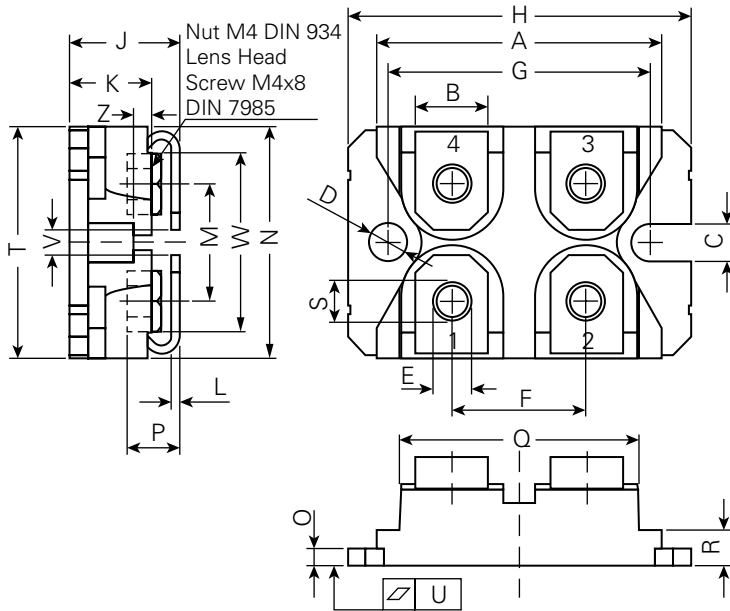
**Fig. 20. Typical Turn on Gate Charge Trendline**



**Fig. 21. Typical Transient Thermal Impedance**

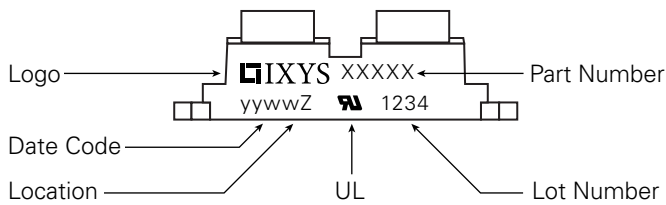


## Part Outline Drawing (SOT-227B miniBLOC)



| Symbol | Inches |       | Millimeters |       |
|--------|--------|-------|-------------|-------|
|        | Min.   | Max.  | Min.        | Max.  |
| A      | 1.240  | 1.255 | 31.50       | 31.88 |
| B      | 0.307  | 0.323 | 7.80        | 8.20  |
| C      | 0.161  | 0.169 | 4.09        | 4.29  |
| D      | 0.161  | 0.169 | 4.09        | 4.29  |
| E      | 0.161  | 0.169 | 4.09        | 4.29  |
| F      | 0.587  | 0.595 | 14.91       | 15.11 |
| G      | 1.186  | 1.193 | 30.12       | 30.30 |
| H      | 1.488  | 1.505 | 37.80       | 38.23 |
| J      | 0.460  | 0.481 | 11.68       | 12.22 |
| K      | 0.351  | 0.378 | 8.92        | 9.60  |
| L      | 0.029  | 0.033 | 0.74        | 0.84  |
| M      | 0.492  | 0.516 | 12.50       | 13.10 |
| N      | 0.990  | 1.001 | 25.15       | 25.42 |
| O      | 0.077  | 0.084 | 1.95        | 2.13  |
| P      | 0.195  | 0.244 | 4.95        | 6.20  |
| Q      | 1.045  | 1.059 | 26.54       | 26.90 |
| R      | 0.155  | 0.167 | 3.94        | 4.42  |
| S      | 0.179  | 0.191 | 4.55        | 4.85  |
| T      | 0.968  | 0.994 | 24.59       | 25.25 |
| U      | -0.002 | 0.004 | -0.05       | 0.10  |
| V      | 0.126  | 0.217 | 3.20        | 5.50  |
| W      | 0.780  | 0.830 | 19.81       | 21.08 |
| Z      | .098   | 0.106 | 2.50        | 2.70  |

## Part Number and Marking



## Ordering Information

| Ordering | Part Number  | Marking on Product | Delivering Mode | Base Quantity | Ordering Code |
|----------|--------------|--------------------|-----------------|---------------|---------------|
| Standard | IXFN55N120SK | IXFN55N120SK       | Tube            | 10            | IXFN55N120SK  |

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Part of:

