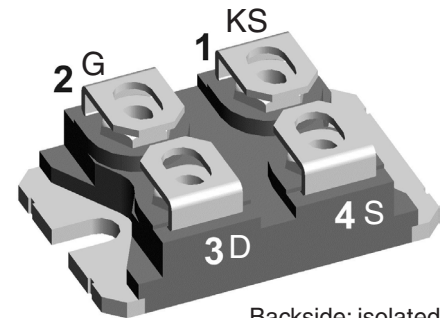


# SiC Power MOSFET

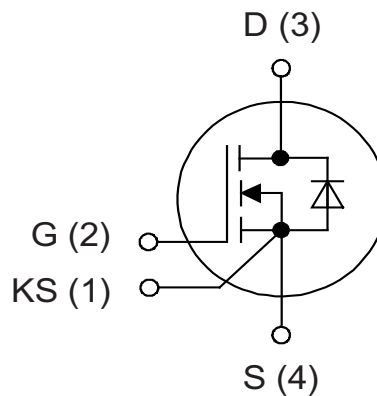
$$\begin{aligned}
 I_{D25} &= 27 \text{ A} \\
 V_{DSS} &= 1200 \text{ V} \\
 R_{DS(on) \text{ max}} &= 98 \text{ m}\Omega
 \end{aligned}$$

Kelvin Source gate connection

**Part number**  
IXFN27N120SK



Backside: isolated  
 E72873



## Features / Advantages:

- High speed switching with low capacitances
- High blocking voltage with low  $R_{DS(on)}$
- Easy to parallel and simple to drive
- Resistant to latch-up
- Real Kelvin source connection

## Applications:

- Solar inverters
- High voltage DC/DC converters
- Motor drives
- Switch mode power supplies
- UPS
- Battery chargers
- Induction heating

## Package: SOT-227B (minibloc)

- Isolation Voltage: 2500 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Base plate with Aluminium nitride isolation
- Advanced power cycling

## Disclaimer Notice

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| MOSFET         |                                         |                                                                                                                                                                                          |      | Ratings |      |      |     |
|----------------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|------|------|-----|
| Symbol         | Definitions                             | Conditions                                                                                                                                                                               | min. | typ.    | max. |      |     |
| $V_{(BR)DSS}$  | drain source breakdown voltage          | $I_D = 100 \mu A$                                                                                                                                                                        | 1200 |         |      |      | V   |
| $V_{GS(max)}$  | max transient gate source voltage       |                                                                                                                                                                                          | -10  |         | +25  |      | V   |
| $V_{GS}$       | continous gate source voltage           | recommended operational value                                                                                                                                                            | -5   |         | +20  |      | V   |
| $I_{D25}$      | drain current                           | $V_{GS} = 20 V$                                                                                                                                                                          |      |         |      | 27   | A   |
| $I_{D80}$      |                                         |                                                                                                                                                                                          |      |         |      | 21.5 | A   |
| $I_{D100}$     |                                         |                                                                                                                                                                                          |      |         |      | 19   | A   |
| $I_{D(pulse)}$ | pulsed drain current                    | pulse width limited by $T_{VJ max}$                                                                                                                                                      |      |         | 70   |      | A   |
| $P_D$          | power dissipation                       | $T_C = 25^\circ C, T_{VJ} = 175^\circ C$                                                                                                                                                 |      |         | 150  |      | W   |
| $R_{DSon}$     | static drain source on resistance       | $I_D = 20 A; V_{GS} = 20 V$                                                                                                                                                              |      |         |      | 80   | mΩ  |
|                |                                         |                                                                                                                                                                                          |      |         |      | 155  | mΩ  |
| $V_{GS(th)}$   | gate threshold voltage                  | $I_D = 5 mA; V_{GS} = V_{DS}$                                                                                                                                                            | 2.0  | 2.6     | 4.0  |      | V   |
|                |                                         |                                                                                                                                                                                          |      |         |      | 2.1  | V   |
| $I_{DSS}$      | drain source leakage current            | $V_{DS} = 1200 V; V_{GS} = 0 V$                                                                                                                                                          |      |         | 1    | 100  | μA  |
| $I_{GSS}$      | gate source leakage current             | $V_{DS} = 0 V; V_{GS} = 20 V$                                                                                                                                                            |      |         |      | 250  | nA  |
| $R_G$          | internal gate resistance                | $f = 1 MHz, V_{AC} = 25 mV, ESR \text{ of } C_{ISS}$                                                                                                                                     |      | 4.6     |      |      | Ω   |
| $C_{iss}$      | input capacitance                       | $V_{DS} = 1000 V; V_{GS} = 0 V; f = 1 MHz \quad T_{VJ} = 25^\circ C$                                                                                                                     |      |         |      | 950  | pF  |
| $C_{oss}$      | output capacitance                      |                                                                                                                                                                                          |      |         |      | 80   | pF  |
| $C_{rss}$      | reverse transfer (Miller) capacitance   |                                                                                                                                                                                          |      |         |      | 7.6  | pF  |
| $Q_g$          | total gate charge                       | $V_{DS} = 800 V; I_D = 40 A; V_{GS} = -5/20 V \quad T_{VJ} = 25^\circ C$                                                                                                                 |      |         |      | 62   | nC  |
| $Q_{gs}$       | gate source charge                      |                                                                                                                                                                                          |      |         |      | 23   | nC  |
| $Q_{gd}$       | gate drain (Miller) charge              |                                                                                                                                                                                          |      |         |      | 37   | nC  |
| $t_{d(on)}$    | turn-on delay time                      | Inductive switching $T_{VJ} = 25^\circ C$<br>Free Wheeling Diode: Body Diode @ $V_{GS} = -5V$<br>$V_{DS} = 800 V; I_D = 20 A$<br>$V_{GS} = -5/20 V; R_G = 22 \Omega \text{ (external)}$  |      |         |      | 10   | ns  |
| $t_r$          | current rise time                       |                                                                                                                                                                                          |      |         |      | 8    | ns  |
| $t_{d(off)}$   | turn-off delay time                     |                                                                                                                                                                                          |      |         |      | 62   | ns  |
| $t_f$          | current fall time                       |                                                                                                                                                                                          |      |         |      | 16   | ns  |
| $E_{on}$       | turn-on energy per pulse                |                                                                                                                                                                                          |      |         |      | 0.51 | mJ  |
| $E_{off}$      | turn-off energy per pulse               |                                                                                                                                                                                          |      |         |      | 0.22 | mJ  |
| $E_{rec(off)}$ | reverse recovery losses at turn-off     |                                                                                                                                                                                          |      |         |      | 0.02 | mJ  |
| $t_{d(on)}$    | turn-on delay time                      |                                                                                                                                                                                          |      |         |      | 10   | ns  |
| $t_r$          | current rise time                       |                                                                                                                                                                                          |      |         |      | 8    | ns  |
| $t_{d(off)}$   | turn-off delay time                     |                                                                                                                                                                                          |      |         |      | 70   | ns  |
| $t_f$          | current fall time                       |                                                                                                                                                                                          |      |         |      | 14   | ns  |
| $E_{on}$       | turn-on energy per pulse                | Inductive switching $T_{VJ} = 150^\circ C$<br>Free Wheeling Diode: Body Diode @ $V_{GS} = -5V$<br>$V_{DS} = 800 V; I_D = 20 A$<br>$V_{GS} = -5/20 V; R_G = 22 \Omega \text{ (external)}$ |      |         |      | 0.63 | mJ  |
| $E_{off}$      | turn-off energy per pulse               |                                                                                                                                                                                          |      |         |      | 0.21 | mJ  |
| $E_{rec(off)}$ | reverse recovery losses at turn-off     |                                                                                                                                                                                          |      |         |      | 0.06 | mJ  |
|                |                                         |                                                                                                                                                                                          |      |         |      |      |     |
| $R_{thJC}$     | thermal resistance junction to case     | with heatsink compound; IXYS test setup                                                                                                                                                  |      |         |      | 1.0  | K/W |
| $R_{thJH}$     | thermal resistance junction to heatsink |                                                                                                                                                                                          |      |         |      |      | K/W |

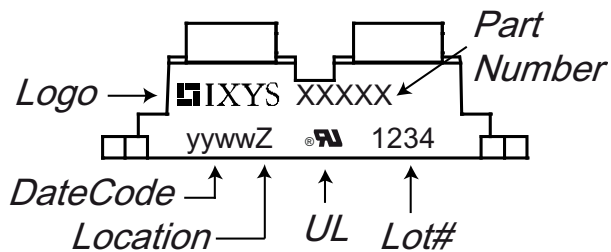
| Source-Drain Diode |                                           |                                                                                                         |      | Ratings |      |      |      |
|--------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------|------|---------|------|------|------|
| Symbol             | Definitions                               | Conditions                                                                                              | min. | typ.    | max. |      |      |
| $V_{SD}$           | forward voltage drop                      | $I_F = 20 A; V_{GS} = -5 V$                                                                             |      | 5.2     |      |      | V    |
|                    |                                           | $T_{VJ} = 25^\circ C$                                                                                   |      | 4.6     |      |      | V    |
| $t_{rr}$           | reverse recovery time                     | $V_{GS} = -5 V; I_F = 20 A; V_R = 800 V$<br>Mosfet gate drive:<br>$V_{GS} = -5 / 20 V; R_G = 22 \Omega$ |      |         |      | 14   | ns   |
| $Q_{RM}$           | reverse recovery charge (intrinsic diode) |                                                                                                         |      |         |      | 0.12 | μC   |
| $I_{RM}$           | max. reverse recovery current             |                                                                                                         |      |         |      | 15   | A    |
| $dI_F/dt$          | current slew rate                         |                                                                                                         |      |         |      | 2320 | A/μs |
| $t_{rr}$           | reverse recovery time                     | $V_{GS} = -5 V; I_F = 20 A; V_R = 800 V$<br>Mosfet gate drive:<br>$V_{GS} = -5 / 20 V; R_G = 22 \Omega$ |      |         |      | 29   | ns   |
| $Q_{RM}$           | reverse recovery charge (intrinsic diode) |                                                                                                         |      |         |      | 0.48 | μC   |
| $I_{RM}$           | max. reverse recovery current             |                                                                                                         |      |         |      | 24   | A    |
| $dI_F/dt$          | current slew rate                         |                                                                                                         |      |         |      | 2740 | A/μs |

**Note:** When using SiC Body Diode the maximum recommended  $V_{GS} = -5V$

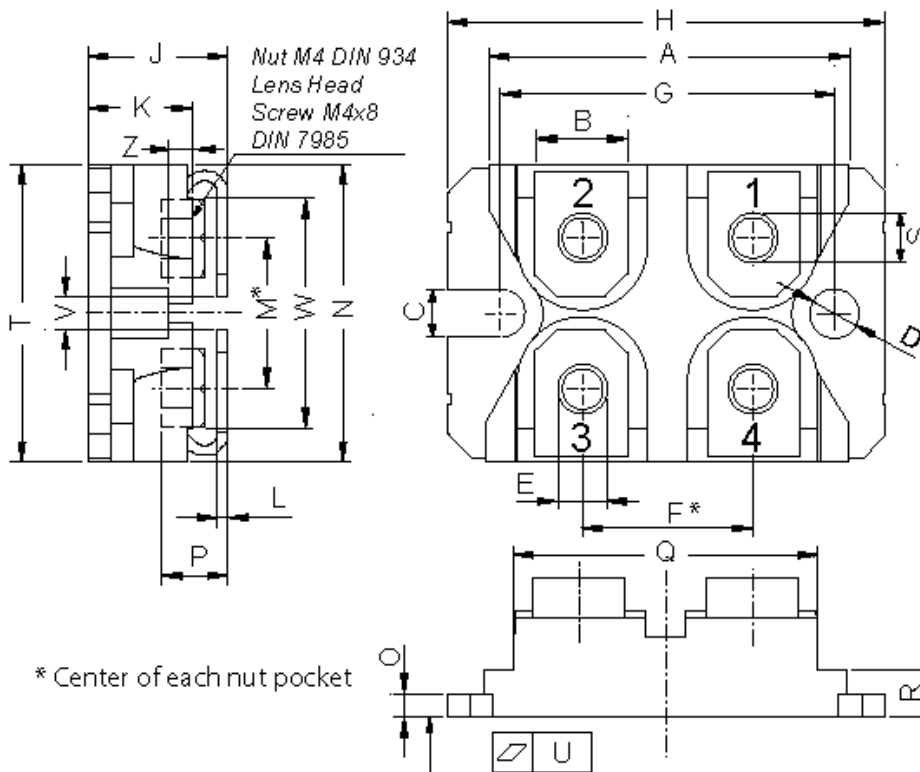
| Package Outlines SOT-227B (minibloc) |                               |                                                                                                  | Ratings      |      |            |          |
|--------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------|--------------|------|------------|----------|
| Symbol                               | Definitions                   | Conditions                                                                                       | min.         | typ. | max.       | Unit     |
| $I_{RMS}$                            | RMS current                   | per terminal                                                                                     |              |      | 100        | A        |
| $T_{stg}$                            | storage temperature           |                                                                                                  | -40          |      | 150        | °C       |
| $T_{op}$                             | operation temperature         |                                                                                                  | -40          |      | 150        | °C       |
| $T_{vj}$                             | virtual junction temperature  |                                                                                                  | -40          |      | 175        | °C       |
| <b>Weight</b>                        |                               |                                                                                                  |              | 30   |            | g        |
| $M_D$                                | mounting torque <sup>1)</sup> | screws to heatsink<br>terminal connection screws                                                 |              |      | 1.5<br>1.3 | Nm<br>Nm |
| $d_{Spp}$                            | creepage distance on surface  | terminal to terminal                                                                             | 10.5         |      |            | mm       |
| $d_{Spb}$                            |                               | terminal to backside                                                                             | 8.5          |      |            | mm       |
| $d_{App}$                            | striking distance through air | terminal to terminal                                                                             | 3.2          |      |            | mm       |
| $d_{Apb}$                            |                               | terminal to backside                                                                             | 6.8          |      |            | mm       |
| $V_{ISOL}$                           | isolation voltage             | $I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}$<br>$t = 1 \text{ sec.}$<br>$t = 1 \text{ minute}$ | 3000<br>2500 |      |            | V<br>V   |
| $C_p$                                | coupling capacity per switch  | between drain and back side metallization<br>with gate and source shorted                        |              | 42   |            | pF       |

<sup>1)</sup> further information see application note IXAN0073 on  
[www.ixys.com/TechnicalSupport/appnotes.aspx](http://www.ixys.com/TechnicalSupport/appnotes.aspx) (General / Isolation, Mounting, Soldering, Cooling)

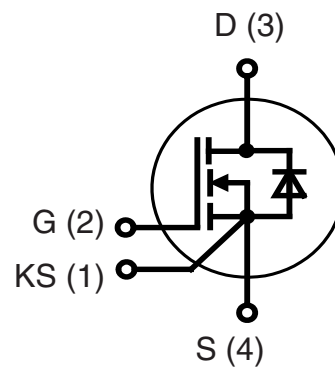
## Product Marking

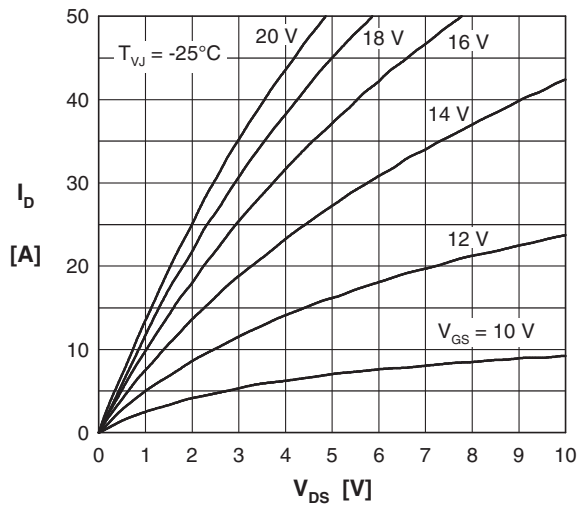
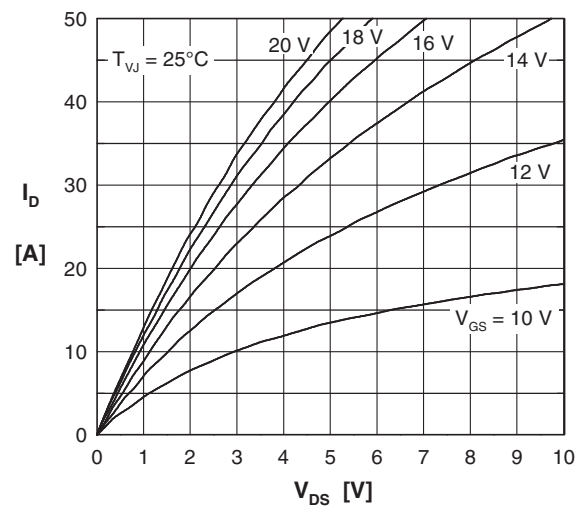
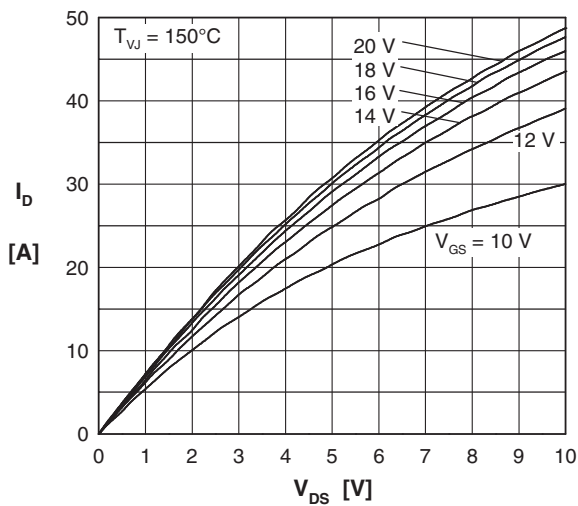
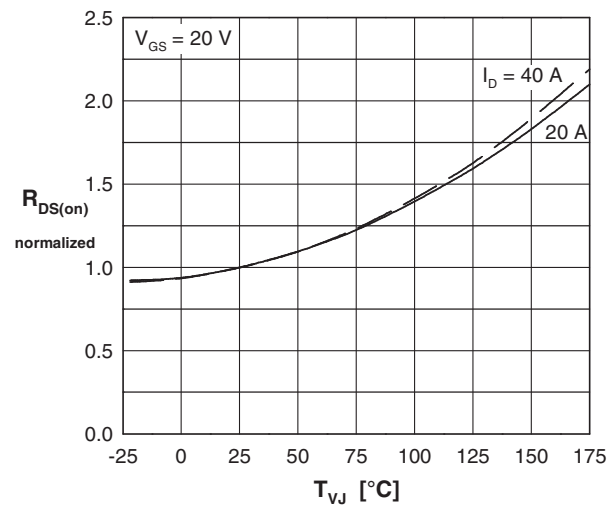
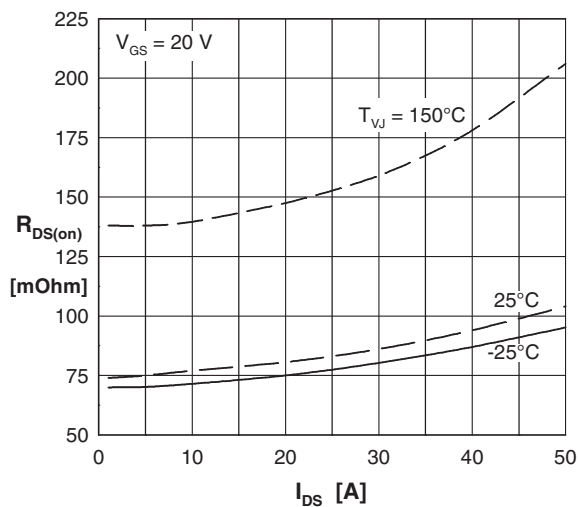
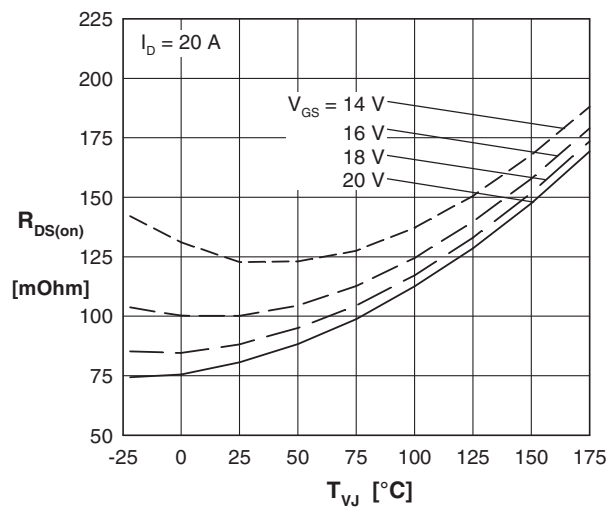


| Ordering | Part Name    | Marking on Product | Delivering Mode | Base Qty | Ordering Code |
|----------|--------------|--------------------|-----------------|----------|---------------|
| Standard | IXFN27N120SK | IXFN27N120SK       | Tube            | 10       | IXFN27N120SK  |

**Outlines SOT-227B (minibloc)**


| 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      | 38.23 | 1.488  | 1.505 |
| J    | 11.68      | 12.22 | 0.460  | 0.481 |
| K    | 8.92       | 9.60  | 0.351  | 0.378 |
| L    | 0.74       | 0.84  | 0.029  | 0.033 |
| M    | 12.50      | 13.10 | 0.492  | 0.516 |
| N    | 25.15      | 25.42 | 0.990  | 1.001 |
| O    | 1.95       | 2.13  | 0.077  | 0.084 |
| P    | 4.95       | 6.20  | 0.195  | 0.244 |
| Q    | 26.54      | 26.90 | 1.045  | 1.059 |
| R    | 3.94       | 4.42  | 0.155  | 0.167 |
| S    | 4.55       | 4.85  | 0.179  | 0.191 |
| T    | 24.59      | 25.25 | 0.968  | 0.994 |
| U    | -0.05      | 0.10  | -0.002 | 0.004 |
| V    | 3.20       | 5.50  | 0.126  | 0.217 |
| W    | 19.81      | 21.08 | 0.780  | 0.830 |
| Z    | 2.50       | 2.70  | 0.098  | 0.106 |



**Curves**

 Fig. 1 Typical output characteristics ( $-25^\circ\text{C}$ )

 Fig. 2 Typical output characteristics ( $25^\circ\text{C}$ )

 Fig. 3 Typical output characteristics ( $150^\circ\text{C}$ )

 Fig. 4  $R_{DS(on)}$  normalized vs. junction temperature  $T_{VJ}$ 

 Fig. 5  $R_{DS(on)}$  versus drain current

 Fig. 6  $R_{DS(on)}$  versus junction temperature  $T_{VJ}$

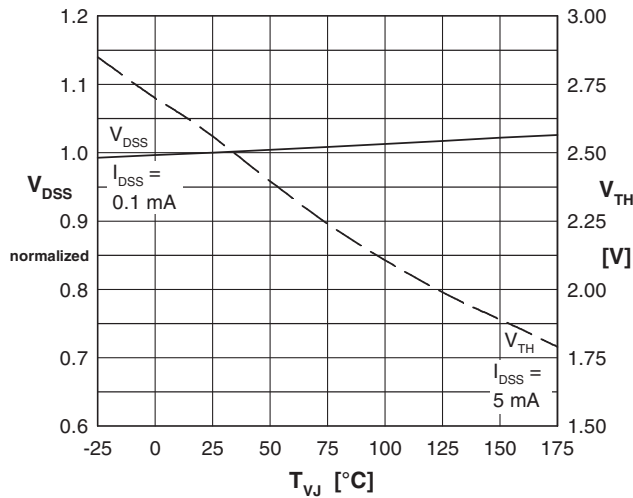
**Curves**


Fig. 7 Norm. breakdw  $V_{DSS}$  & treshhold voltage  $V_{TH}$  versus junction temperature  $T_{VJ}$

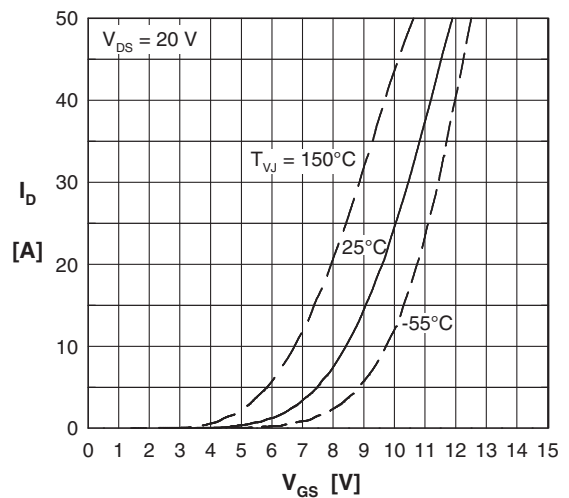


Fig. 8 Typical transfer characteristics

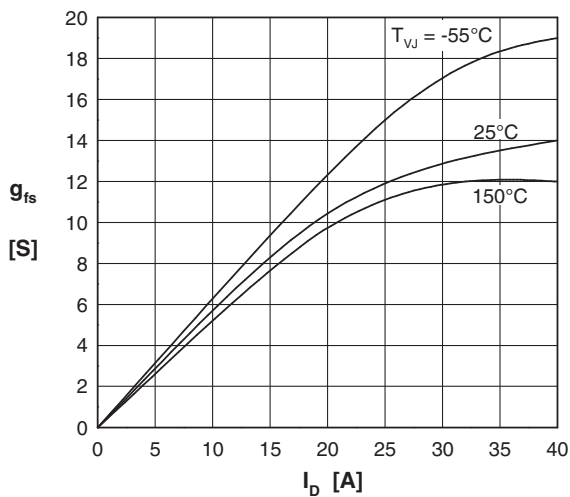


Fig. 9 Typical forward transconductance

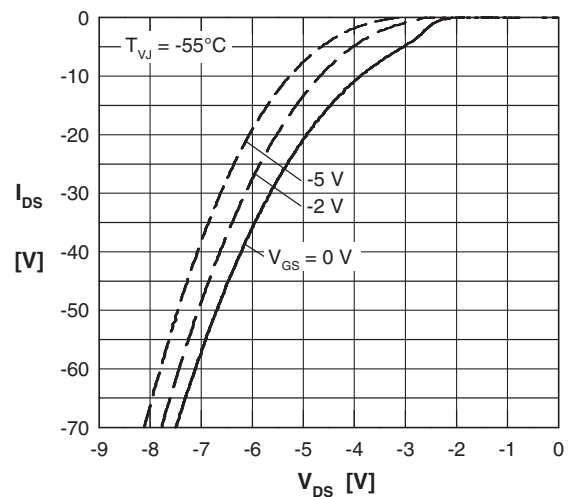


Fig. 10 Forward voltage drop of intrinsic diode versus  $V_{DS}$  measured at  $-55^{\circ}\text{C}$

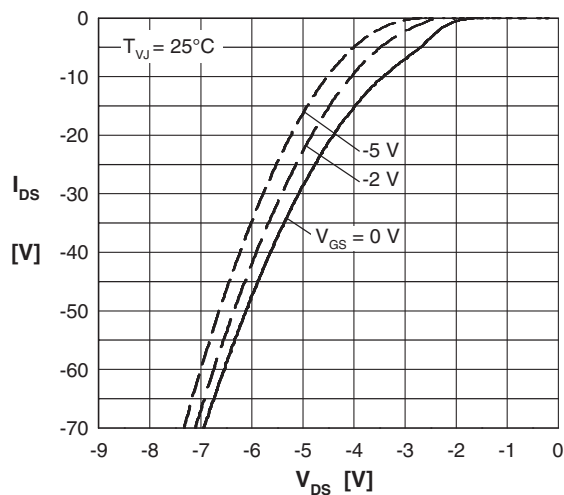


Fig. 11 Forward voltage drop of intrinsic diode versus  $V_{DS}$  measured at  $25^{\circ}\text{C}$

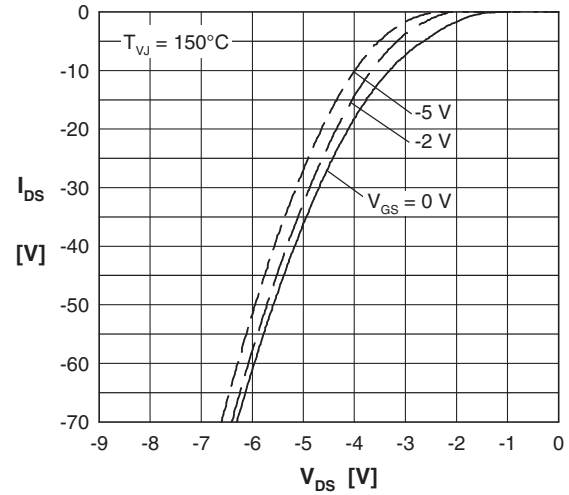


Fig. 12 Forward voltage drop of intrinsic diode versus  $V_{DS}$  measured at  $150^{\circ}\text{C}$

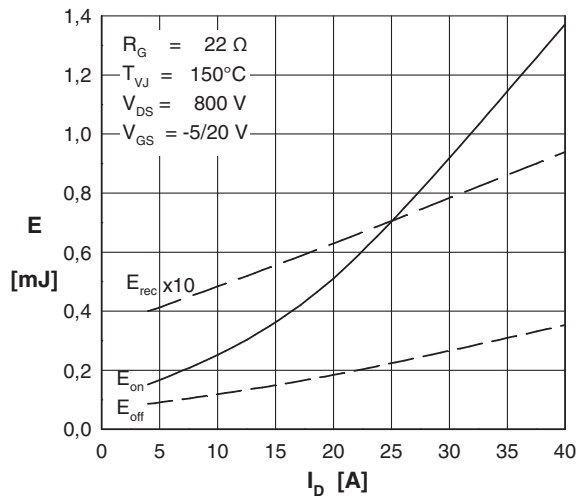
**Curves**


Fig. 13 Typical switching energy versus drain current

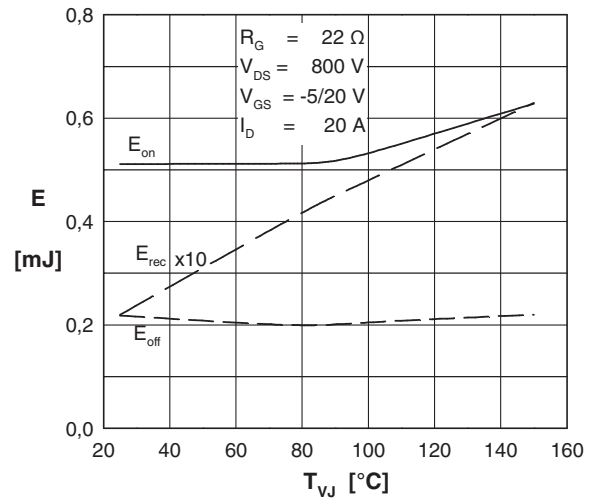


Fig. 14 Typical switching energy versus temperature

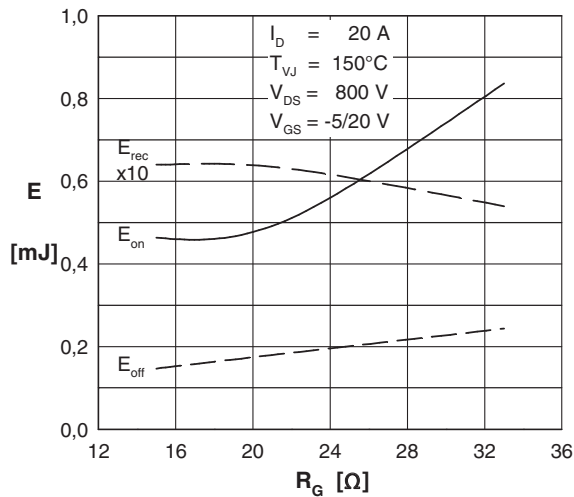


Fig. 15 Typical switching energy versus external gate resistor

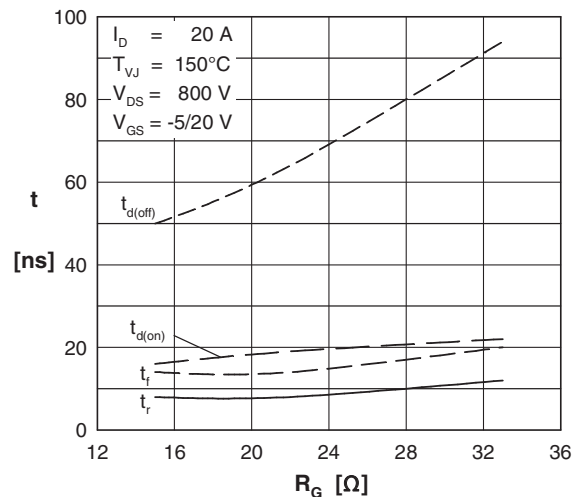


Fig. 16 Typical switching time versus external gate resistor

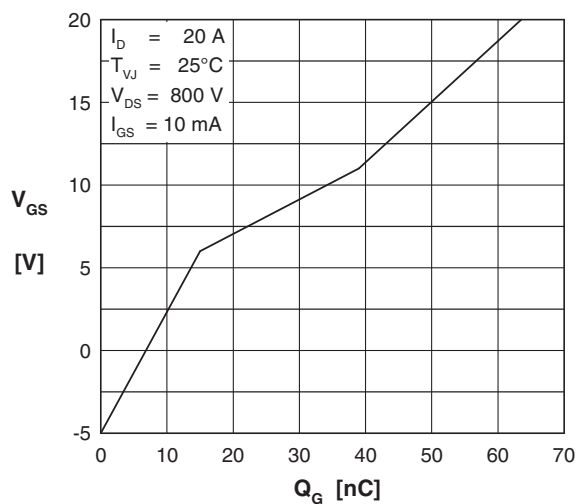


Fig. 17 Typical turn on gate charge, trendline

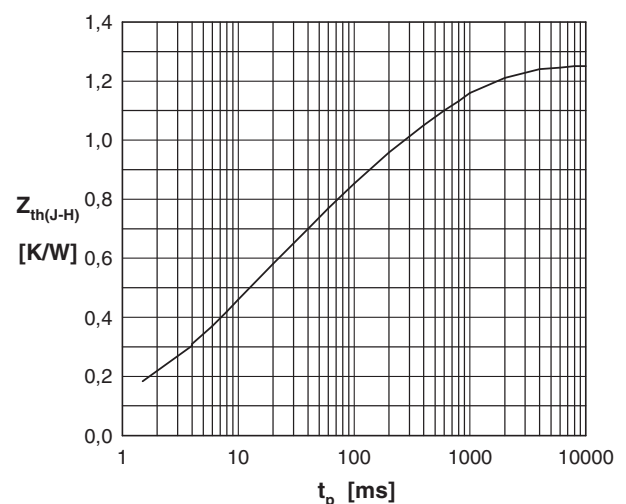


Fig. 18 Typical transient thermal impedance