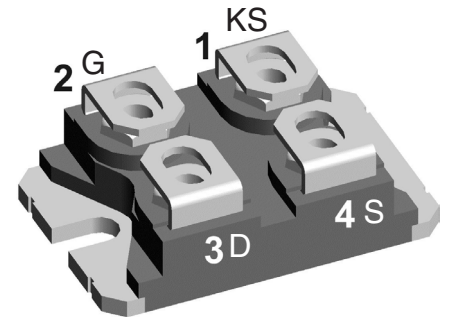


SiC Power MOSFET

$I_{D25} = 48 \text{ A}$
 $V_{DSS} = 1200 \text{ V}$
 $R_{DS(on) \text{ max}} = 50 \text{ m}\Omega$

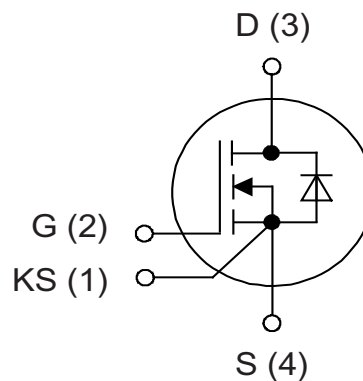
Kelvin Source gate connection

Part number
 IXFN50N120SK



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 insulation
- Advanced power cycling

Disclaimer Notice

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.

| MOSFET | | | | Ratings | | |
|----------------|---|--|------------------------------|---------|------|-----|
| Symbol | Definitions | Conditions | min. | typ. | max. | |
| $V_{DS(max)}$ | max drain source voltage | | | | 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 | $V_{GS} = 20\text{ V}$ | | | 48 | A |
| I_{D80} | | | $T_C = 25^\circ\text{C}$ | | 38 | A |
| I_{D100} | | | $T_C = 80^\circ\text{C}$ | | 33 | A |
| $I_{D(pulse)}$ | pulsed drain current | pulse width limited by $T_{VJ\max}$ | | | 110 | A |
| P_D | power dissipation | $T_C = 25^\circ\text{C}, T_{VJ} = 175^\circ\text{C}$ | | | 250 | W |
| R_{DSon} | static drain source on resistance | $I_D = 40\text{ A}; V_{GS} = 20\text{ V}$ | | 40 | 52 | mΩ |
| | | | $T_{VJ} = 25^\circ\text{C}$ | | 84 | mΩ |
| $V_{GS(th)}$ | gate threshold voltage | $I_D = 10\text{ mA}; V_{GS} = V_{DS}$ | 2.0 | 2.6 | 4.0 | V |
| | | | $T_{VJ} = 150^\circ\text{C}$ | | 2.0 | V |
| I_{DSS} | drain source leakage current | $V_{DS} = 1200\text{ V}; V_{GS} = 0\text{ V}$ | | 1 | 100 | μA |
| I_{GSS} | gate source leakage current | $V_{DS} = 0\text{ V}; V_{GS} = 20\text{ V}$ | | | 0.25 | μA |
| R_G | internal gate resistance | $f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$ | | 1.8 | | Ω |
| C_{iss} | input capacitance | $V_{DS} = 1000\text{ V}; V_{GS} = 0\text{ V}; f = 1\text{ MHz}$ | | 1895 | | pF |
| C_{oss} | output capacitance | | $T_{VJ} = 25^\circ\text{C}$ | | 150 | pF |
| C_{rss} | reverse transfer (Miller) capacitance | | | | 10 | pF |
| Q_g | total gate charge | $V_{DS} = 800\text{ V}; I_D = 40\text{ A}; V_{GS} = -5/20\text{ V}$ | | 115 | | nC |
| Q_{gs} | gate source charge | | $T_{VJ} = 25^\circ\text{C}$ | | 28 | nC |
| Q_{gd} | gate drain (Miller) charge | | | | 37 | nC |
| $t_{d(on)}$ | turn-on delay time | Inductive switching $V_{DS} = 800\text{ V}; I_D = 20\text{ A}$ $V_{GS} = -5 / 20\text{ V}; R_G = 22\ \Omega$ (external) Freewheeling diode is Mosfet's body diode | | 10 | | ns |
| t_r | current rise time | | $T_{VJ} = 25^\circ\text{C}$ | | 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 | Inductive switching $V_{DS} = 800\text{ V}; I_D = 20\text{ A}$ $V_{GS} = -5 / 20\text{ V}; R_G = 22\ \Omega$ (external) Freewheeling diode is Mosfet's body diode | | 10 | | ns |
| t_r | current rise time | | $T_{VJ} = 150^\circ\text{C}$ | | 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 | | | | 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 | | | | 0.6 | K/W |
| R_{thJH} | thermal resistance junction to heatsink | with heatsink compound; IXYS test setup | | 0.72 | | K/W |

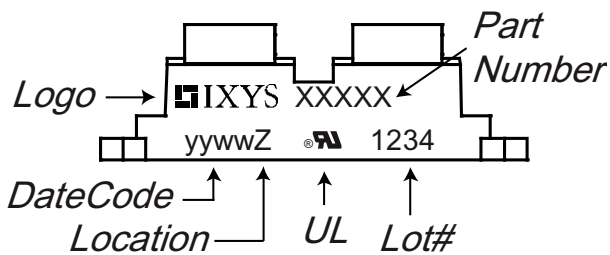
| Source-Drain Diode | | | | Ratings | | |
|--------------------|---|---|-----------------------------|---------|------|----|
| Symbol | Definitions | Conditions | min. | typ. | max. | |
| V_{SD} | forward voltage drop | $I_F = 20\text{ A}; V_{GS} = -5\text{ V}$ | | 3.3 | | V |
| | | | $T_{VJ} = 25^\circ\text{C}$ | | 3.1 | V |
| t_{rr} | reverse recovery time | $V_{GS} = -5\text{ V}; I_F = 40\text{ A}$ $V_R = 800\text{ V}; -di_F/dt = 1000\text{ A}/\mu\text{s}$ | | 54 | | ns |
| Q_{RM} | reverse recovery charge (intrinsic diode) | | $T_{VJ} = 25^\circ\text{C}$ | | 285 | nC |
| I_{RM} | max. reverse recovery current | | | | 15 | A |

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

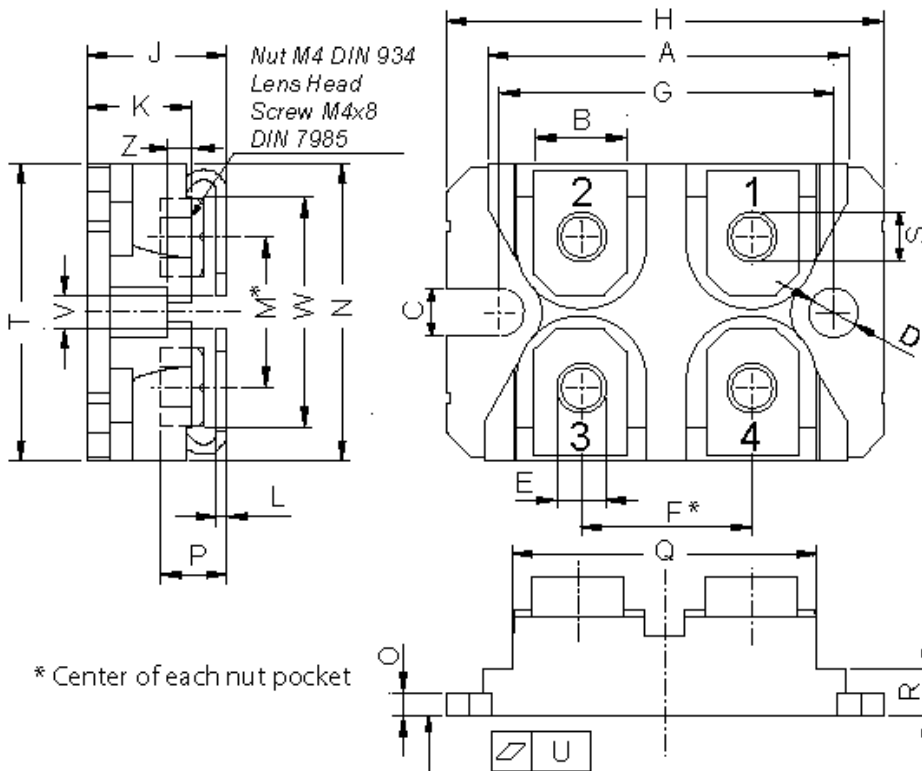
| Package Outlines SOT-227B (minibloc) | | | Ratings | | | |
|--------------------------------------|-------------------------------|---|--------------|------|------------|----------|
| Symbol | Definitions | Conditions | min. | typ. | max. | Unit |
| I_{RMS} | RMS current | per terminal | | | 100 | A |
| T_{stg} | storage temperature | | -40 | | 150 | °C |
| T_{op} | operation temperature | | -40 | | 150 | °C |
| T_{vJ} | virtual junction temperature | | -40 | | 175 | °C |
| Weight | | | | 30 | | g |
| M_D | mounting torque ¹⁾ | screws to heatsink terminal connection screws | | | 1.5 1.3 | Nm 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 | $I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}$ | 3000 2500 | | | V V |
| C_p | coupling capacity per switch | between drain and back side metallization with gate and source shorted | | 42 | | pF |

¹⁾ further information see application note IXAN0073 on www.ixys.com/TechnicalSupport/appnotes.aspx (General / Isolation, Mounting, Soldering, Cooling)

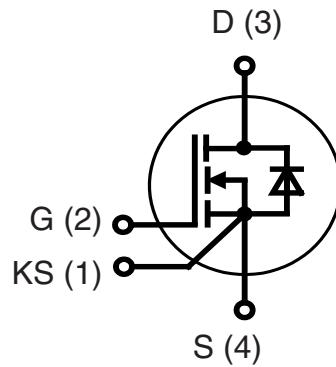
Product Marking

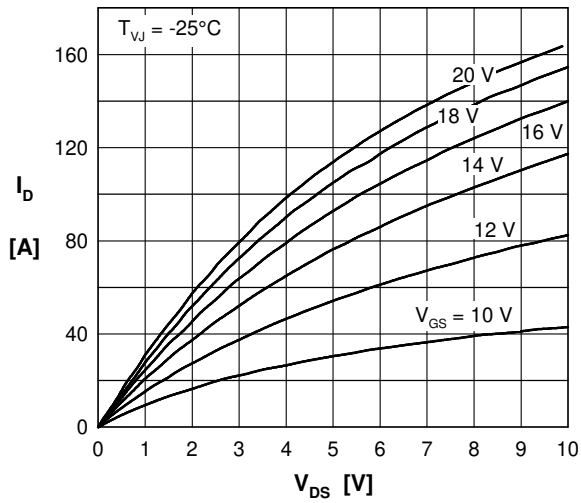
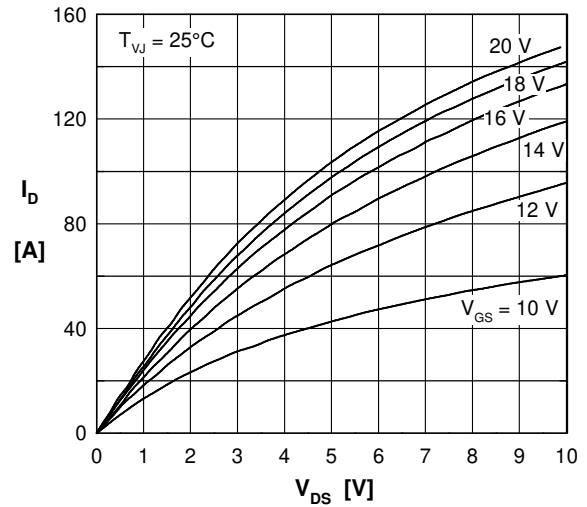
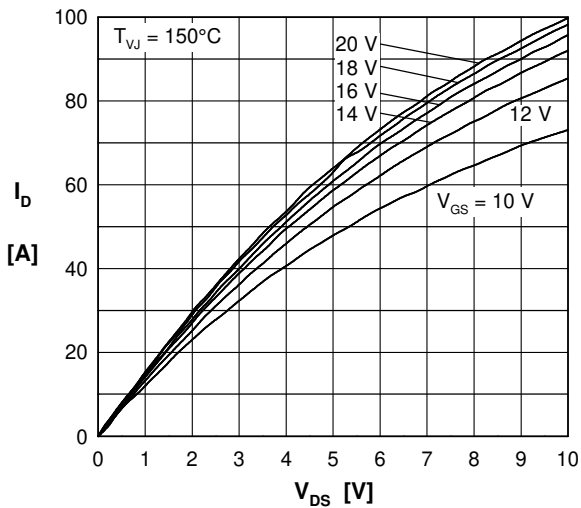
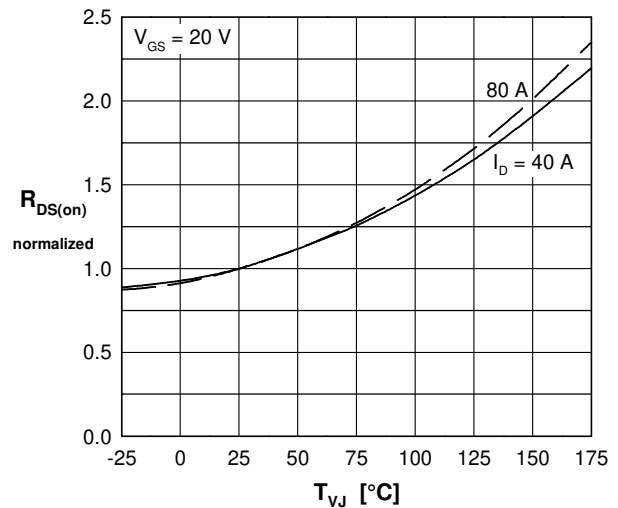
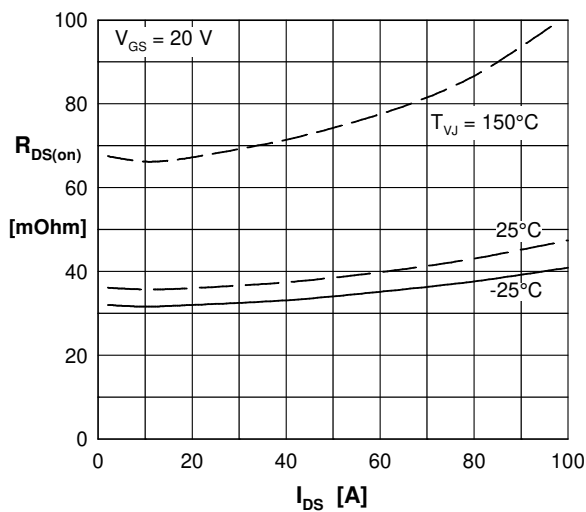
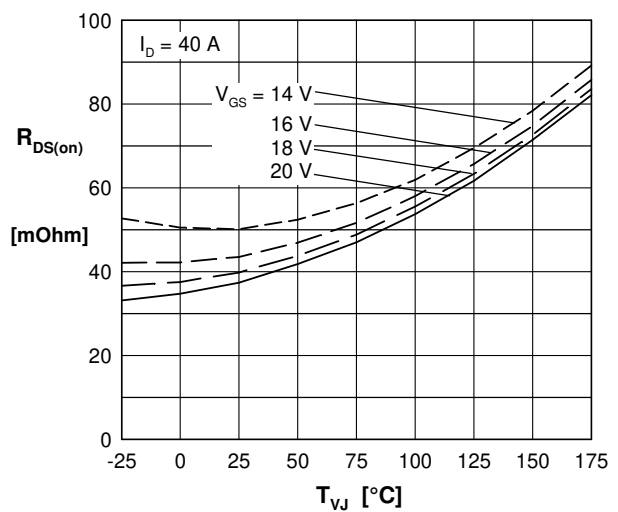


| Ordering | Part Name | Marking on Product | Delivering Mode | Base Qty | Ordering Code |
|----------|--------------|--------------------|-----------------|----------|---------------|
| Standard | IXFN50N120SK | IXFN50N120SK | Tube | 10 | IXFN50N120SK |

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°C)

 Fig. 2 Typical output characteristics (25°C)

 Fig. 3 Typical output characteristics (150°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}

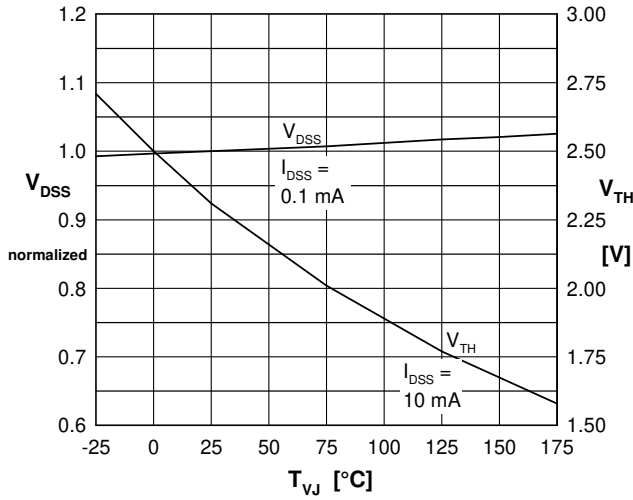
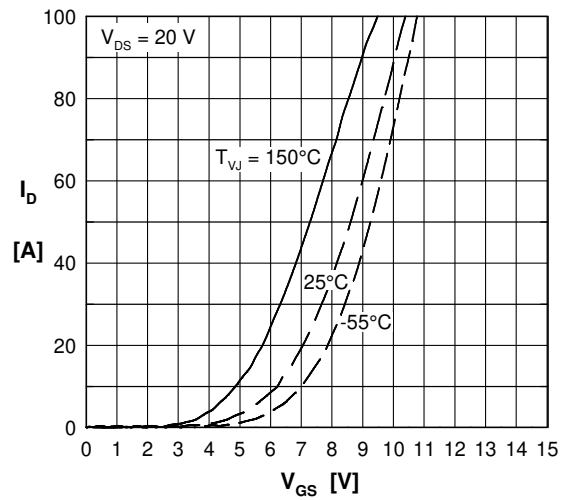
Curves

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


Fig. 8 Typical transfer characteristics

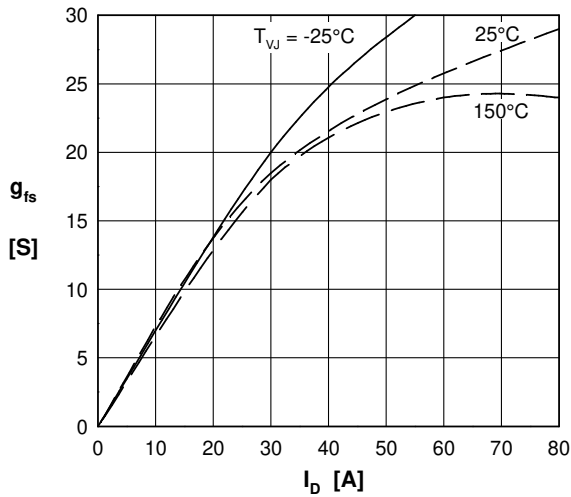
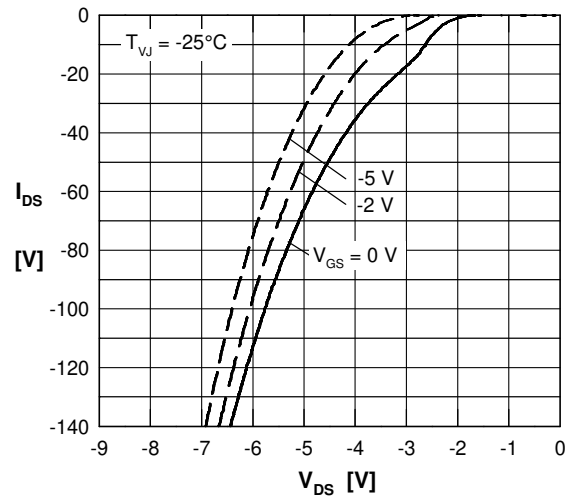
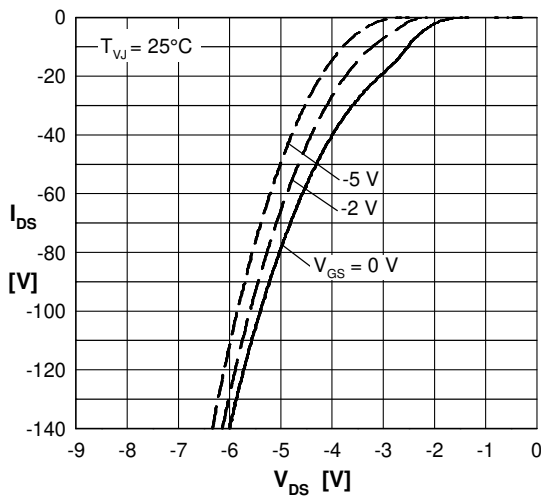
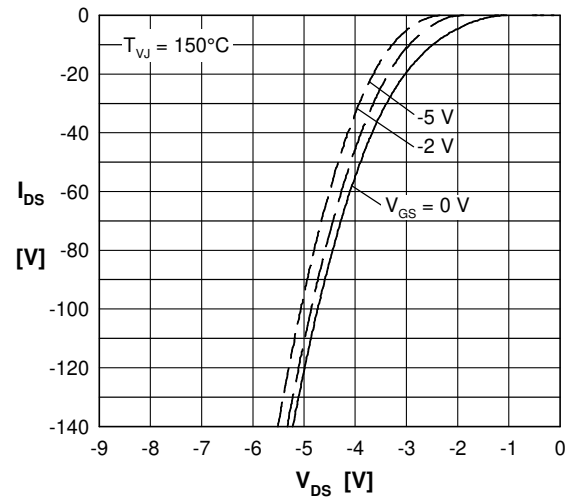


Fig. 9 Typical forward transconductance


 Fig. 10 Forward voltage drop of intrinsic diode versus V_{DS} measured at -55°C

 Fig. 11 Forward voltage drop of intrinsic diode versus V_{DS} measured at 25°C

 Fig. 12 Forward voltage drop of intrinsic diode versus V_{DS} measured at 150°C

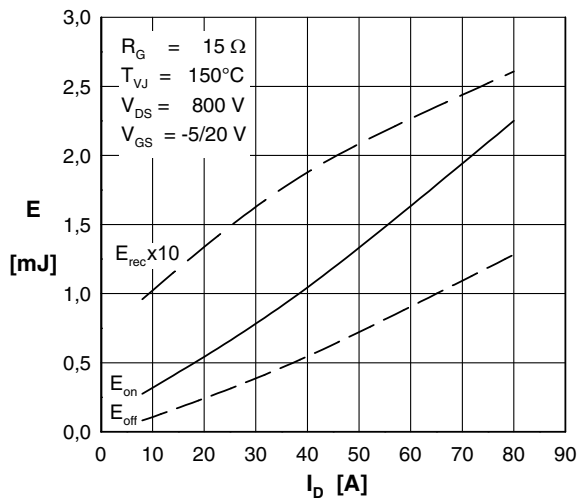
Curves


Fig. 13 Typical switching energy versus drain current

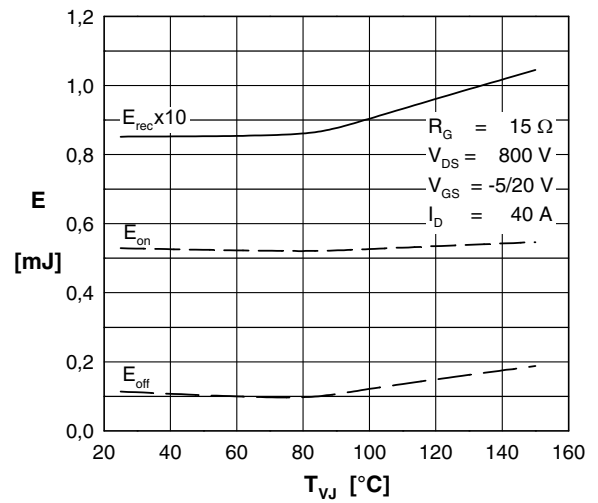


Fig. 14 Typical switching energy versus temperature

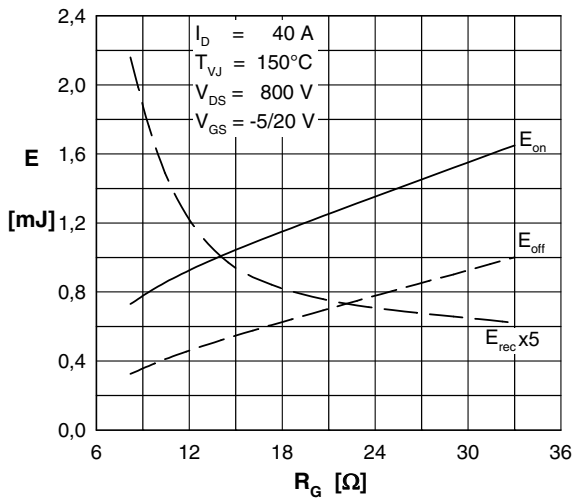


Fig. 15 Typical switching energy versus external gate resistor

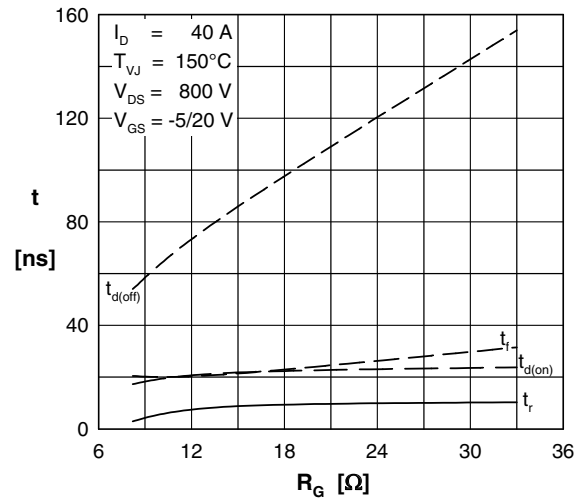


Fig. 16 Typical switching time versus external gate resistor

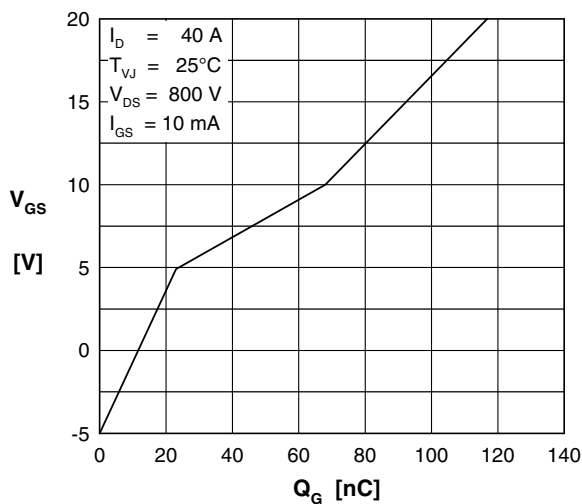


Fig. 17 Typical turn on gate charge, trendline

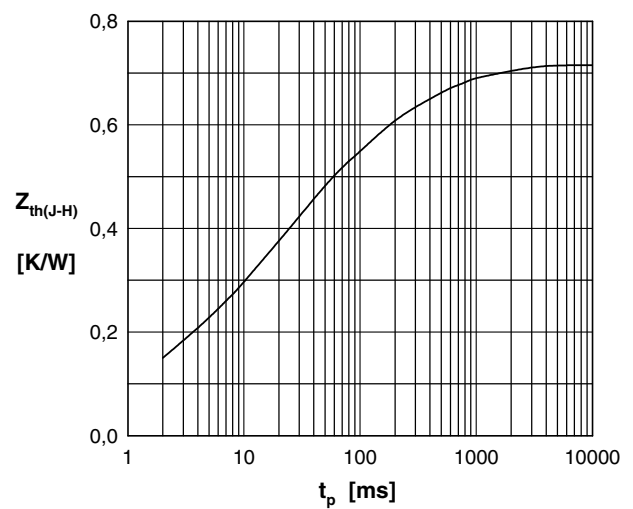


Fig. 18 Typical transient thermal impedance