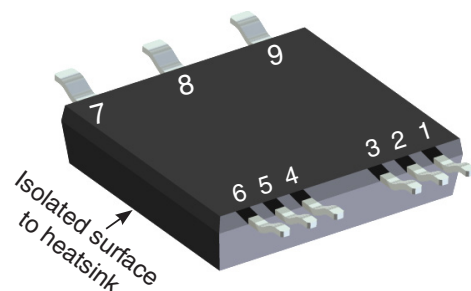


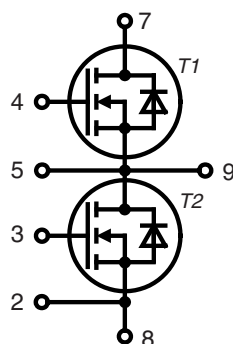
# SiC Power MOSFET

$$\begin{aligned} I_{D25} &= 55 \text{ A} \\ V_{DSS} &= 1200 \text{ V} \\ R_{DS(on) \text{ max}} &= 34 \text{ m}\Omega \end{aligned}$$

**Part number**  
**MCB40P1200LB**



 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: SMPD

- DCB isolated backside
- Isolation Voltage 2500 V
- Epoxy meets UL 94V-0
- RoHS compliant
- Advanced power cycling

## Disclaimer Notice

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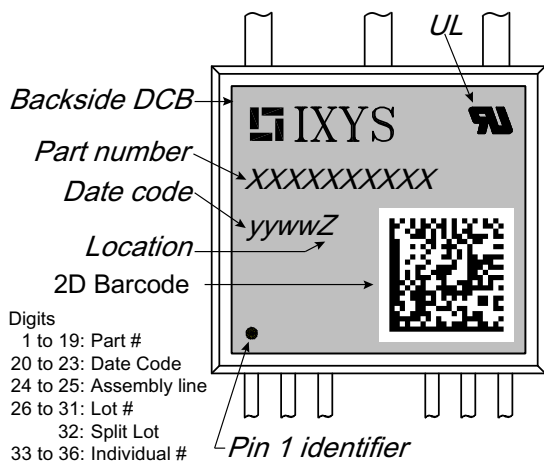
| MOSFET                                                                 |                                                                                                                                              |                                                                                                                                                                                     |      | 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                                |  |
| $I_{D25}$<br>$I_{D80}$<br>$I_{D100}$                                   | drain current                                                                                                                                | $V_{GS} = 20 V$<br>$T_C = 25^\circ C$<br>$T_C = 80^\circ C$<br>$T_C = 100^\circ C$                                                                                                  |      |                                       | 55<br>44<br>39 | A<br>A<br>A                      |  |
| $R_{DSon}$                                                             | static drain source on resistance                                                                                                            | $I_D = 50 A; V_{GS} = 20 V$<br>$T_{VJ} = 25^\circ C$<br>$T_{VJ} = 175^\circ C$                                                                                                      |      | 25<br>52                              | 34             | mΩ<br>mΩ                         |  |
| $V_{GS(th)}$                                                           | gate threshold voltage                                                                                                                       | $I_D = 15 mA; V_{GS} = V_{DS}$<br>$T_{VJ} = 25^\circ C$<br>$T_{VJ} = 175^\circ C$                                                                                                   | 2.0  | 2.6<br>2.1                            | 4.0            | V<br>V                           |  |
| $I_{DSS}$                                                              | drain source leakage current                                                                                                                 | $V_{DS} = 1200 V; V_{GS} = 0 V$<br>$T_{VJ} = 25^\circ C$                                                                                                                            |      | 2                                     | 100            | μA                               |  |
| $I_{GSS}$                                                              | gate source leakage current                                                                                                                  | $V_{DS} = 0 V; V_{GS} = 20 V$<br>$T_{VJ} = 25^\circ C$                                                                                                                              |      |                                       | 0.6            | μA                               |  |
| $R_G$                                                                  | internal gate resistance                                                                                                                     | $f = 1 MHz; V_{AC} = 25 mV$ , ESR of $C_{ISS}$                                                                                                                                      |      | 1.1                                   |                | Ω                                |  |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$                                    | input capacitance<br>output capacitance<br>reverse transfer (Miller) capacitance                                                             | $V_{DS} = 1000 V; V_{GS} = 0 V; f = 1 MHz$<br>$T_{VJ} = 25^\circ C$                                                                                                                 |      | 2790<br>220<br>15                     |                | pF<br>pF<br>pF                   |  |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$                                          | total gate charge<br>gate source charge<br>gate drain (Miller) charge                                                                        | $V_{DS} = 800 V; I_D = 50 A; V_{GS} = -5/20 V$<br>$T_{VJ} = 25^\circ C$                                                                                                             |      | 161<br>46<br>50                       |                | nC<br>nC<br>nC                   |  |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$<br>$E_{on}$<br>$E_{off}$ | turn-on delay time<br>current rise time<br>turn-off delay time<br>current fall time<br>turn-on energy per pulse<br>turn-off energy per pulse | Inductive switching<br>Free Wheeling Diode: Body Diode @ $V_{GS} = -5V$<br>$V_{DS} = 800 V; I_D = 50 A$<br>$V_{GS} = -5/20 V; R_G = 15 \Omega$ (external)<br>$T_{VJ} = 25^\circ C$  |      | 33<br>20<br>116<br>27<br>1.58<br>0.69 |                | ns<br>ns<br>ns<br>ns<br>mJ<br>mJ |  |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$<br>$E_{on}$<br>$E_{off}$ | turn-on delay time<br>current rise time<br>turn-off delay time<br>current fall time<br>turn-on energy per pulse<br>turn-off energy per pulse | Inductive switching<br>Free Wheeling Diode: Body Diode @ $V_{GS} = -5V$<br>$V_{DS} = 800 V; I_D = 50 A$<br>$V_{GS} = -5/20 V; R_G = 15 \Omega$ (external)<br>$T_{VJ} = 150^\circ C$ |      | 30<br>16<br>128<br>30<br>1.82<br>0.68 |                | ns<br>ns<br>ns<br>ns<br>mJ<br>mJ |  |
| $R_{thJC}$<br>$R_{thJH}$                                               | thermal resistance junction to case<br>thermal resistance junction to heatsink                                                               | with heatsink compound; IXYS test setup                                                                                                                                             |      | 0.85                                  | 0.70           | K/W<br>K/W                       |  |

| Source-Drain Diode                            |                                                                                                                          |                                                                                                                                            |      | Ratings                  |      |                       |  |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------|------|-----------------------|--|
| Symbol                                        | Definitions                                                                                                              | Conditions                                                                                                                                 | min. | typ.                     | max. |                       |  |
| $V_{SD}$                                      | forward voltage drop                                                                                                     | $I_F = 25 A; V_{GS} = -5 V$<br>$T_{VJ} = 25^\circ C$<br>$T_{VJ} = 175^\circ C$                                                             |      | 4.0<br>3.5               |      | V<br>V                |  |
| $t_{rr}$<br>$Q_{RM}$<br>$I_{RM}$<br>$dI_F/dt$ | reverse recovery time<br>reverse recovery charge (intrinsic diode)<br>max. reverse recovery current<br>current slew rate | $V_{GS} = -5 V; I_F = 50 A; V_R = 800 V;$<br>Mosfet gat drive:<br>$V_{GS} = -5/20 V; R_G = 15 \Omega$ (external)<br>$T_{VJ} = 25^\circ C$  |      | 18<br>0.34<br>32<br>2900 |      | ns<br>μC<br>A<br>A/μs |  |
| $t_{rr}$<br>$Q_{RM}$<br>$I_{RM}$<br>$dI_F/dt$ | reverse recovery time<br>reverse recovery charge (intrinsic diode)<br>max. reverse recovery current<br>current slew rate | $V_{GS} = -5 V; I_F = 50 A; V_R = 800 V;$<br>Mosfet gat drive:<br>$V_{GS} = -5/20 V; R_G = 15 \Omega$ (external)<br>$T_{VJ} = 150^\circ C$ |      | 29<br>0.96<br>50<br>3400 |      | ns<br>μC<br>A<br>A/μs |  |

**Note:**

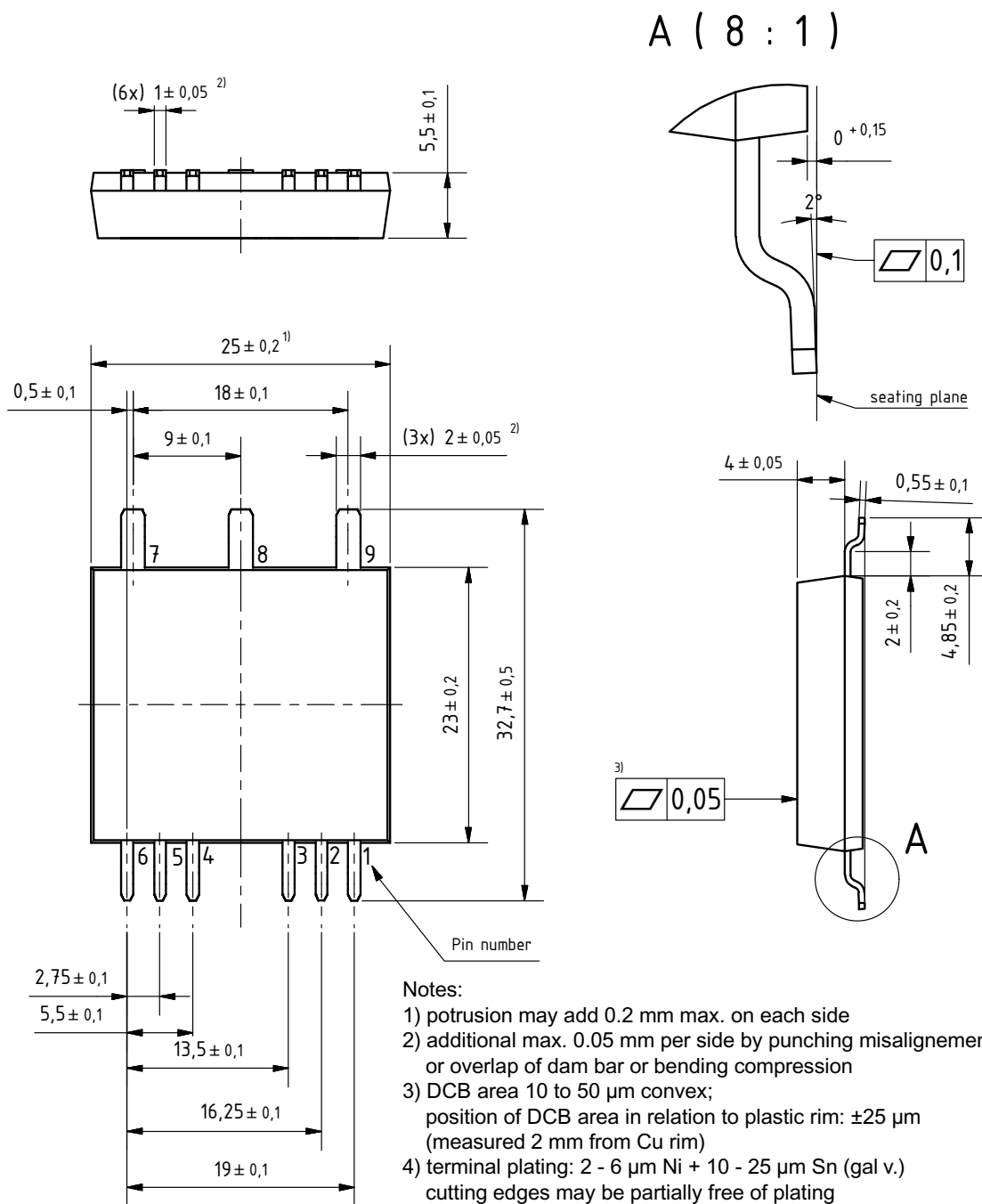
When using SiC Body Diode the maximum recommended  $V_{GS} = -5V$

| Package SMPD  |                                |                                    | Ratings |              |                                  |        |
|---------------|--------------------------------|------------------------------------|---------|--------------|----------------------------------|--------|
| Symbol        | Definitions                    | Conditions                         | min.    | typ.         | max.                             |        |
| $I_{RMS}$     | RMS current                    | wide terminal<br>standard terminal |         |              | 100<br>60                        | A<br>A |
| $T_{stg}$     | storage temperature            |                                    | -55     |              | 150                              | °C     |
| $T_{op}$      | operation temperature          |                                    | -55     |              | 150                              | °C     |
| $T_{VJ}$      | virtual junction temperature   |                                    | -55     |              | 175                              | °C     |
| <b>Weight</b> |                                |                                    |         | 8            |                                  | g      |
| $F_C$         | mounting force with clip       |                                    | 40      |              | 130                              | N      |
| $d_{Spp/App}$ | creepage distance on surface / | terminal to terminal               | 1.6     |              |                                  | mm     |
| $d_{Spb/Apb}$ | striking distance through air  | terminal to backside               | 4.0     |              |                                  | mm     |
| $V_{ISOL}$    | isolation voltage              | $t = 1$ second<br>$t = 1$ minute   |         | 3000<br>2500 |                                  | V<br>V |
|               |                                |                                    |         |              | 50/60 Hz; RMS; $I_{ISOL} < 1$ mA |        |

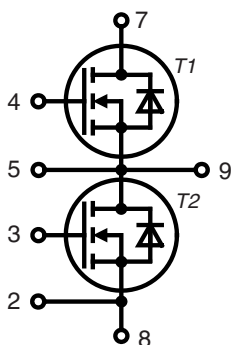

**Part number**

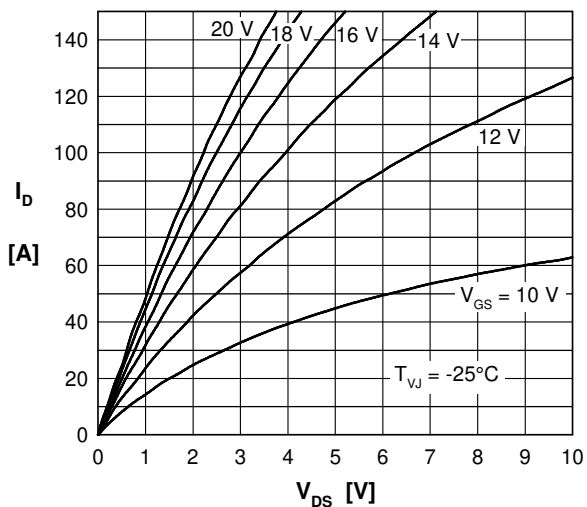
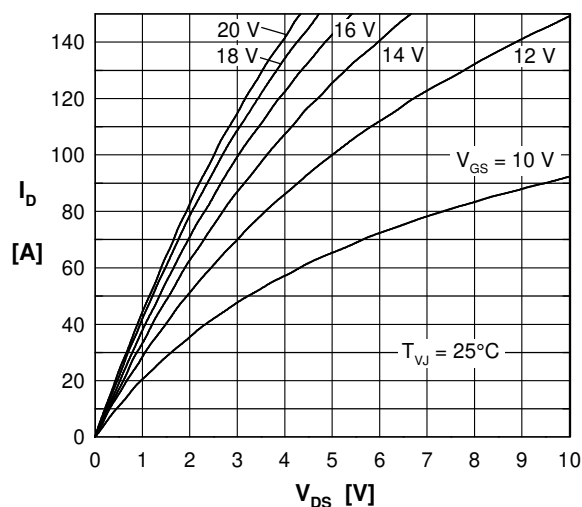
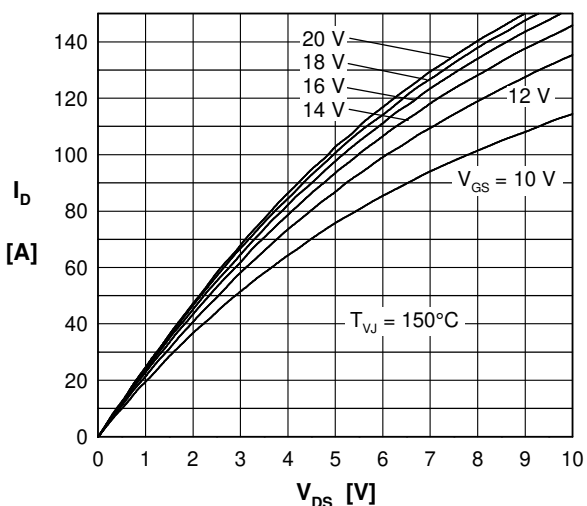
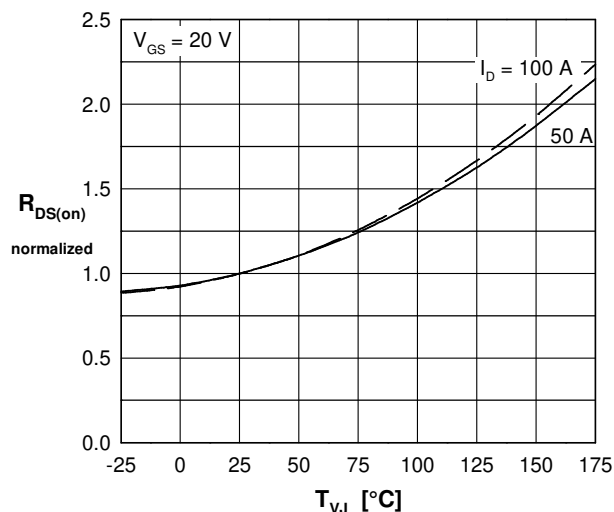
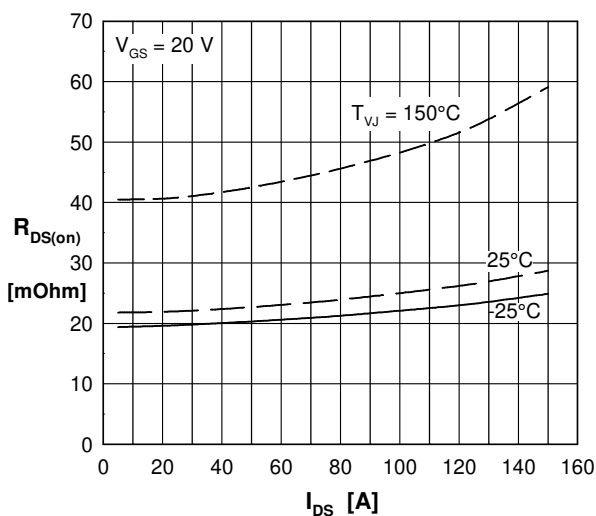
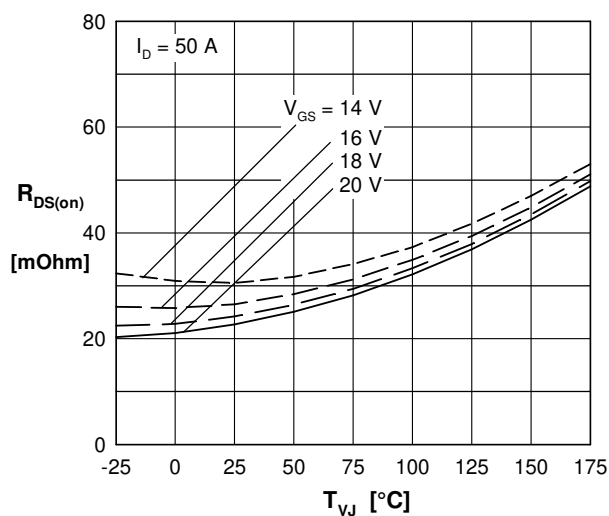
M = Mosfet  
 C = SiC MOSFET  
 B = Generation 2  
 40 = Current Rating [A]  
 P = Phase leg  
 1200 = Reverse Voltage [V]  
 LB = SMPD-B

| Ordering   | Part Name        | Marking on Product | Delivering Mode | Base Qty | Ordering Code    |
|------------|------------------|--------------------|-----------------|----------|------------------|
| Standard   | MCB40P1200LB-TUB | MCB40P1200LB       | Tube            | 20       | MCB40P1200LB-TUB |
| Alternativ | MCB40P1200LB-TRR | MCB40P1200LB       | Tape&Reel       | 200      | MCB40P1200LB-TRR |

**Outlines SMPD-B**


**Dimensions in mm**  
 (1 mm = 0.0394")



**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  $T_{VJ}$

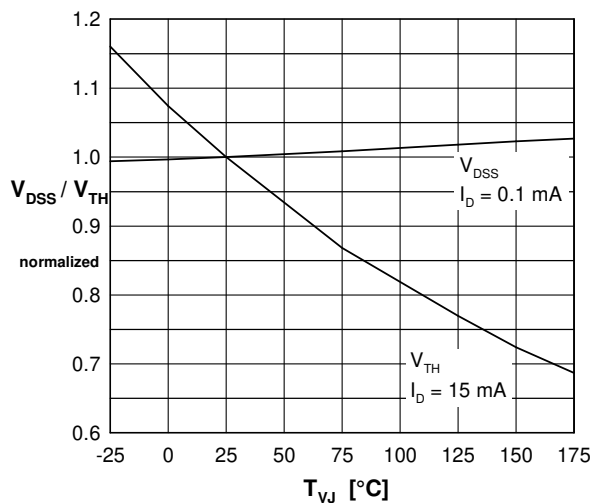
**Curves**


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

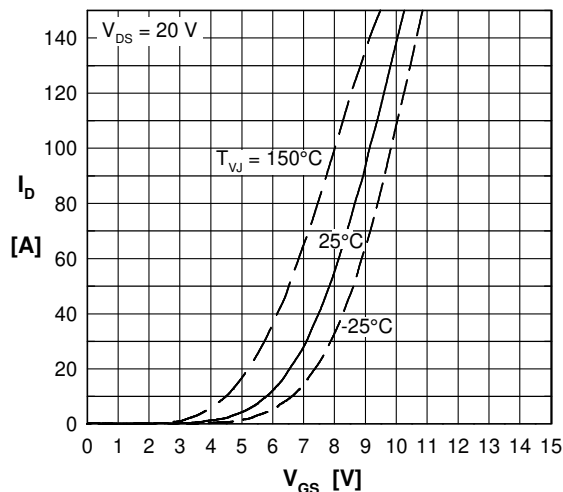


Fig. 8 Typical transfer characteristics

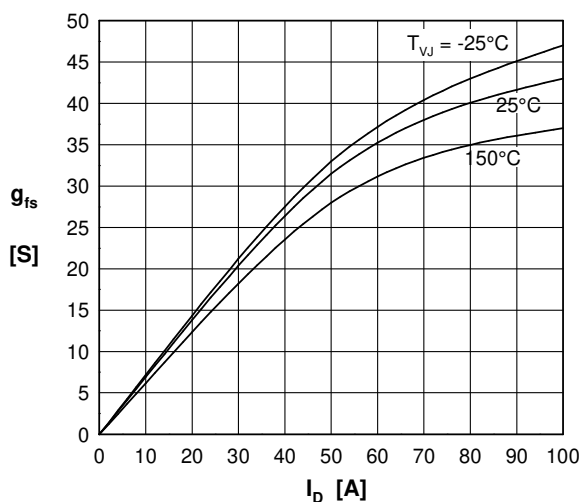


Fig. 9 Typical forward transconductance

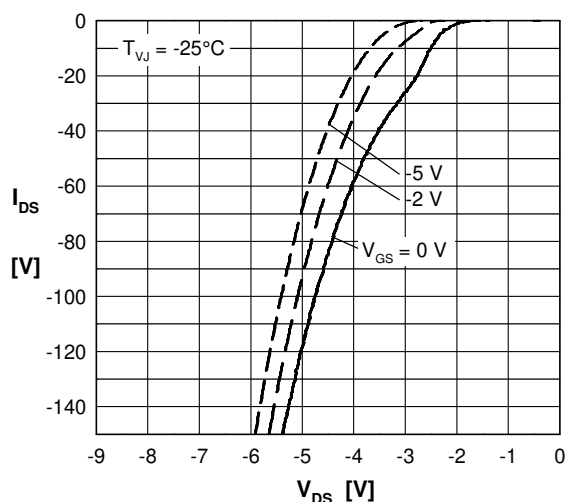


Fig. 10 Forward voltage drop of intrinsic diode versus  $V_{DS}$  measured at  $-25^{\circ}\text{C}$

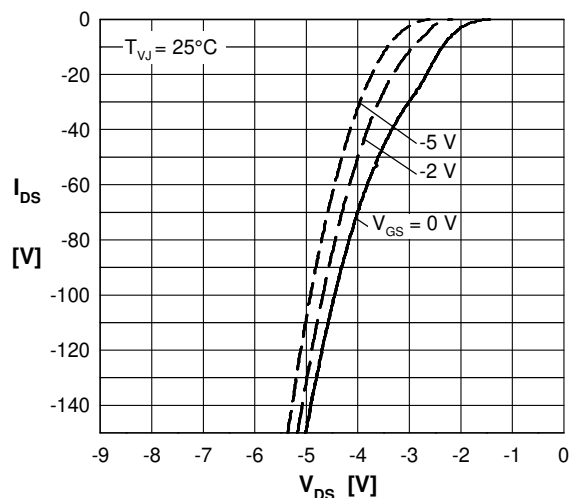


Fig. 11 Forward voltage drop of intrinsic diode versus  $V_{DS}$  measured at  $25^{\circ}\text{C}$

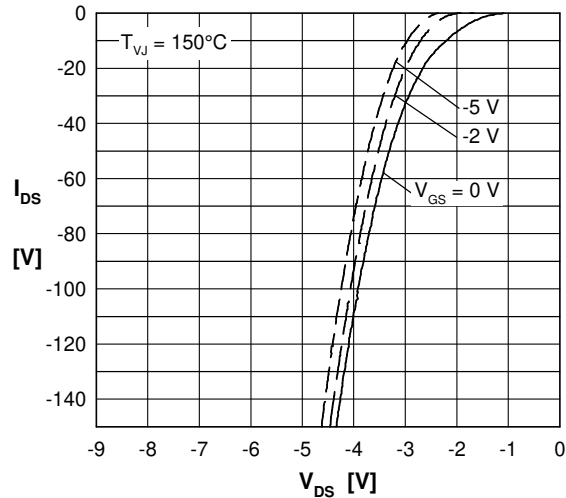


Fig. 12 Forward voltage drop of intrinsic diode versus  $V_{DS}$  measured at  $150^{\circ}\text{C}$

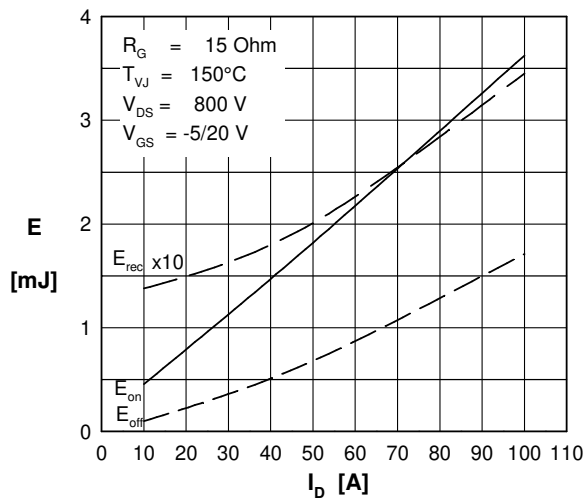
**Curves**


Fig. 13 Typical switching energy versus drain current

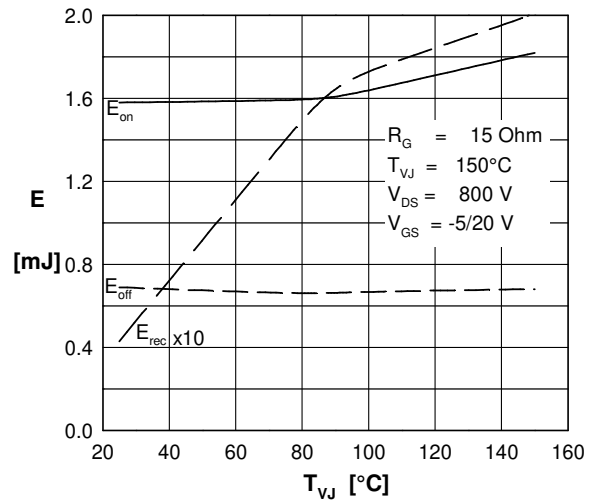


Fig. 14 Typical switching energy versus temperature

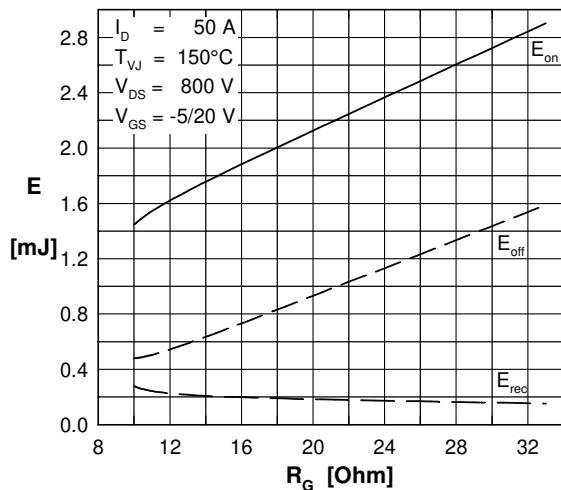


Fig. 15 Typical switching energy versus external gate resistor

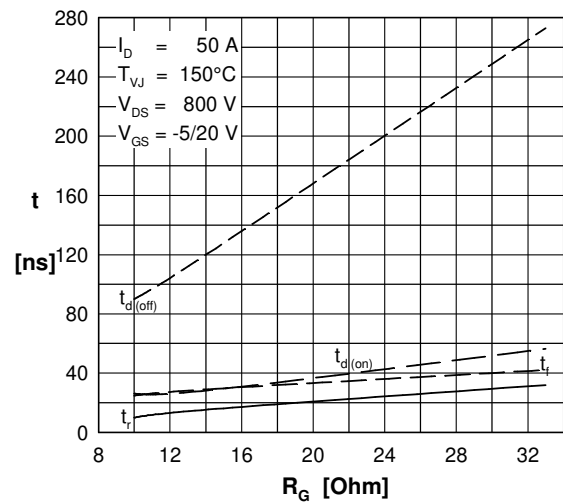


Fig. 16 Typical switching time versus external gate resistor

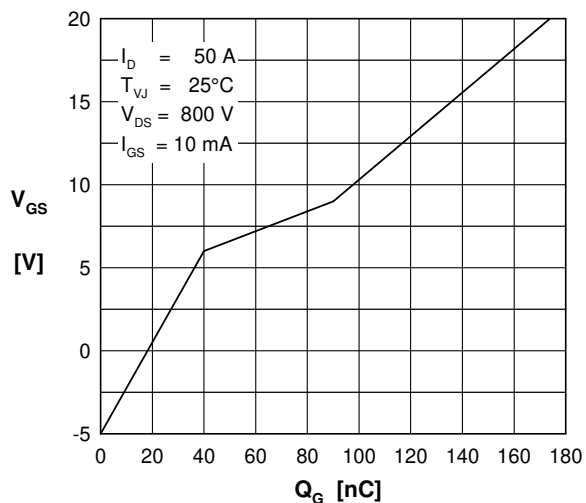


Fig. 17 Typical turn on gate charge, trendline

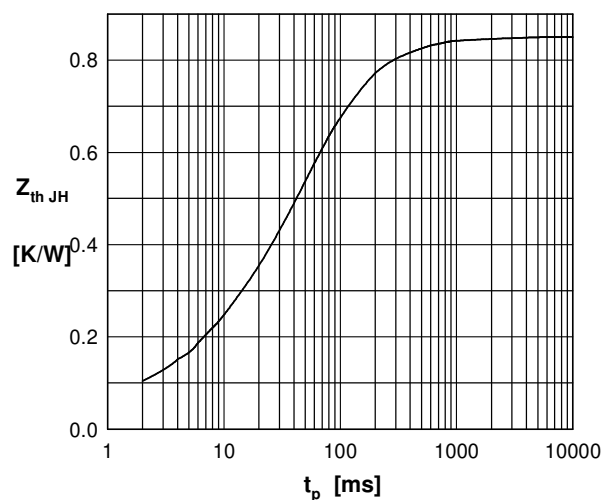


Fig. 18 Typical transient thermal impedance junction to heatsink