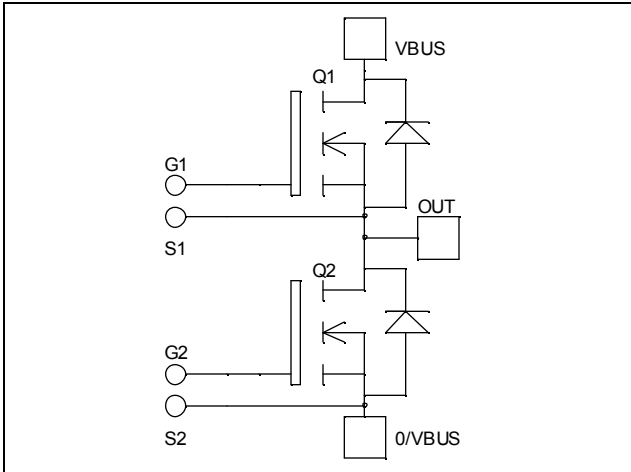


## Phase leg MOSFET Power Module

**$V_{DSS} = 200V$**   
 **$R_{DSon} = 4m\Omega$  typ @  $T_j = 25^\circ C$**   
 **$I_D = 372A$  @  $T_c = 25^\circ C$**



### Application

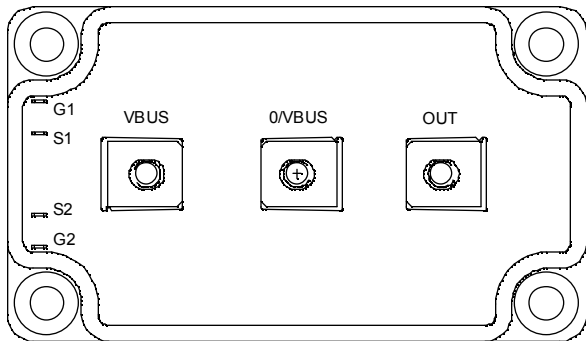
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

### Features

- Power MOS 7<sup>®</sup> FREDFETs
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Fast intrinsic reverse diode
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- High level of integration

### Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile
- RoHS Compliant



### Absolute maximum ratings

| Symbol     | Parameter   | Max ratings        | Unit      |
|------------|---|--------------------|-----------|
| $V_{DSS}$  | Drain - Source Breakdown Voltage                  | 200                | V         |
| $I_D$      | Continuous Drain Current                          | $T_c = 25^\circ C$ | A         |
|            |   | $T_c = 80^\circ C$ |           |
| $I_{DM}$   | Pulsed Drain current                              | 1488               |           |
| $V_{GS}$   | Gate - Source Voltage                             | $\pm 30$           | V         |
| $R_{DSon}$ | Drain - Source ON Resistance                      | 5                  | $m\Omega$ |
| $P_D$      | Maximum Power Dissipation                         | $T_c = 25^\circ C$ | W         |
| $I_{AR}$   | Avalanche current (repetitive and non repetitive) | 100                | A         |
| $E_{AR}$   | Repetitive Avalanche Energy                       | 50                 | mJ        |
| $E_{AS}$   | Single Pulse Avalanche Energy                     | 3000               |           |

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

**Electrical Characteristics**

| Symbol       | Characteristic                  | Test Conditions                               | Min | Typ | Max       | Unit             |
|--------------|---------------------------------|---|-----|-----|-----------|------------------|
| $I_{DSS}$    | Zero Gate Voltage Drain Current | $V_{GS} = 0\text{V}, V_{DS} = 200\text{V}$    |     |     | 500       | $\mu\text{A}$    |
|              |                                 | $T_j = 25^\circ\text{C}$                      |     |     |           |                  |
|              |                                 | $V_{GS} = 0\text{V}, V_{DS} = 160\text{V}$    |     |     | 2000      |                  |
| $R_{DS(on)}$ | Drain – Source on Resistance    | $V_{GS} = 10\text{V}, I_D = 186\text{A}$      |     | 4   | 5         | $\text{m}\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage          | $V_{GS} = V_{DS}, I_D = 10\text{mA}$          | 3   |     | 5         | V                |
| $I_{GSS}$    | Gate – Source Leakage Current   | $V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$ |     |     | $\pm 200$ | nA               |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions   | Min | Typ  | Max | Unit          |
|--------------|------------------------------|---|-----|------|-----|---------------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0\text{V}$  |     | 28.9 |     | nF            |
| $C_{oss}$    | Output Capacitance           | $V_{DS} = 25\text{V}$   |     | 9.32 |     |               |
| $C_{rss}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$   |     | 0.58 |     |               |
| $Q_g$        | Total gate Charge            | $V_{GS} = 10\text{V}$   |     | 560  |     | nC            |
| $Q_{gs}$     | Gate – Source Charge         | $V_{Bus} = 100\text{V}$   |     | 212  |     |               |
| $Q_{gd}$     | Gate – Drain Charge          | $I_D = 372\text{A}$   |     | 268  |     |               |
| $T_{d(on)}$  | Turn-on Delay Time           | <b>Inductive switching @ <math>125^\circ\text{C}</math></b><br>$V_{GS} = 15\text{V}$<br>$V_{Bus} = 133\text{V}$<br>$I_D = 372\text{A}$<br>$R_G = 1.2\Omega$ |     | 32   |     | ns            |
| $T_r$        | Rise Time                    |   |     | 64   |     |               |
| $T_{d(off)}$ | Turn-off Delay Time          |   |     | 88   |     |               |
| $T_f$        | Fall Time                    |   |     | 116  |     |               |
| $E_{on}$     | Turn-on Switching Energy     | <b>Inductive switching @ <math>25^\circ\text{C}</math></b><br>$V_{GS} = 15\text{V}, V_{Bus} = 133\text{V}$<br>$I_D = 372\text{A}, R_G = 1.2\Omega$          |     | 3396 |     | $\mu\text{J}$ |
| $E_{off}$    | Turn-off Switching Energy    |   |     | 3716 |     |               |
| $E_{on}$     | Turn-on Switching Energy     | <b>Inductive switching @ <math>125^\circ\text{C}</math></b><br>$V_{GS} = 15\text{V}, V_{Bus} = 133\text{V}$<br>$I_D = 372\text{A}, R_G = 1.2\Omega$         |     | 3744 |     | $\mu\text{J}$ |
| $E_{off}$    | Turn-off Switching Energy    |   |     | 3944 |     |               |

**Source - Drain diode ratings and characteristics**

| Symbol   | Characteristic                         | Test Conditions  | Min                       | Typ | Max  | Unit          |    |
|----------|--|--|---------------------------|-----|------|---------------|----|
| $I_S$    | Continuous Source current (Body diode) | $T_c = 25^\circ\text{C}$   |                           |     | 372  | A             |    |
|          |  | $T_c = 80^\circ\text{C}$   |                           |     | 278  |               |    |
| $V_{SD}$ | Diode Forward Voltage                  | $V_{GS} = 0\text{V}, I_S = -372\text{A}$   |                           |     | 1.3  | V             |    |
| $dv/dt$  | Peak Diode Recovery ①                  |  |                           |     | 5    | V/ns          |    |
| $t_{rr}$ | Reverse Recovery Time                  | $I_S = -372\text{A}$<br>$V_R = 133\text{V}$<br>$di/dt = 400\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  |     |      | 230           | ns |
|          |  |  | $T_j = 125^\circ\text{C}$ |     |      | 450           |    |
| $Q_{rr}$ | Reverse Recovery Charge                | $I_S = -372\text{A}$<br>$V_R = 133\text{V}$<br>$di/dt = 400\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  |     | 3.6  | $\mu\text{C}$ |    |
|          |  |  | $T_j = 125^\circ\text{C}$ |     | 13.6 |               |    |

 ①  $dv/dt$  numbers reflect the limitations of the circuit rather than the device itself.

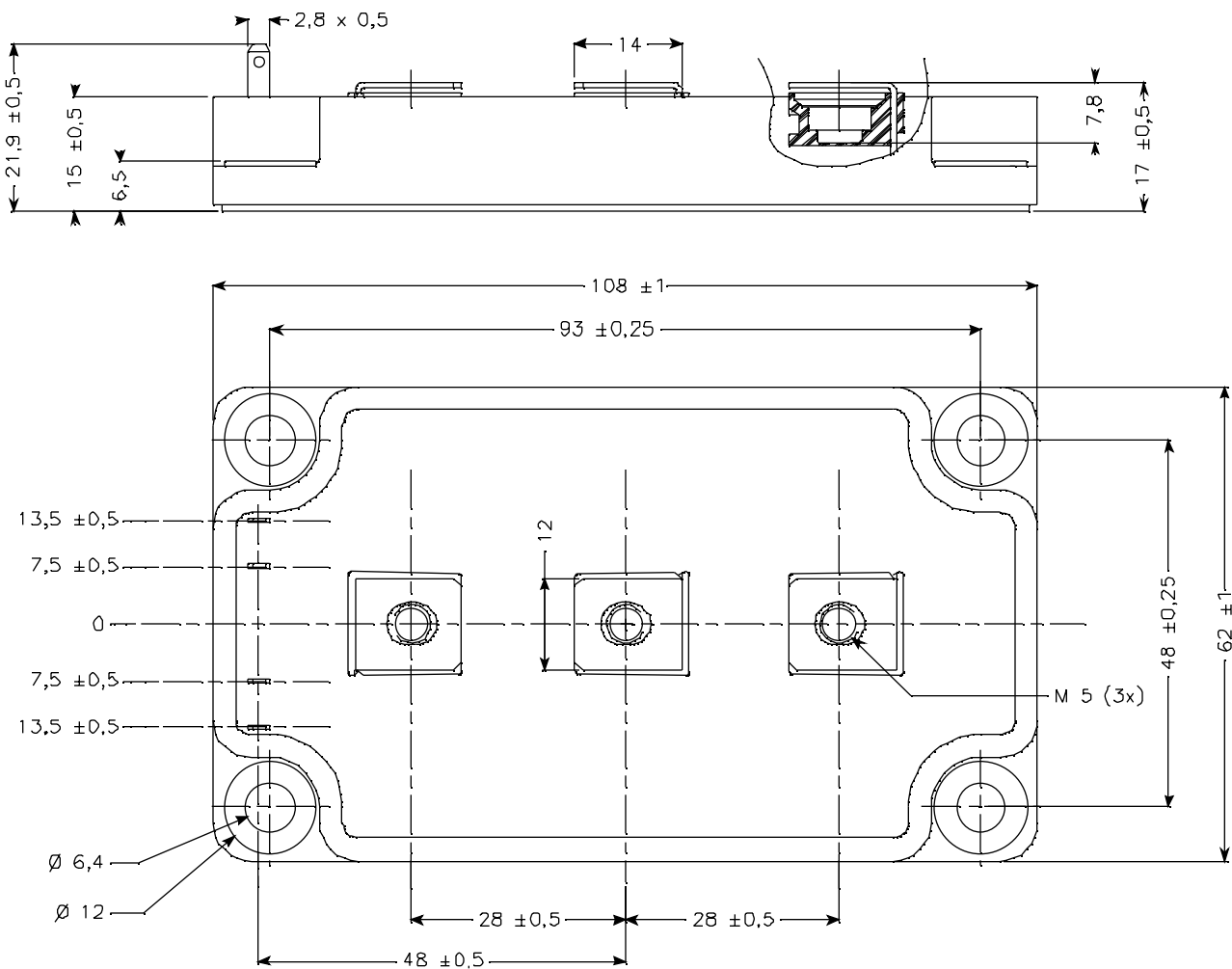
$$I_S \leq -372\text{A} \quad di/dt \leq 700\text{A}/\mu\text{s} \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

## Thermal and package characteristics

*Symbol Characteristic*

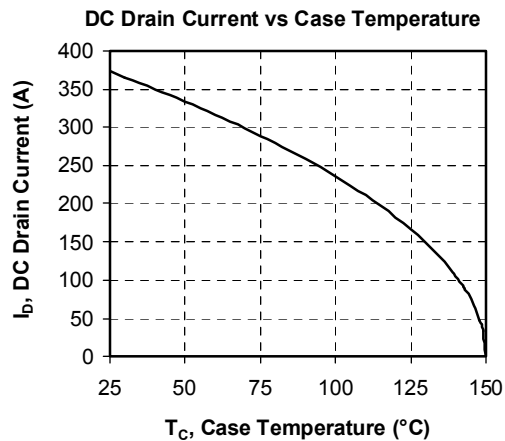
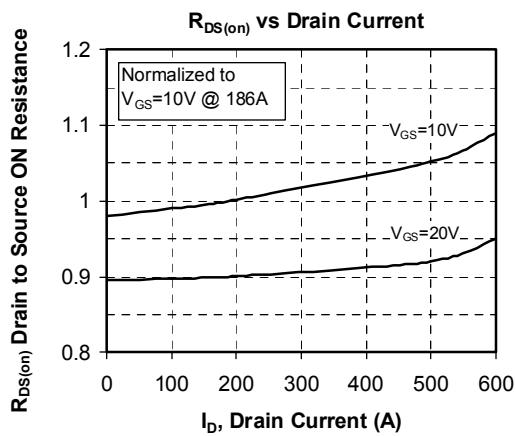
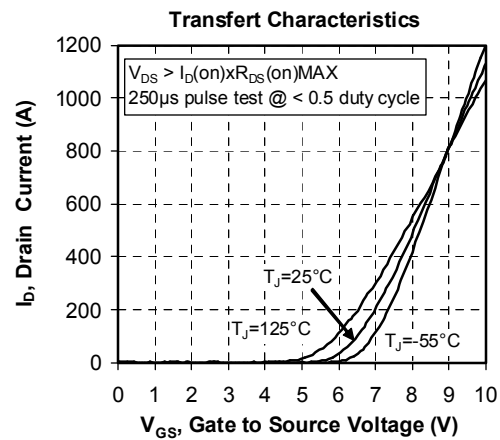
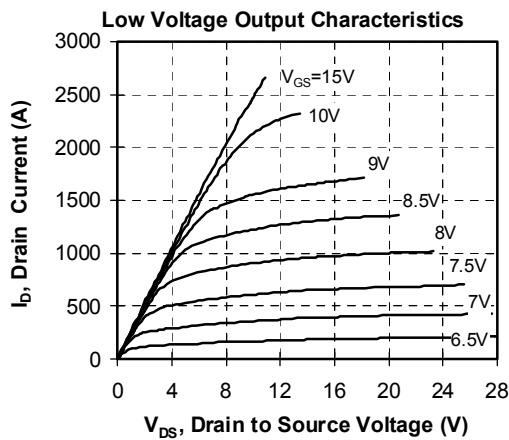
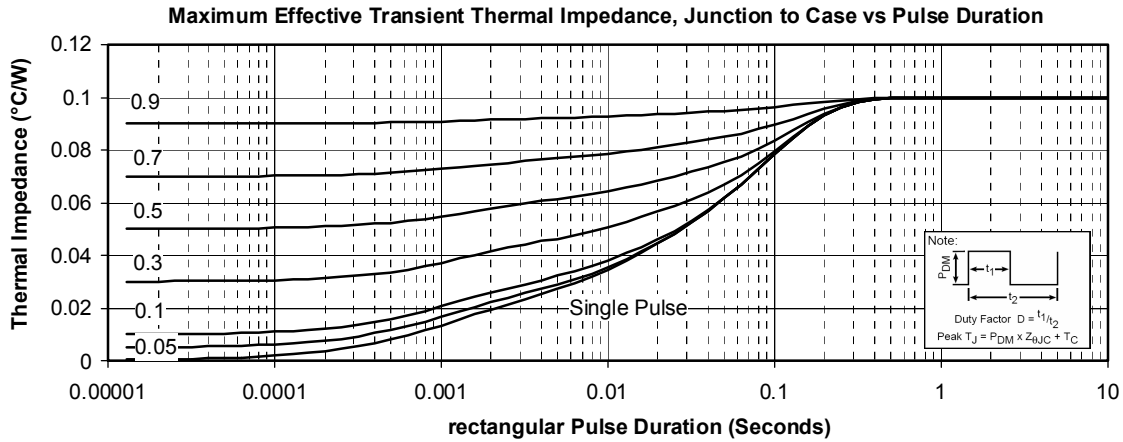
|            |   | <i>Min</i>    | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |     |
|------------|---|---------------|------------|------------|-------------|-----|
| $R_{thJC}$ | Junction to Case Thermal Resistance                                   |               |            | 0.1        | °C/W        |     |
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case t=1 min, Iso<1mA, 50/60Hz | 2500          |            |            | V           |     |
| $T_J$      | Operating junction temperature range                                  | -40           |            | 150        | °C          |     |
| $T_{STG}$  | Storage Temperature Range   | -40           |            | 125        |             |     |
| $T_C$      | Operating Case Temperature  | -40           |            | 100        |             |     |
| Torque     | Mounting torque   | To heatsink   | M6         | 3          | 5           | N.m |
|            |   | For terminals | M5         | 2          | 3.5         |     |
| Wt         | Package Weight  |               |            | 280        | g           |     |

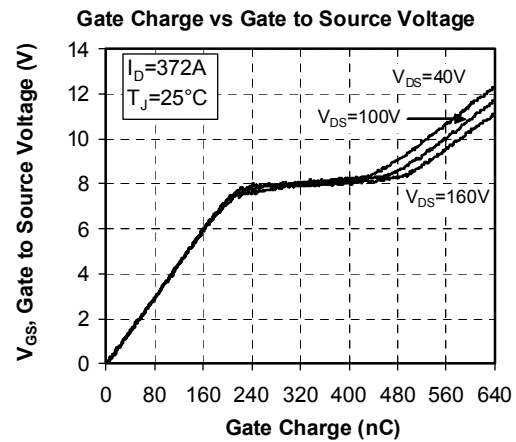
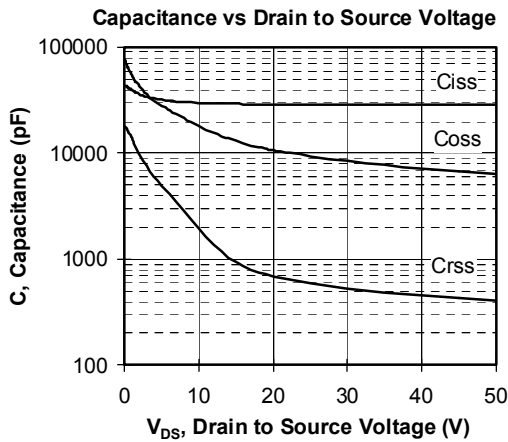
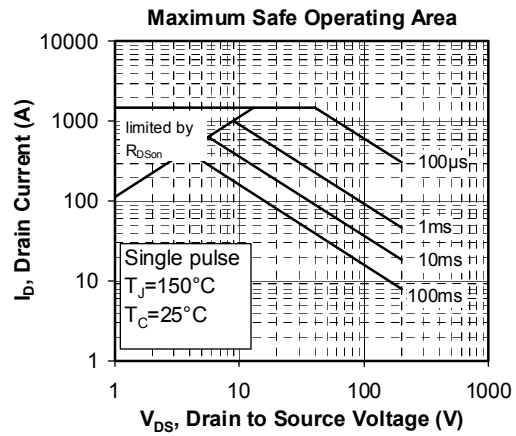
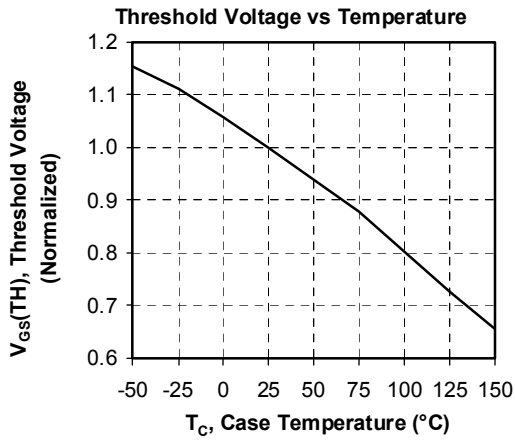
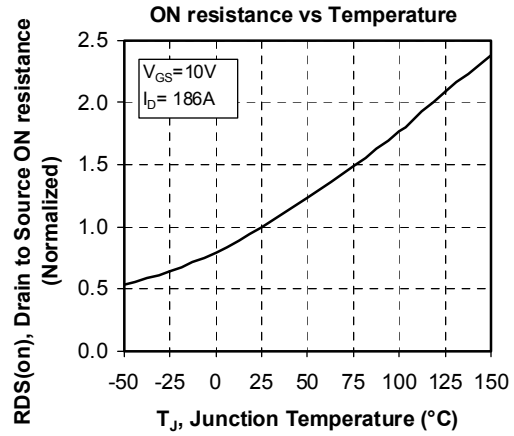
## SP6 Package outline (dimensions in mm)



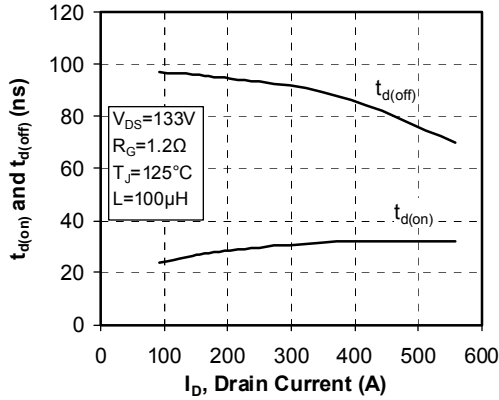
See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve

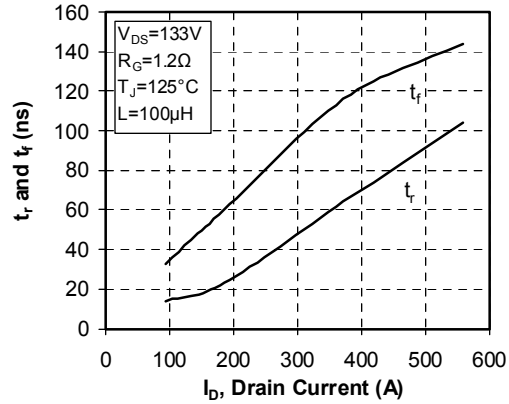




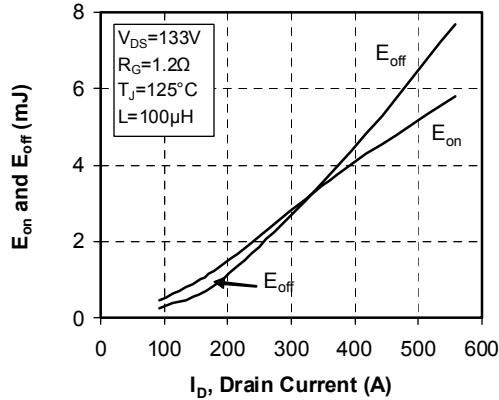
**Delay Times vs Current**



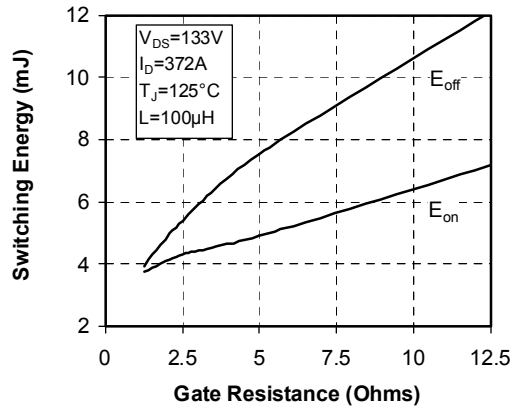
**Rise and Fall times vs Current**



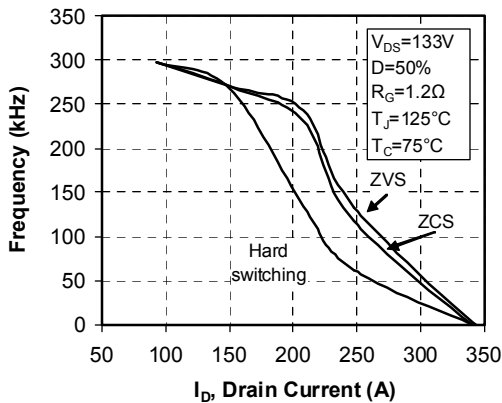
**Switching Energy vs Current**



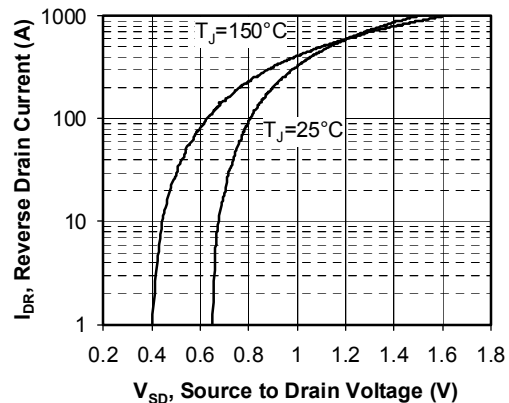
**Switching Energy vs Gate Resistance**



**Operating Frequency vs Drain Current**



**Source to Drain Diode Forward Voltage**



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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.