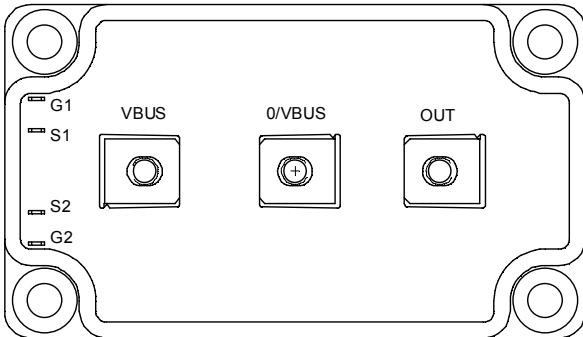
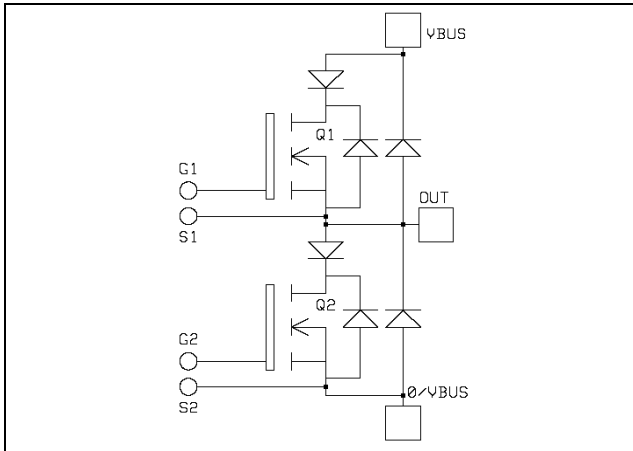


*Phase leg  
Series & parallel diodes  
MOSFET Power Module*

**$V_{DSS} = 200V$   
 $R_{DSon} = 6m\Omega \text{ max @ } T_j = 25^\circ C$   
 $I_D = 300A \text{ @ } T_c = 25^\circ C$**



**Application**

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

**Features**

- Power MOS 7<sup>®</sup> MOSFETs
  - 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

**Absolute maximum ratings**

| Symbol     | Parameter                                         | Max ratings        | Unit      |
|------------|---------------------------------------------------|--------------------|-----------|
| $V_{DSS}$  | Drain - Source Breakdown Voltage                  | 200                | V         |
| $I_D$      | Continuous Drain Current                          | $T_c = 25^\circ C$ | 300       |
|            |                                                   | $T_c = 80^\circ C$ | 225       |
| $I_{DM}$   | Pulsed Drain current                              | 1200               | A         |
| $V_{GS}$   | Gate - Source Voltage                             | $\pm 30$           | V         |
| $R_{DSon}$ | Drain - Source ON Resistance                      | 6                  | $m\Omega$ |
| $P_D$      | Maximum Power Dissipation                         | $T_c = 25^\circ C$ | 1250      |
| $I_{AR}$   | Avalanche current (repetitive and non repetitive) | 24                 | A         |
| $E_{AR}$   | Repetitive Avalanche Energy                       | 30                 | mJ        |
| $E_{AS}$   | Single Pulse Avalanche Energy                     | 1300               |           |

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

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

## Electrical Characteristics

| Symbol       | Characteristic                   | Test Conditions                 | Min | Typ | Max       | Unit      |
|--------------|----------------------------------|---------------------------------|-----|-----|-----------|-----------|
| $BV_{DSS}$   | Drain - Source Breakdown Voltage | $V_{GS} = 0V, I_D = 1.5mA$      | 200 |     |           | V         |
| $I_{DSS}$    | Zero Gate Voltage Drain Current  | $V_{GS} = 0V, V_{DS} = 200V$    |     |     | 500       | $\mu A$   |
|              |                                  | $V_{GS} = 0V, V_{DS} = 160V$    |     |     | 3         | mA        |
| $R_{DS(on)}$ | Drain - Source on Resistance     | $V_{GS} = 10V, I_D = 150A$      |     |     | 6         | $m\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage           | $V_{GS} = V_{DS}, I_D = 6mA$    | 3   |     | 5         | V         |
| $I_{GSS}$    | Gate - Source Leakage Current    | $V_{GS} = \pm 30V, V_{DS} = 0V$ |     |     | $\pm 500$ | nA        |

## Dynamic Characteristics

| Symbol       | Characteristic               | Test Conditions                                                                                               | Min | Typ  | Max | Unit    |
|--------------|------------------------------|---------------------------------------------------------------------------------------------------------------|-----|------|-----|---------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0V$                                                                                                 |     | 18.5 |     | nF      |
| $C_{oss}$    | Output Capacitance           | $V_{DS} = 25V$                                                                                                |     | 6.03 |     |         |
| $C_{rss}$    | Reverse Transfer Capacitance | $f = 1MHz$                                                                                                    |     | 0.58 |     |         |
| $Q_g$        | Total gate Charge            | $V_{GS} = 10V$<br>$V_{Bus} = 100V$<br>$I_D = 300A$                                                            |     | 325  |     | nC      |
| $Q_{gs}$     | Gate - Source Charge         |                                                                                                               |     | 144  |     |         |
| $Q_{gd}$     | Gate - Drain Charge          |                                                                                                               |     | 156  |     |         |
| $T_{d(on)}$  | Turn-on Delay Time           | <b>Inductive switching @ 125°C</b><br>$V_{GS} = 15V$<br>$V_{Bus} = 133V$<br>$I_D = 300A$<br>$R_G = 0.8\Omega$ |     | 28   |     | ns      |
| $T_r$        | Rise Time                    |                                                                                                               |     | 56   |     |         |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                               |     | 81   |     |         |
| $T_f$        | Fall Time                    |                                                                                                               |     | 99   |     |         |
| $E_{on}$     | Turn-on Switching Energy ❶   | <b>Inductive switching @ 25°C</b><br>$V_{GS} = 15V, V_{Bus} = 133V$<br>$I_D = 300A, R_G = 0.8\Omega$          |     | 1543 |     | $\mu J$ |
| $E_{off}$    | Turn-off Switching Energy ❷  |                                                                                                               |     | 1517 |     |         |
| $E_{on}$     | Turn-on Switching Energy ❶   | <b>Inductive switching @ 125°C</b><br>$V_{GS} = 15V, V_{Bus} = 133V$<br>$I_D = 300A, R_G = 0.8\Omega$         |     | 2027 |     | $\mu J$ |
| $E_{off}$    | Turn-off Switching Energy ❷  |                                                                                                               |     | 1770 |     |         |

❶  $E_{on}$  includes diode reverse recovery.

❷ In accordance with JEDEC standard JESD24-1.

## Series diode ratings and characteristics

| Symbol      | Characteristic                  | Test Conditions                                      | Min                       | Typ | Max  | Unit |
|-------------|---------------------------------|------------------------------------------------------|---------------------------|-----|------|------|
| $I_{F(AV)}$ | Maximum Average Forward Current | 50% duty cycle                                       |                           | 120 |      | A    |
| $V_F$       | Diode Forward Voltage           | $I_F = 120A$                                         |                           | 1.1 | 1.15 | V    |
|             |                                 | $I_F = 240A$                                         |                           | 1.4 |      |      |
|             |                                 | $I_F = 120A$                                         | $T_j = 125^\circ\text{C}$ |     | 0.9  |      |
| $t_{rr}$    | Reverse Recovery Time           | $I_F = 120A$<br>$V_R = 133V$<br>$di/dt = 400A/\mu s$ | $T_j = 25^\circ\text{C}$  |     | 31   | ns   |
|             |                                 |                                                      | $T_j = 125^\circ\text{C}$ |     | 60   |      |
| $Q_{rr}$    | Reverse Recovery Charge         |                                                      | $T_j = 25^\circ\text{C}$  |     | 120  | nC   |
|             |                                 |                                                      | $T_j = 125^\circ\text{C}$ |     | 500  |      |

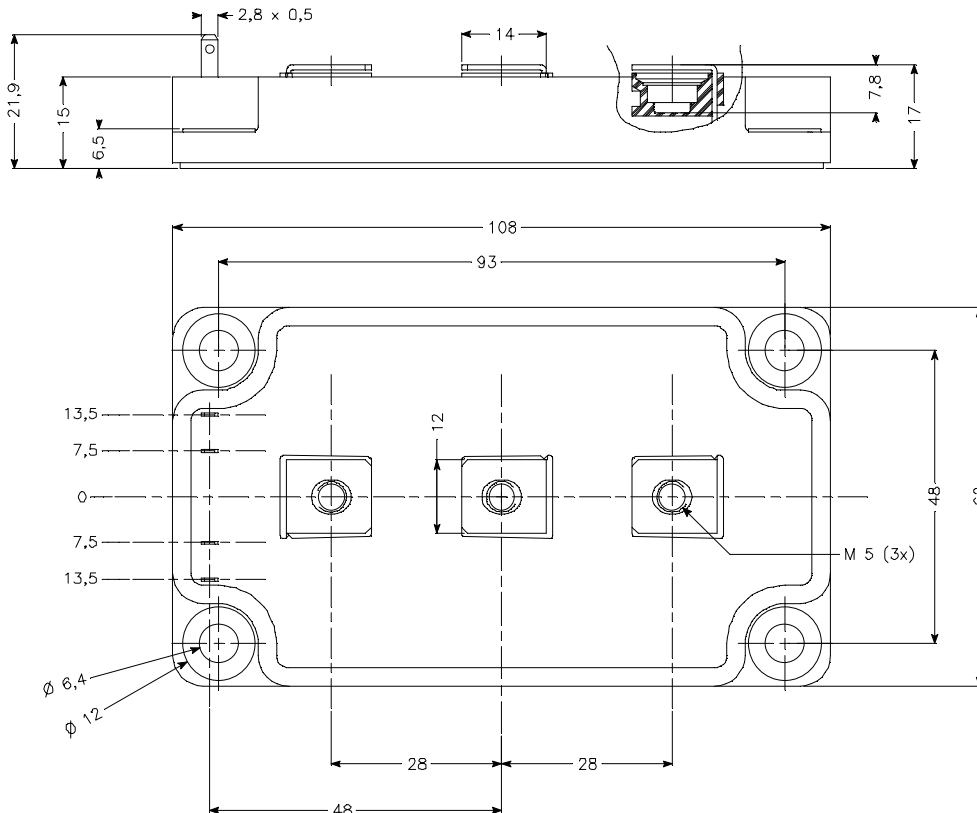
## Parallel diode ratings and characteristics

| Symbol      | Characteristic                  | Test Conditions                                                                 |                           | Min | Typ | Max  | Unit |
|-------------|---------------------------------|---------------------------------------------------------------------------------|---------------------------|-----|-----|------|------|
| $I_{F(AV)}$ | Maximum Average Forward Current | 50% duty cycle                                                                  | $T_c = 85^\circ\text{C}$  |     | 120 |      | A    |
| $V_F$       | Diode Forward Voltage           | $I_F = 120\text{A}$                                                             |                           |     | 1.1 | 1.15 | V    |
|             |                                 | $I_F = 240\text{A}$                                                             |                           |     | 1.4 |      |      |
|             |                                 | $I_F = 120\text{A}$                                                             | $T_j = 125^\circ\text{C}$ |     | 0.9 |      |      |
| $t_{rr}$    | Reverse Recovery Time           | $I_F = 120\text{A}$<br>$V_R = 130\text{V}$<br>$di/dt = 400\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  |     | 31  |      | ns   |
|             |                                 |                                                                                 | $T_j = 125^\circ\text{C}$ |     | 60  |      |      |
| $Q_{rr}$    | Reverse Recovery Charge         | $I_F = 120\text{A}$<br>$V_R = 130\text{V}$<br>$di/dt = 400\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  |     | 120 |      | nC   |
|             |                                 |                                                                                 | $T_j = 125^\circ\text{C}$ |     | 500 |      |      |

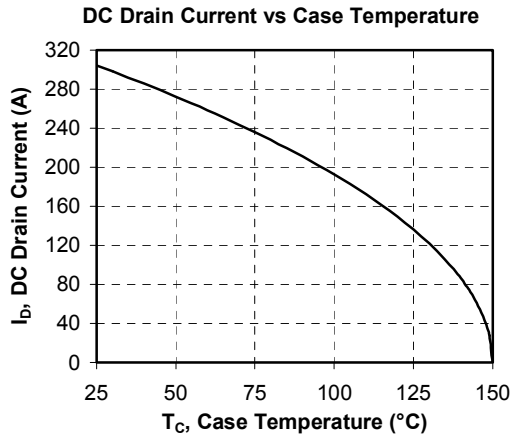
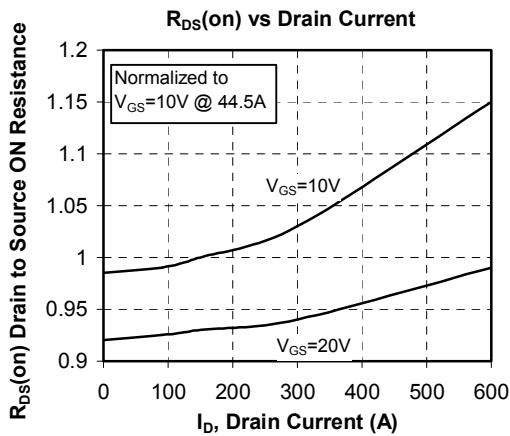
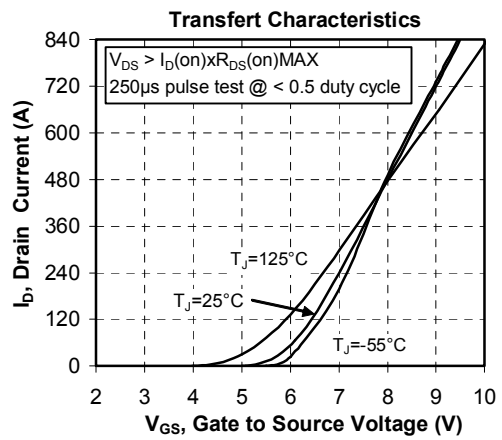
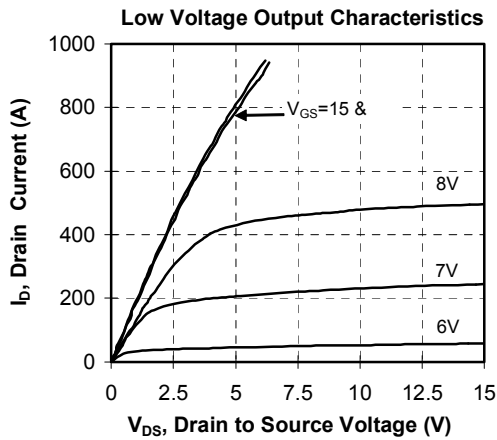
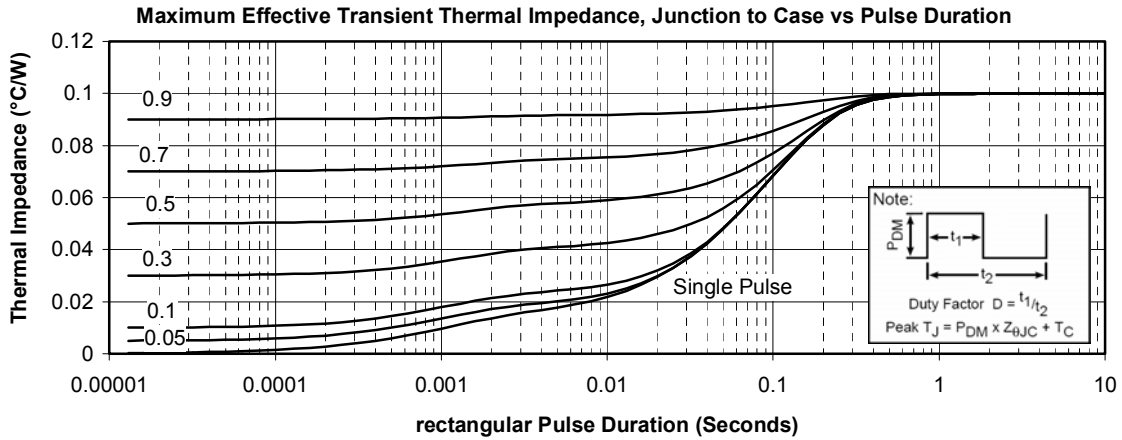
## Thermal and package characteristics

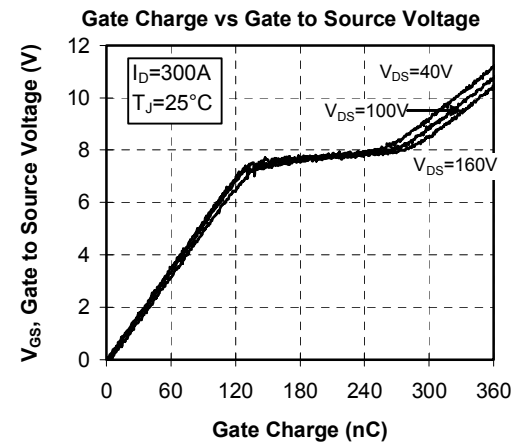
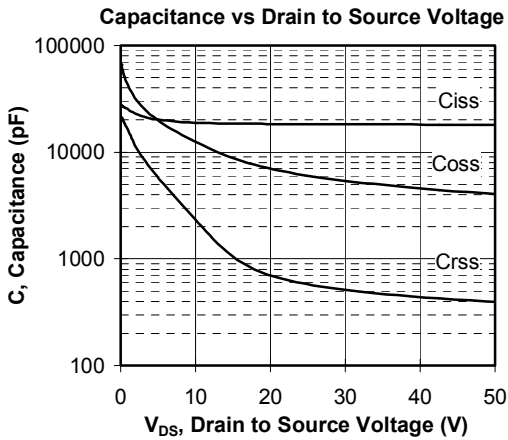
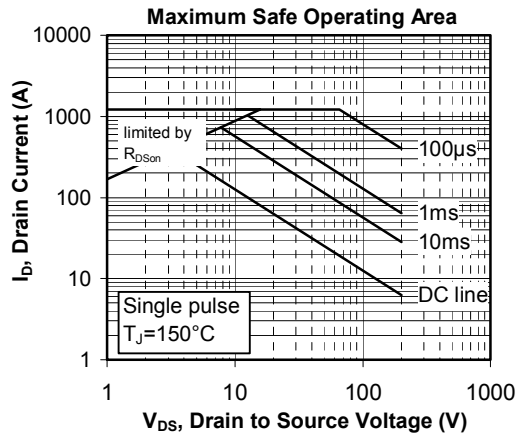
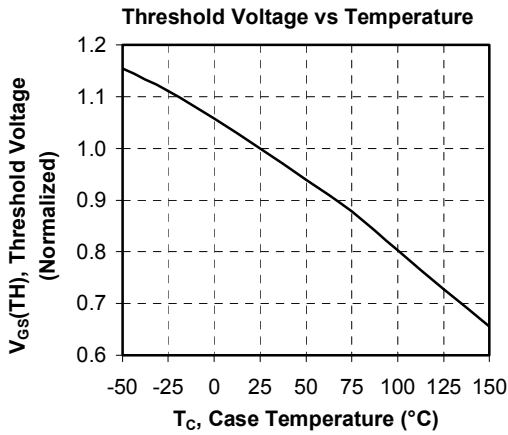
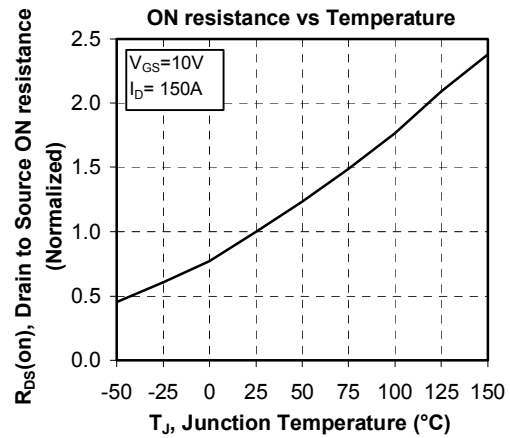
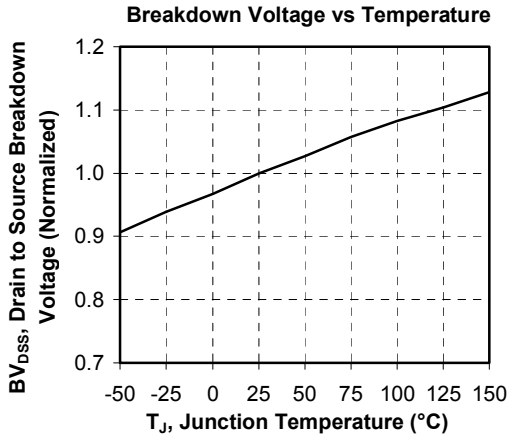
| Symbol     | Characteristic                                                                                   | Min            | Typ | Max | Unit             |                           |
|------------|--------------------------------------------------------------------------------------------------|----------------|-----|-----|------------------|---------------------------|
| $R_{thJC}$ | Junction to Case                                                                                 | Transistor     |     |     | 0.10             | $^\circ\text{C}/\text{W}$ |
|            |                                                                                                  | Diode serie    |     |     | 0.46             |                           |
|            |                                                                                                  | Diode parallel |     |     | 0.46             |                           |
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case $t=1\text{ min}$ , $I_{isol} < 1\text{mA}$ , 50/60Hz | 2500           |     |     | V                |                           |
| $T_J$      | Operating junction temperature range                                                             | -40            |     | 150 | $^\circ\text{C}$ |                           |
| $T_{STG}$  | 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                |                           |

## Package outline

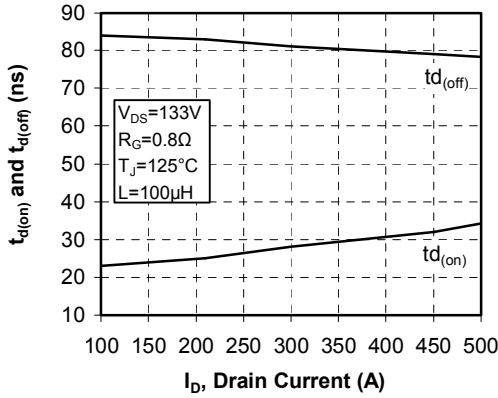


**Typical Performance Curve**

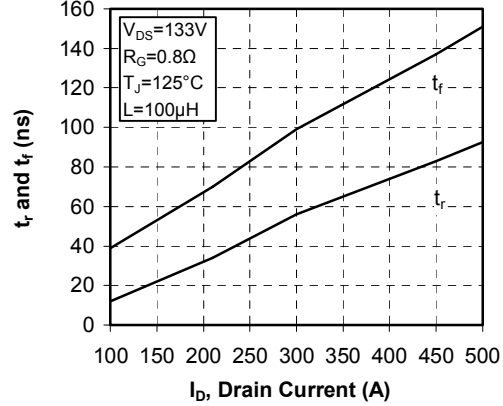




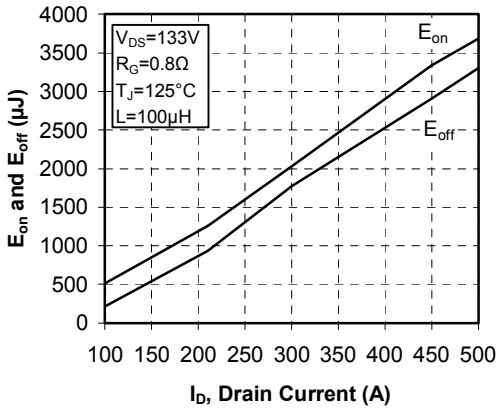
**Delay Times vs Current**



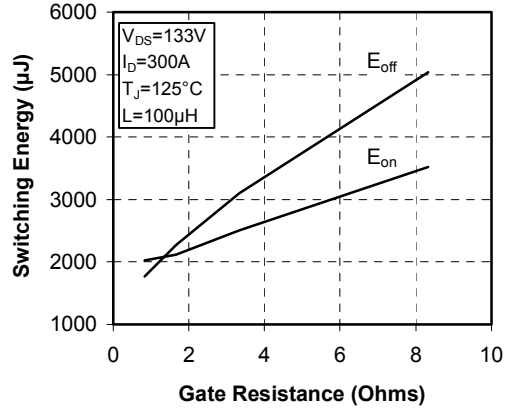
**Rise and Fall times vs Current**



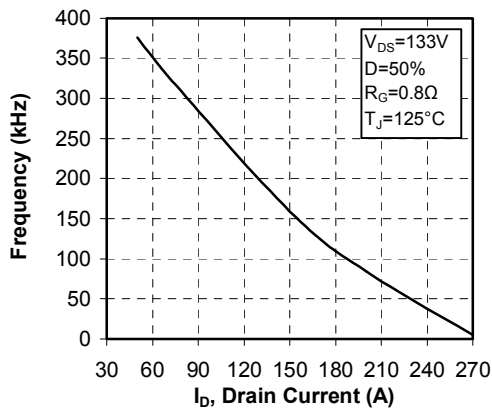
**Switching Energy vs Current**



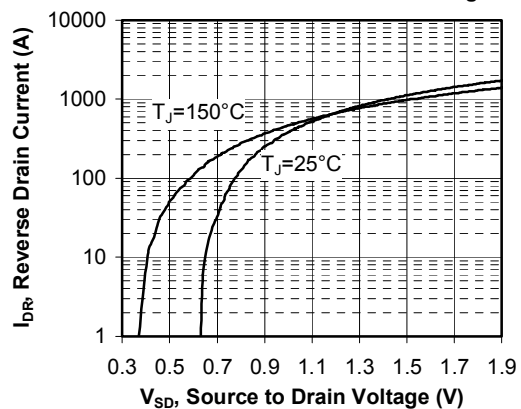
**Switching Energy vs Gate Resistance**



**Operating Frequency vs Drain Current**



**Source to Drain Diode Forward Voltage**



APT reserves the right to change, without notice, the specifications and information contained herein

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