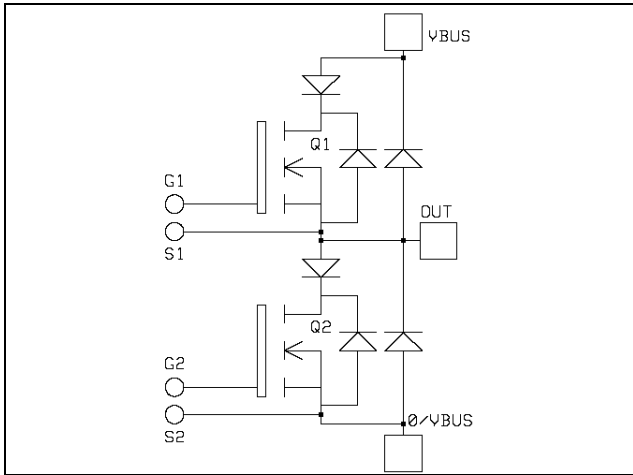


*Phase leg
Series & SiC parallel diodes
Super Junction
MOSFET Power Module*

$V_{DSS} = 800V$
 $R_{DSon} = 75m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 56A \text{ @ } T_c = 25^\circ C$



Application

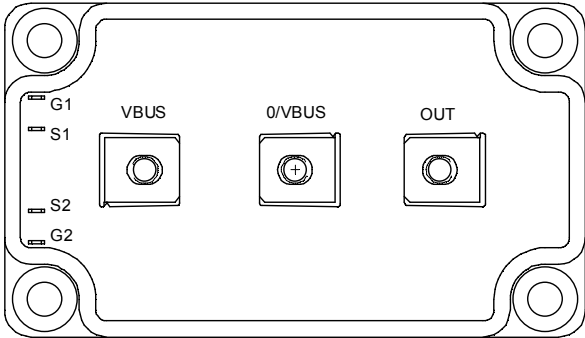
- Motor control
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- **COOLMOS** Power Semiconductors
 - Ultra low R_{DSon}
 - Low Miller capacitance
 - Ultra low gate charge
 - Avalanche energy rated
- **Parallel SiC Schottky Diode**
 - Zero reverse recovery
 - Zero forward recovery
 - Temperature Independent switching behavior
 - Positive temperature coefficient on VF
- 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 | 800 | V |
| I_D | Continuous Drain Current | $T_c = 25^\circ C$ | 56 |
| | | $T_c = 80^\circ C$ | 43 |
| I_{DM} | Pulsed Drain current | 232 | |
| V_{GS} | Gate - Source Voltage | ± 30 | V |
| R_{DSon} | Drain - Source ON Resistance | 75 | $m\Omega$ |
| P_D | Maximum Power Dissipation | $T_c = 25^\circ C$ | 568 |
| I_{AR} | Avalanche current (repetitive and non repetitive) | 24 | A |
| E_{AR} | Repetitive Avalanche Energy | 0.5 | mJ |
| E_{AS} | Single Pulse Avalanche Energy | 670 | |

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 | $V_{GS} = 0V, I_D = 1000\mu A$ | 800 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{GS} = 0V, V_{DS} = 800V, T_j = 25^\circ\text{C}$ | | | 100 | μA |
| | | $V_{GS} = 0V, V_{DS} = 800V, T_j = 125^\circ\text{C}$ | | | 1000 | |
| $R_{DS(on)}$ | Drain - Source on Resistance | $V_{GS} = 10V, I_D = 28A$ | | | 75 | $m\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 4mA$ | 2.1 | 3 | 3.9 | V |
| I_{GSS} | Gate - Source Leakage Current | $V_{GS} = \pm 20V, V_{DS} = 0V$ | | | ± 200 | nA |

Dynamic Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|------------------------------|--|-----|------|-----|---------|
| C_{iss} | Input Capacitance | $V_{GS} = 0V$ | | 9015 | | pF |
| C_{oss} | Output Capacitance | $V_{DS} = 25V$ | | 4183 | | |
| C_{rss} | Reverse Transfer Capacitance | $f = 1MHz$ | | 215 | | |
| Q_g | Total gate Charge | $V_{GS} = 10V$ | | 364 | | nC |
| Q_{gs} | Gate - Source Charge | $V_{Bus} = 400V$ | | 48 | | |
| Q_{gd} | Gate - Drain Charge | $I_D = 56A$ | | 184 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive switching @ 125°C $V_{GS} = 15V$ $V_{Bus} = 553V$ $I_D = 56A$ $R_G = 1.2\Omega$ | | 10 | | ns |
| T_r | Rise Time | | | 13 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 83 | | |
| T_f | Fall Time | | | 35 | | |
| E_{on} | Turn-on Switching Energy | Inductive switching @ 25°C $V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 56A, R_G = 1.2\Omega$ | | 583 | | μJ |
| E_{off} | Turn-off Switching Energy ① | | | 556 | | |
| E_{on} | Turn-on Switching Energy | Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 56A, R_G = 1.2\Omega$ | | 1020 | | μJ |
| E_{off} | Turn-off Switching Energy ① | | | 684 | | |

Series diode ratings and characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|-------------|---------------------------------|---|-----|-----|------|------|
| $I_{F(AV)}$ | Maximum Average Forward Current | 50% duty cycle, $T_c = 85^\circ\text{C}$ | | 60 | | A |
| V_F | Diode Forward Voltage | $I_F = 60A$ | | 1.1 | 1.15 | V |
| | | $I_F = 120A$ | | 1.4 | | |
| | | $I_F = 60A, T_j = 125^\circ\text{C}$ | | 0.9 | | |
| t_{rr} | Reverse Recovery Time | $I_F = 60A, V_R = 133V, di/dt = 400A/\mu s, T_j = 25^\circ\text{C}$ | | 24 | | ns |
| | | $T_j = 125^\circ\text{C}$ | | 48 | | |
| Q_{rr} | Reverse Recovery Charge | $I_F = 60A, V_R = 133V, di/dt = 400A/\mu s, T_j = 25^\circ\text{C}$ | | 66 | | nC |
| | | $T_j = 125^\circ\text{C}$ | | 300 | | |

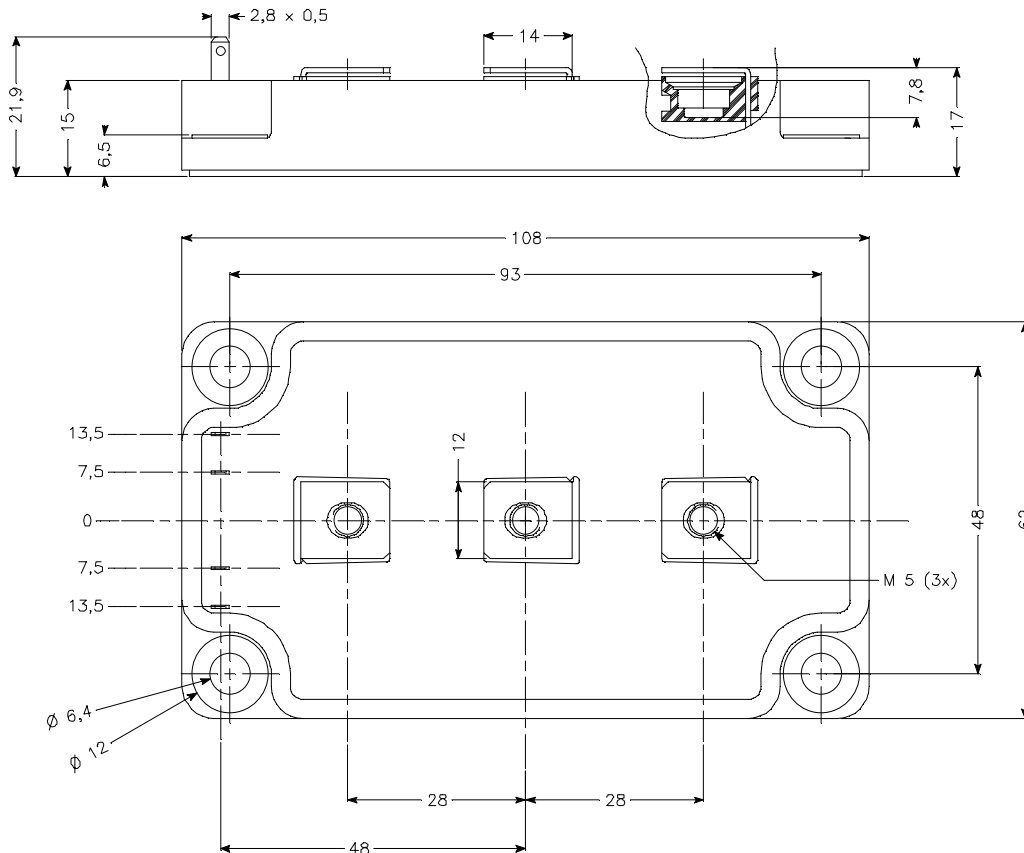
Parallel diode ratings and characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|-------------|---------------------------------|--|---------------------------|-----|-----|------|
| $I_{F(AV)}$ | Maximum Average Forward Current | 50% duty cycle $T_c = 125^\circ\text{C}$ | | 30 | | A |
| V_F | Diode Forward Voltage | $I_F = 30\text{A}$ | $T_j = 25^\circ\text{C}$ | 1.6 | 1.8 | V |
| | | | $T_j = 175^\circ\text{C}$ | 2.6 | 3.0 | |
| Q_C | Total Capacitive Charge | $I_F = 30\text{A}$, $V_R = 600\text{V}$ $di/dt = 1600\text{A}/\mu\text{s}$ | | 84 | | nC |
| Q | Total Capacitance | $f = 1\text{MHz}$, $V_R = 200\text{V}$ | | 270 | | pF |
| | | $f = 1\text{MHz}$, $V_R = 400\text{V}$ | | 198 | | |

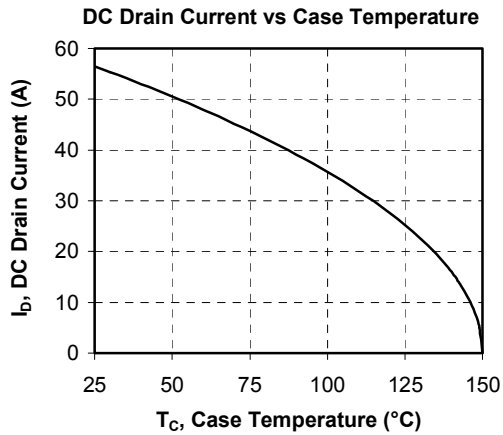
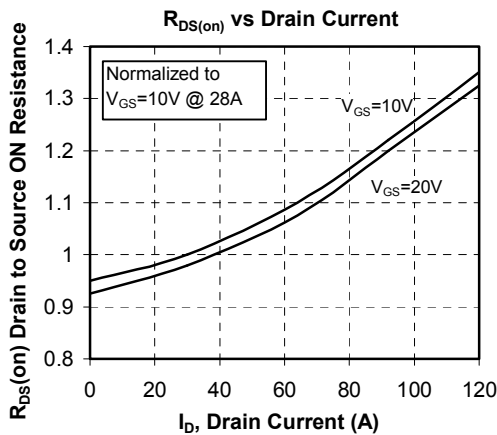
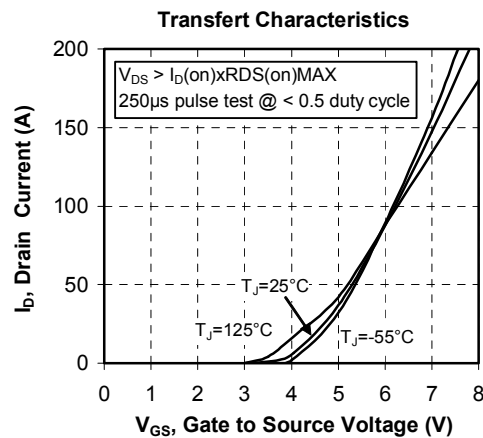
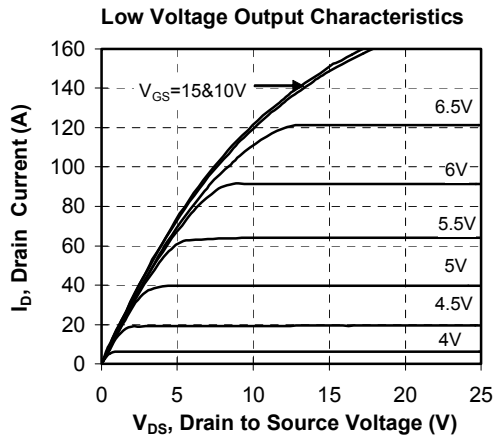
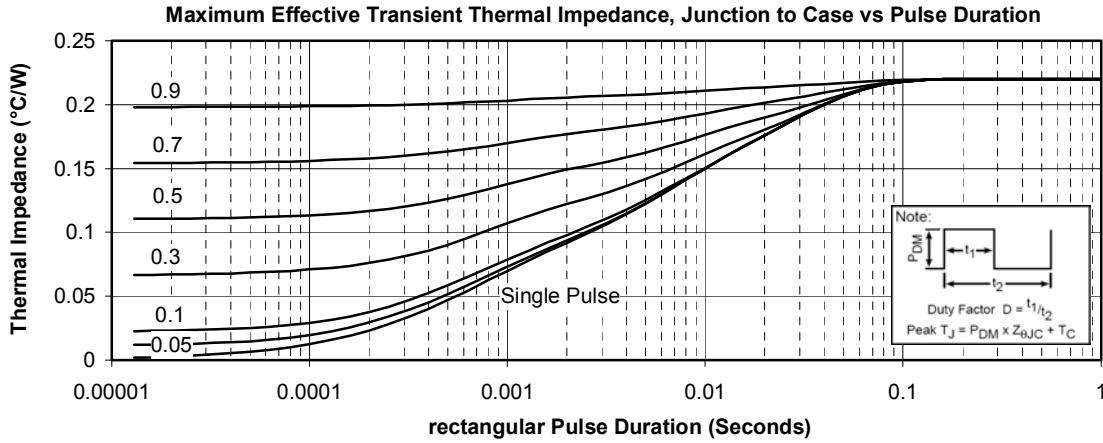
Thermal and package characteristics

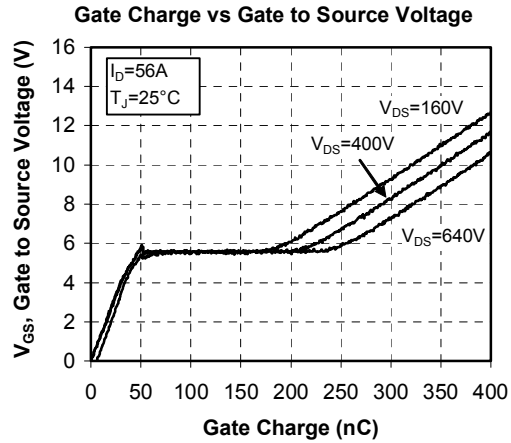
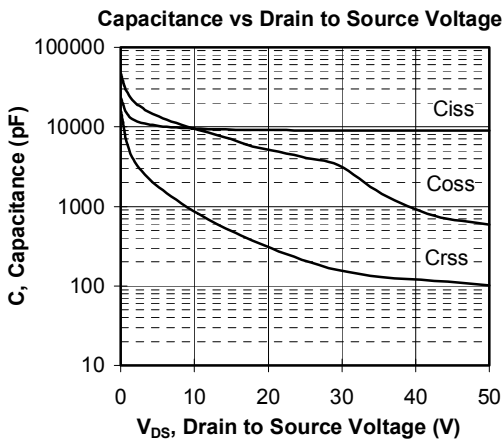
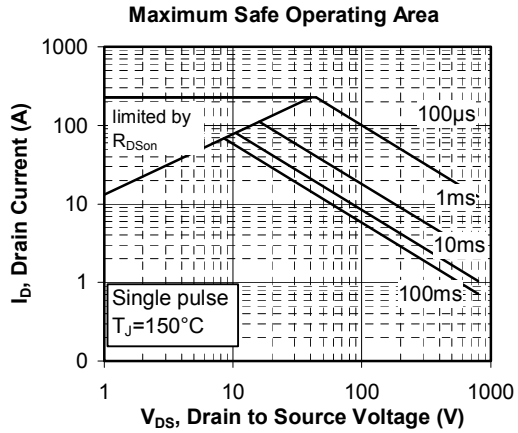
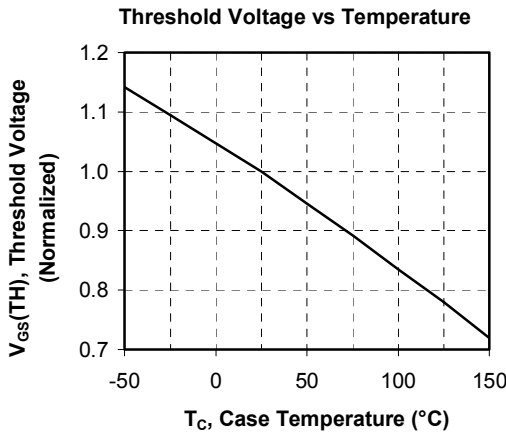
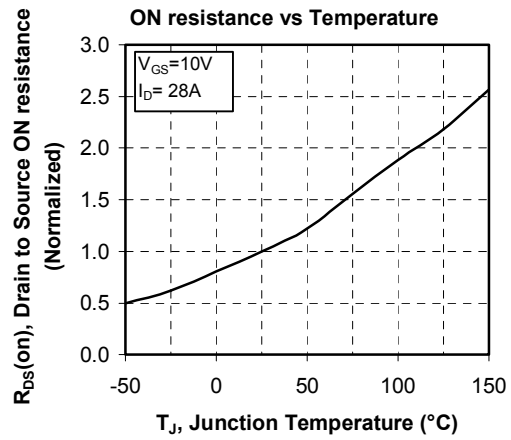
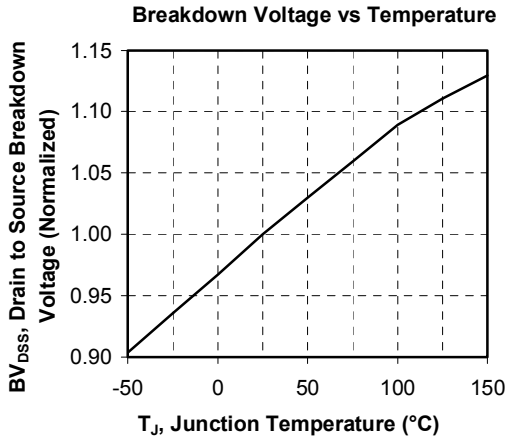
| Symbol | Characteristic | Min | Typ | Max | Unit | |
|------------|--|----------------|-----|-----|------------------|---------------------------|
| R_{thJC} | Junction to Case | Transistor | | | 0.22 | $^\circ\text{C}/\text{W}$ |
| | | Series diode | | | 0.65 | |
| | | Parallel diode | | | 0.45 | |
| 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 | |

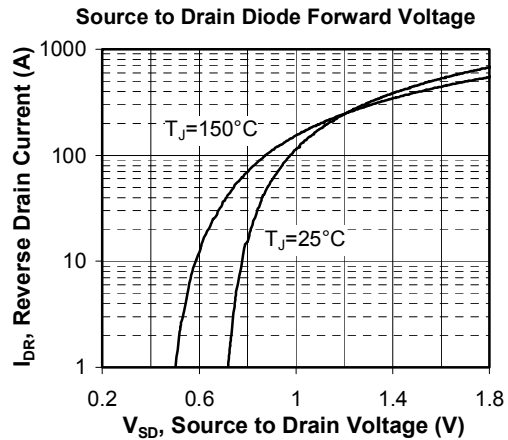
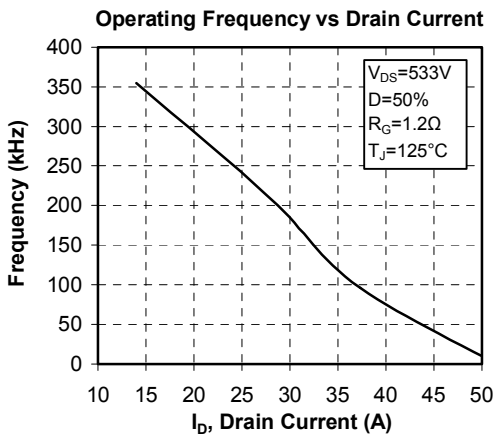
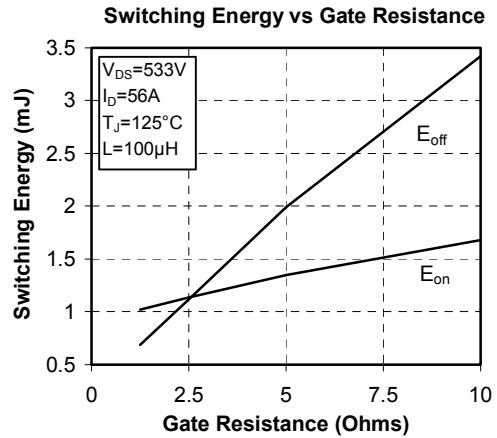
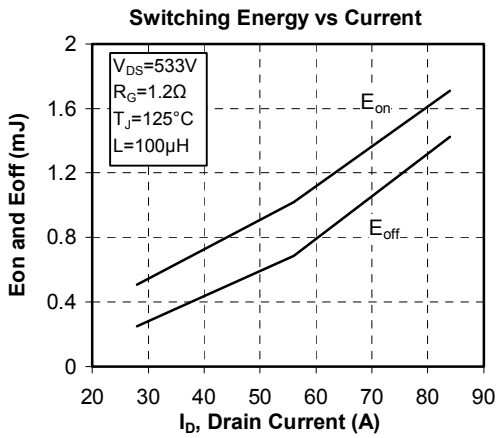
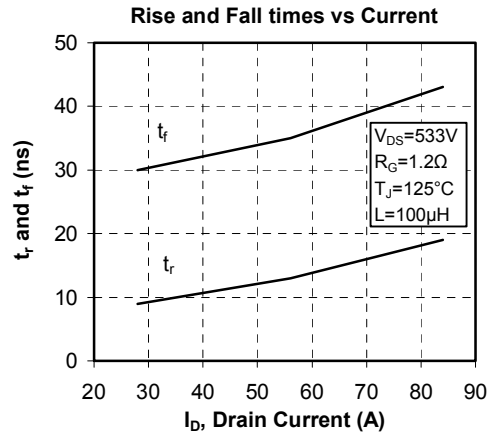
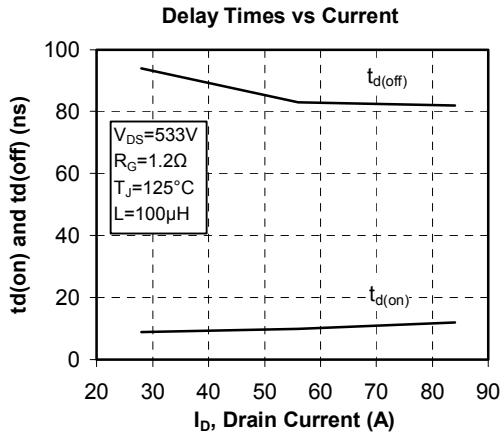
Package outline



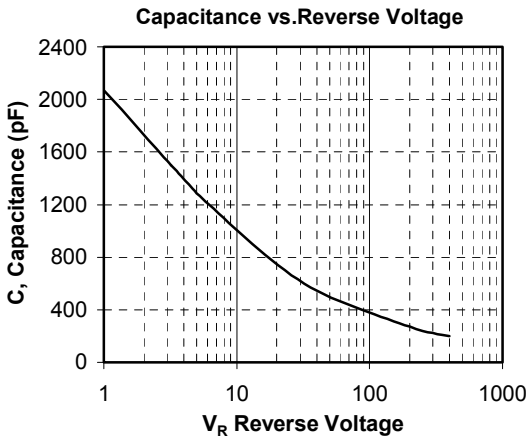
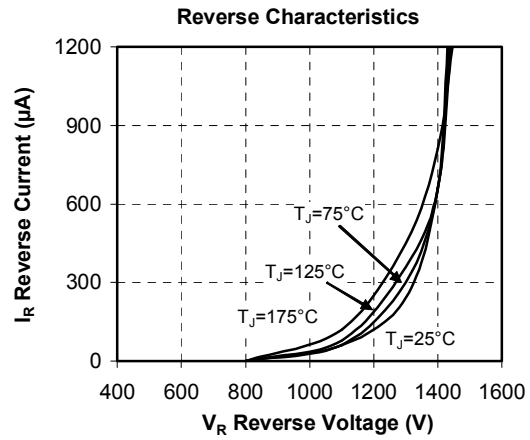
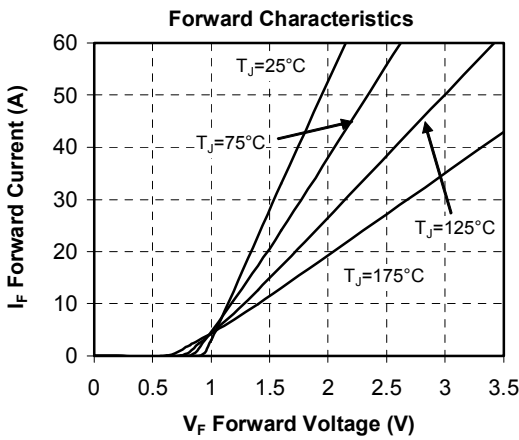
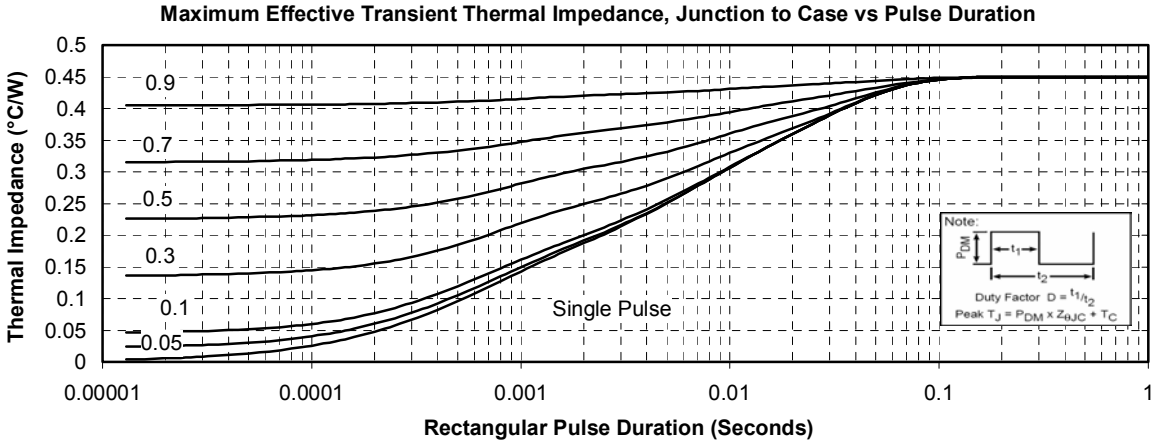
Typical CoolMOS Performance Curve







Typical SiC Diode Performance Curve



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