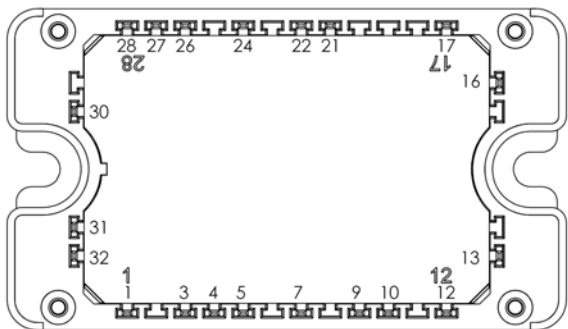
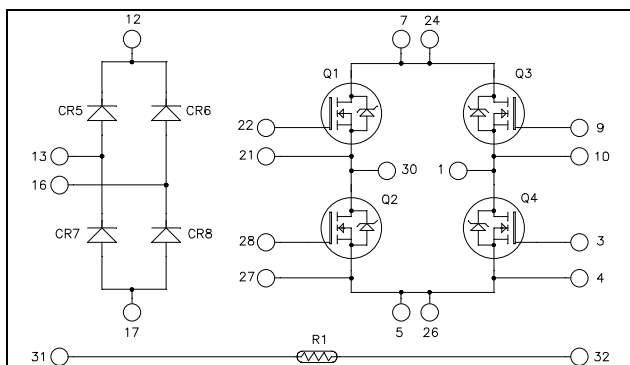


## Full bridge + rectifier bridge CoolMOS Power module



All multiple inputs and outputs must be shorted together  
7/24 ; 5/26

### CoolMOS™ :

$V_{DSS} = 600V$

$R_{DSon} = 70m\Omega \text{ max @ } T_j = 25^\circ C$

### Application

- Solar converter

### Features

- **CoolMOS™**
  - Ultra low  $R_{DSon}$
  - Low Miller capacitance
  - Ultra low gate charge
  - Avalanche energy rated

- Very low stray inductance
- Kelvin source for easy drive
- Internal thermistor for temperature monitoring
- High level of integration

### Benefits

- Optimized conduction & switching losses
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- Easy paralleling due to positive  $T_C$  of  $V_{CEsat}$
- RoHS Compliant

**All ratings @  $T_j = 25^\circ C$  unless otherwise specified**

### 1. Full bridge

#### Absolute maximum ratings (Per CoolMOS™)

| Symbol     | Parameter                                         | Max ratings        | Unit       |
|------------|---------------------------------------------------|--------------------|------------|
| $V_{DSS}$  | Drain - Source Breakdown Voltage                  | 600                | V          |
| $I_D$      | Continuous Drain Current                          | $T_c = 25^\circ C$ | A          |
|            |                                                   | $T_c = 80^\circ C$ |            |
| $I_{DM}$   | Pulsed Drain current                              | 160                |            |
| $V_{GS}$   | Gate - Source Voltage                             | $\pm 20$           | V          |
| $R_{DSon}$ | Drain - Source ON Resistance                      | 70                 | m $\Omega$ |
| $P_D$      | Maximum Power Dissipation                         | $T_c = 25^\circ C$ | W          |
| $I_{AR}$   | Avalanche current (repetitive and non repetitive) | 20                 | A          |
| $E_{AR}$   | Repetitive Avalanche Energy                       | 1                  | mJ         |
| $E_{AS}$   | Single Pulse Avalanche Energy                     | 1800               |            |



**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)

**Electrical Characteristics** (Per CoolMOST™)

| Symbol              | Characteristic                  | Test Conditions                                                      | Min | Typ | Max  | Unit |
|---------------------|---------------------------------|----------------------------------------------------------------------|-----|-----|------|------|
| I <sub>DSS</sub>    | Zero Gate Voltage Drain Current | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 600V, T <sub>j</sub> = 25°C  |     |     | 25   | μA   |
|                     |                                 | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 600V, T <sub>j</sub> = 125°C |     |     | 250  |      |
| R <sub>DS(on)</sub> | Drain – Source on Resistance    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 39A                          |     |     | 70   | mΩ   |
| V <sub>GS(th)</sub> | Gate Threshold Voltage          | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 2.7mA           | 2.1 | 3   | 3.9  | V    |
| I <sub>GSS</sub>    | Gate – Source Leakage Current   | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0V                        |     |     | ±100 | nA   |

**Dynamic Characteristics** (Per CoolMOST™)

| Symbol              | Characteristic                      | Test Conditions                                                                                                                       | Min                    | Typ  | Max | Unit |
|---------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|-----|------|
| C <sub>iss</sub>    | Input Capacitance                   | V <sub>GS</sub> = 0V                                                                                                                  |                        | 7    |     | nF   |
| C <sub>oss</sub>    | Output Capacitance                  | V <sub>DS</sub> = 25V                                                                                                                 |                        | 2.56 |     |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance        | f = 1MHz                                                                                                                              |                        | 0.21 |     |      |
| Q <sub>g</sub>      | Total gate Charge                   | V <sub>GS</sub> = 10V                                                                                                                 |                        | 259  |     | nC   |
| Q <sub>gs</sub>     | Gate – Source Charge                | V <sub>Bus</sub> = 300V                                                                                                               |                        | 29   |     |      |
| Q <sub>gd</sub>     | Gate – Drain Charge                 | I <sub>D</sub> = 39A                                                                                                                  |                        | 111  |     |      |
| T <sub>d(on)</sub>  | Turn-on Delay Time                  | <b>Inductive Switching @ 125°C</b><br>V <sub>GS</sub> = 15V<br>V <sub>Bus</sub> = 400V<br>I <sub>D</sub> = 39A<br>R <sub>G</sub> = 5Ω |                        | 21   |     | ns   |
| T <sub>r</sub>      | Rise Time                           |                                                                                                                                       |                        | 30   |     |      |
| T <sub>d(off)</sub> | Turn-off Delay Time                 |                                                                                                                                       |                        | 283  |     |      |
| T <sub>f</sub>      | Fall Time                           |                                                                                                                                       |                        | 84   |     |      |
| E <sub>off</sub>    | Turn-off Switching Energy           | V <sub>GS</sub> = 15V<br>V <sub>Bus</sub> = 400V<br>I <sub>D</sub> = 39A<br>R <sub>G</sub> = 5Ω                                       | T <sub>j</sub> = 25°C  | 980  |     | μJ   |
| E <sub>off</sub>    | Turn-off Switching Energy           |                                                                                                                                       | T <sub>j</sub> = 125°C | 1206 |     |      |
| R <sub>thJC</sub>   | Junction to Case Thermal resistance |                                                                                                                                       |                        |      | 0.5 | °C/W |

**Source - Drain diode ratings and characteristics** (Per CoolMOST™)

| Symbol          | Characteristic                            | Test Conditions                                 | Min                   | Typ | Max | Unit |
|-----------------|-------------------------------------------|-------------------------------------------------|-----------------------|-----|-----|------|
| I <sub>S</sub>  | Continuous Source current<br>(Body diode) | T <sub>C</sub> = 25°C                           |                       | 39  |     | A    |
|                 |                                           | T <sub>C</sub> = 80°C                           |                       | 29  |     |      |
| V <sub>SD</sub> | Diode Forward Voltage                     | V <sub>GS</sub> = 0V, I <sub>S</sub> = - 39A    |                       |     | 1.2 | V    |
| dv/dt           | Peak Diode Recovery ❶                     |                                                 |                       |     | 6   | V/ns |
| t <sub>rr</sub> | Reverse Recovery Time                     | I <sub>S</sub> = - 39A<br>V <sub>R</sub> = 350V | T <sub>j</sub> = 25°C | 580 |     | ns   |
| Q <sub>rr</sub> | Reverse Recovery Charge                   | di <sub>S</sub> /dt = 100A/μs                   | T <sub>j</sub> = 25°C | 23  |     | μC   |

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

I<sub>S</sub> ≤ - 39A    di/dt ≤ 100A/μs    V<sub>R</sub> ≤ V<sub>DSS</sub>    T<sub>j</sub> ≤ 150°C

## 2. Rectifier bridge

**Absolute maximum ratings** (per diode)

| Symbol      | Parameter                               | Max ratings | Unit |
|-------------|-----------------------------------------|-------------|------|
| $V_R$       | Maximum DC reverse Voltage              | 600         | V    |
| $V_{RRM}$   | Maximum Peak Repetitive Reverse Voltage |             |      |
| $I_{F(AV)}$ | Maximum Average Forward Current         | 40          | A    |
| $I_{FSM}$   | Non-Repetitive Forward Surge Current    | 320         |      |

**Electrical Characteristics** (per diode)

| Symbol   | Characteristic                  | Test Conditions                 | Min                 | Typ | Max | Unit    |
|----------|---------------------------------|---------------------------------|---------------------|-----|-----|---------|
| $V_F$    | Diode Forward Voltage           | $I_F = 30A$                     |                     | 1.8 | 2.2 | V       |
|          |                                 | $I_F = 60A$                     |                     | 2.2 |     |         |
|          |                                 | $I_F = 30A$ $T_j = 125^\circ C$ |                     | 1.5 |     |         |
| $I_{RM}$ | Maximum Reverse Leakage Current | $V_R = 600V$                    | $T_j = 25^\circ C$  |     | 250 | $\mu A$ |
|          |                                 |                                 | $T_j = 125^\circ C$ |     | 500 |         |

**Dynamic Characteristics** (per diode)

| Symbol            | Characteristic                      | Test Conditions                                                   |                        | Min | Typ | Max | Unit |
|-------------------|-------------------------------------|-------------------------------------------------------------------|------------------------|-----|-----|-----|------|
| t <sub>rr</sub>   | Reverse Recovery Time               | I <sub>F</sub> =1A, V <sub>R</sub> =30V<br>di/dt = 100A/μs        | T <sub>j</sub> = 25°C  |     | 22  |     | ns   |
| t <sub>rr</sub>   | Reverse Recovery Time               | I <sub>F</sub> = 30A<br>V <sub>R</sub> = 400V<br>di/dt = 200A/μs  | T <sub>j</sub> = 25°C  |     | 25  |     | ns   |
|                   |                                     |                                                                   | T <sub>j</sub> = 125°C |     | 160 |     |      |
| Q <sub>rr</sub>   | Reverse Recovery Charge             |                                                                   | T <sub>j</sub> = 25°C  |     | 35  |     | nC   |
|                   |                                     |                                                                   | T <sub>j</sub> = 125°C |     | 480 |     |      |
| I <sub>RRM</sub>  | Reverse Recovery Current            |                                                                   | T <sub>j</sub> = 25°C  |     | 3   |     | A    |
|                   |                                     |                                                                   | T <sub>j</sub> = 125°C |     | 6   |     |      |
| t <sub>rr</sub>   | Reverse Recovery Time               | I <sub>F</sub> = 30A<br>V <sub>R</sub> = 400V<br>di/dt = 1000A/μs | T <sub>j</sub> = 125°C |     | 85  |     | ns   |
| Q <sub>rr</sub>   | Reverse Recovery Charge             |                                                                   |                        |     | 920 |     | μC   |
| I <sub>RRM</sub>  | Reverse Recovery Current            |                                                                   |                        |     | 20  |     | A    |
| R <sub>thJC</sub> | Junction to Case Thermal Resistance |                                                                   |                        |     |     | 1.2 | °C/W |

## 3. Thermal and package characteristics

**Temperature sensor NTC** (see application note APT0406 on www.microsemi.com for more information).

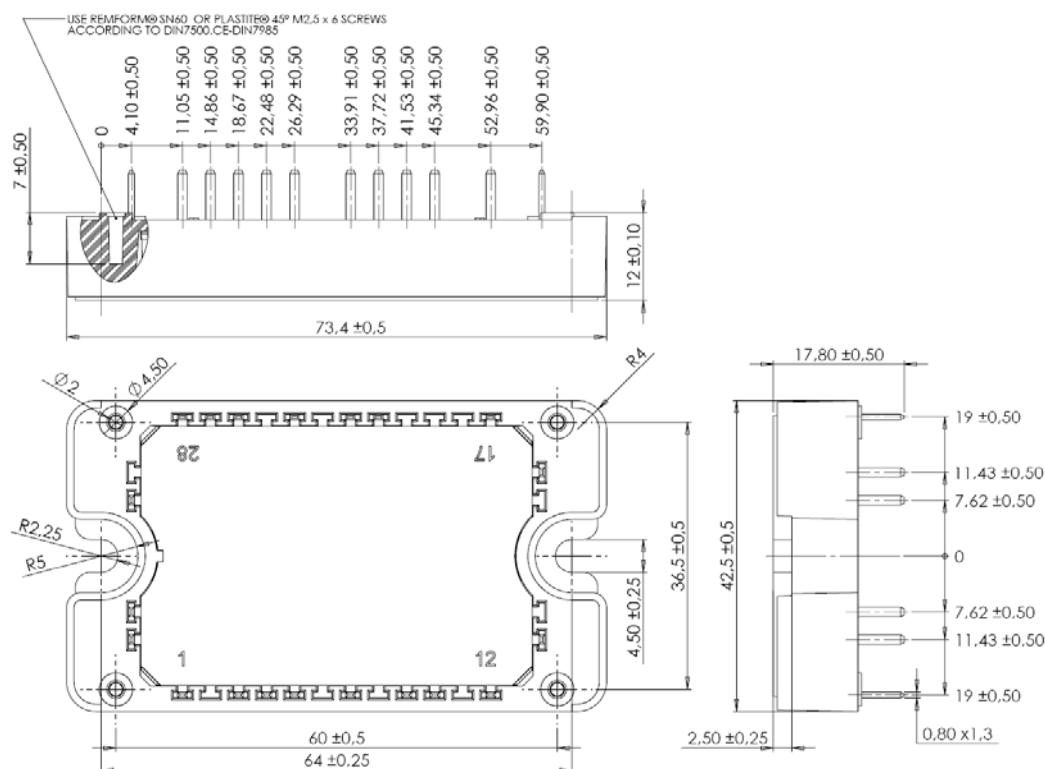
| Symbol                 | Characteristic      | Min | Typ  | Max | Unit       |
|------------------------|---------------------|-----|------|-----|------------|
| $R_{25}$               | Resistance @ 25°C   |     | 50   |     | k $\Omega$ |
| $\Delta R_{25}/R_{25}$ |                     |     | 5    |     | %          |
| $B_{25/85}$            | $T_{25} = 298.15 K$ |     | 3952 |     | K          |
| $\Delta B/B$           |                     |     | 4    |     | %          |

$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

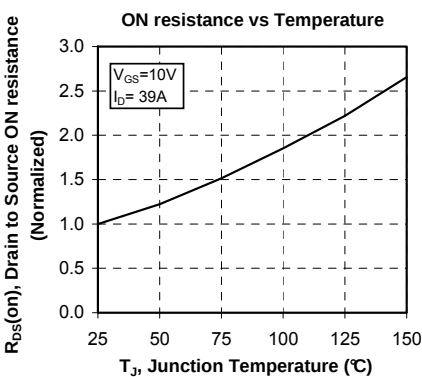
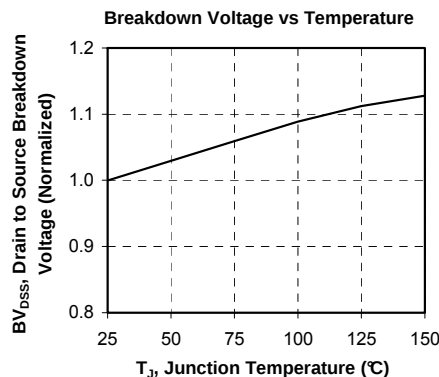
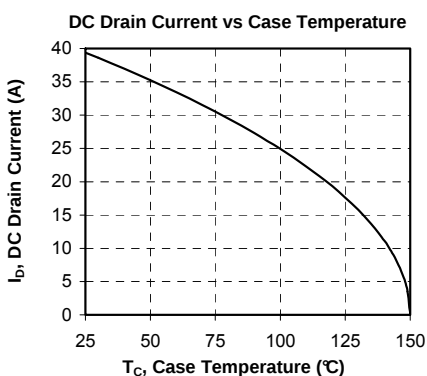
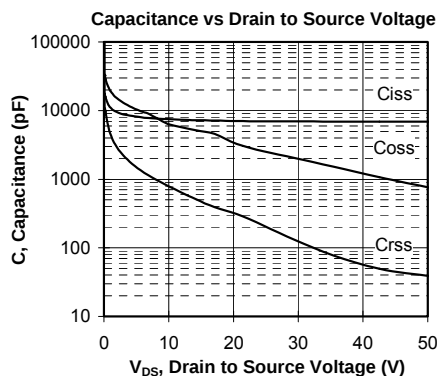
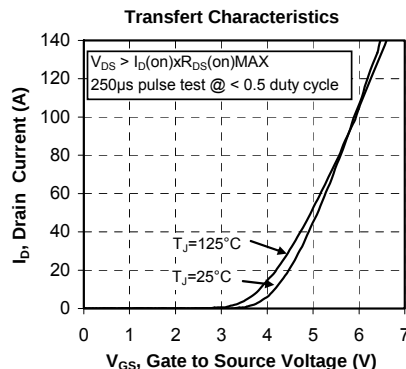
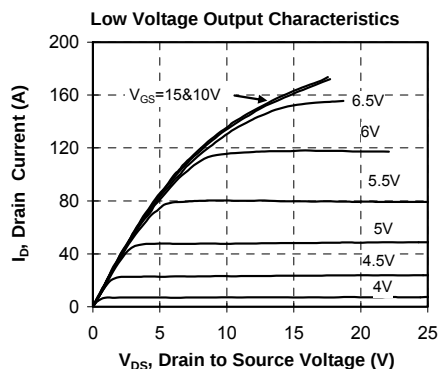
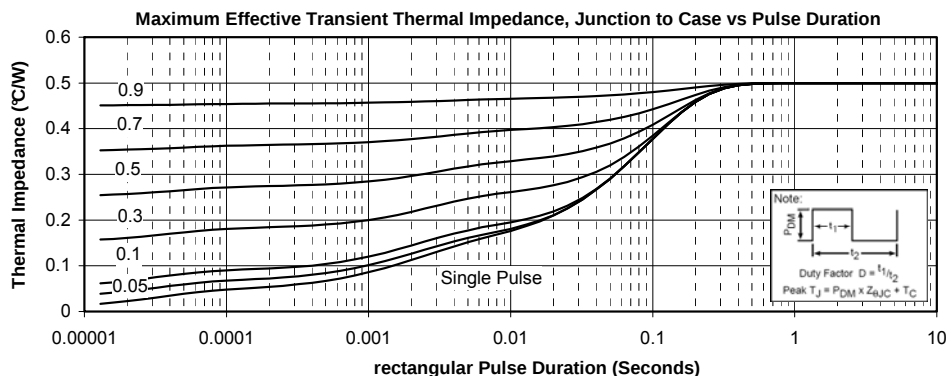
T: Thermistor temperature  
 $R_T$ : Thermistor value at T

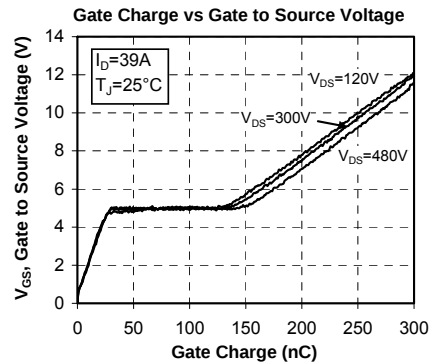
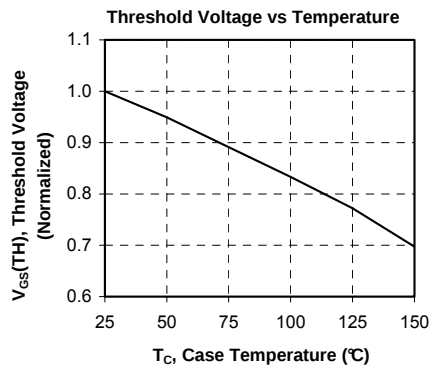
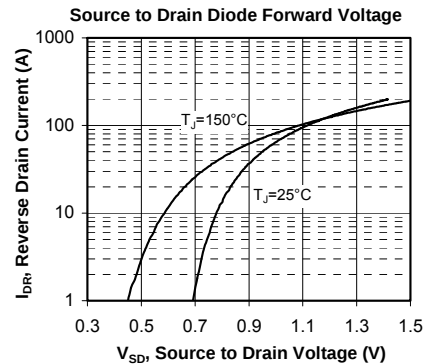
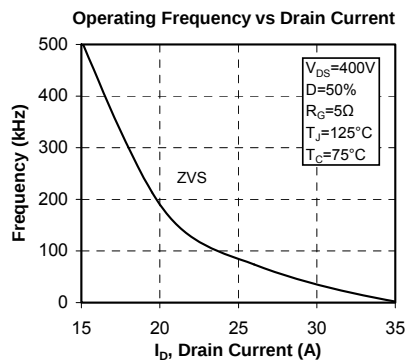
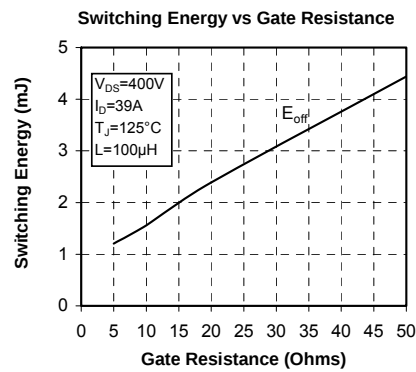
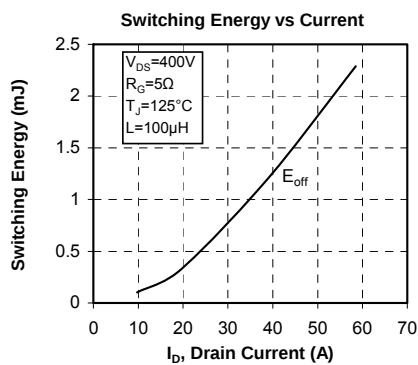
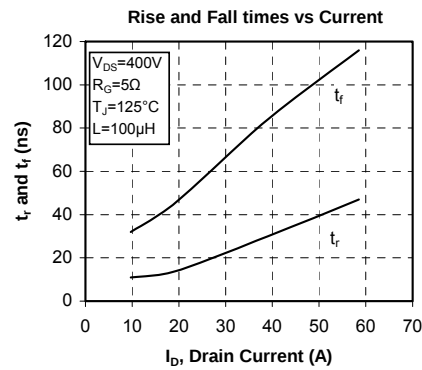
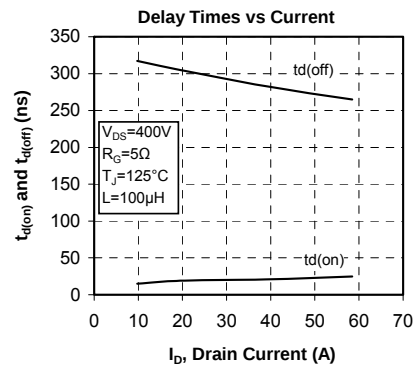
**Package characteristics**

| Symbol            | Characteristic                                                           |             |    | Min  | Typ | Max | Unit |
|-------------------|--------------------------------------------------------------------------|-------------|----|------|-----|-----|------|
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t=1 min, I isol<1mA, 50/60Hz |             |    | 4000 |     |     | V    |
| T <sub>J</sub>    | Operating junction temperature range                                     |             |    | -40  |     | 150 | °C   |
| T <sub>STG</sub>  | Storage Temperature Range                                                |             |    | -40  |     | 125 |      |
| T <sub>C</sub>    | Operating Case Temperature                                               |             |    | -40  |     | 100 |      |
| Torque            | Mounting torque                                                          | To heatsink | M4 | 2.5  |     | 4.7 | N.m  |
| Wt                | Package Weight                                                           |             |    |      |     | 110 | g    |

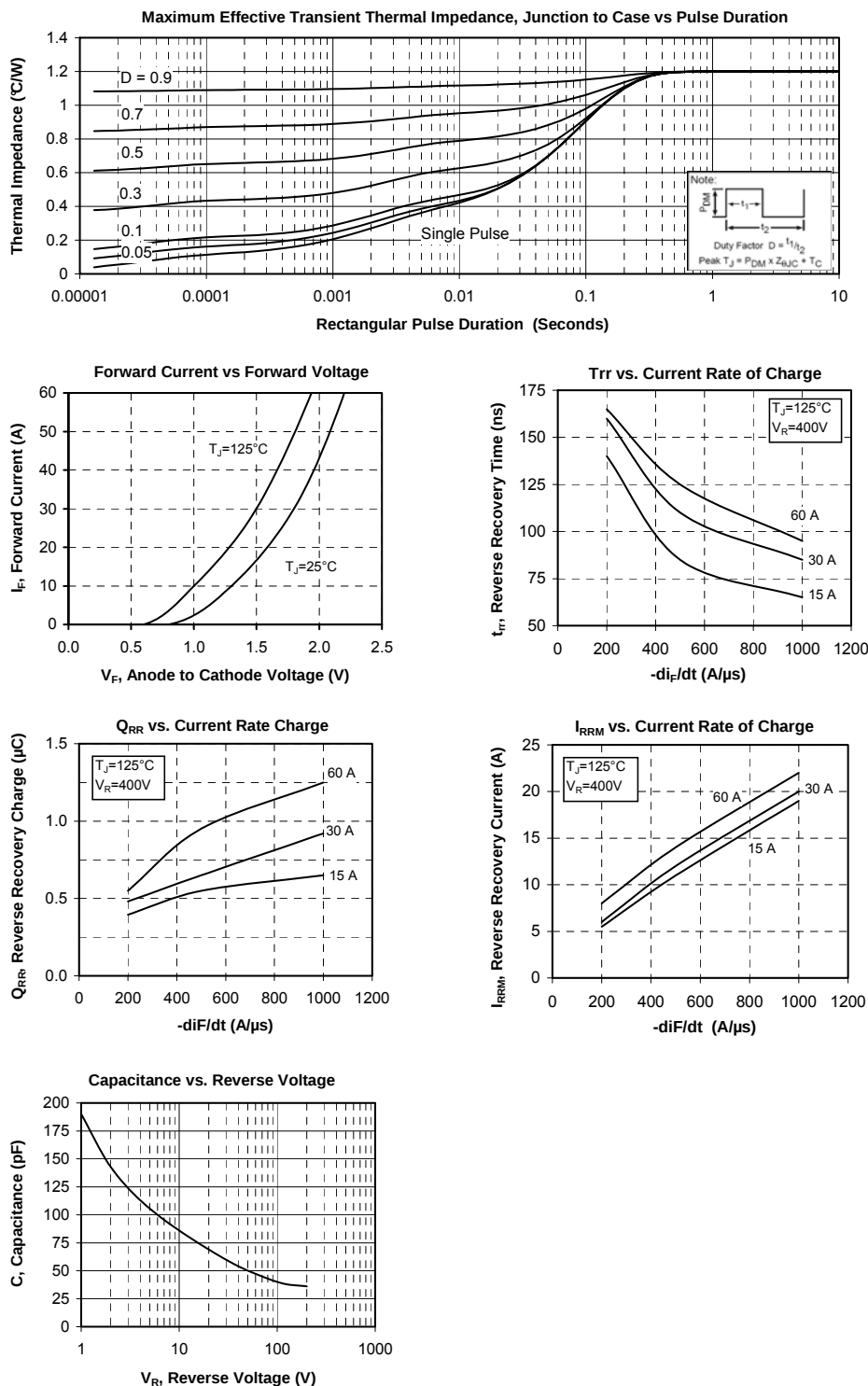
**4. SP3F Package outline (dimensions in mm)**


## 5. Full bridge switches curves (Per CoolMOS™)





## 6. Typical rectifier bridge Performance Curve (per diode)



“COOLMOS™” comprise a new family of transistors developed by Infineon Technologies AG. “COOLMOS” is a trademark of Infineon Technologies AG”.

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