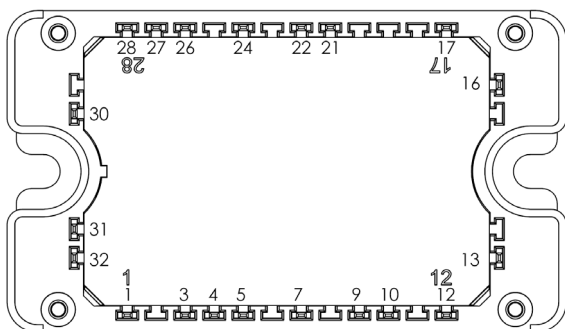
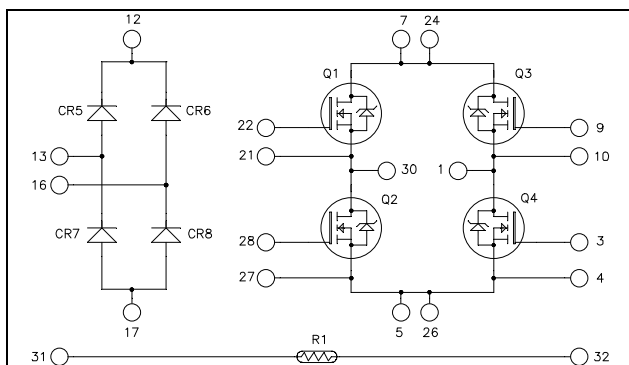


## Full bridge + rectifier bridge CoolMOS Power module



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

### CoolMOSTM :

$V_{DSS} = 600V$

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

### Application

- Solar converter

### Features

- CoolMOSTM**
  - 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 CoolMOSTM)

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	600	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$ 39 $T_c = 80^\circ C$ 29	A
$I_{DM}$	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	$T_c = 25^\circ C$ 250	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> V <sub>GS</sub> = 15V V <sub>Bus</sub> = 400V I <sub>D</sub> = 39A 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 V <sub>Bus</sub> = 400V I <sub>D</sub> = 39A	T <sub>j</sub> = 25°C	980		μJ
E <sub>off</sub>	Turn-off Switching Energy	R <sub>G</sub> = 5Ω	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 (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 V <sub>R</sub> = 350V	T <sub>j</sub> = 25°C	580		ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/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 di/dt = 100A/μs	T <sub>j</sub> = 25°C		22		ns
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 30A V <sub>R</sub> = 400V 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 V <sub>R</sub> = 400V 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](http://www.microsemi.com) for more information).

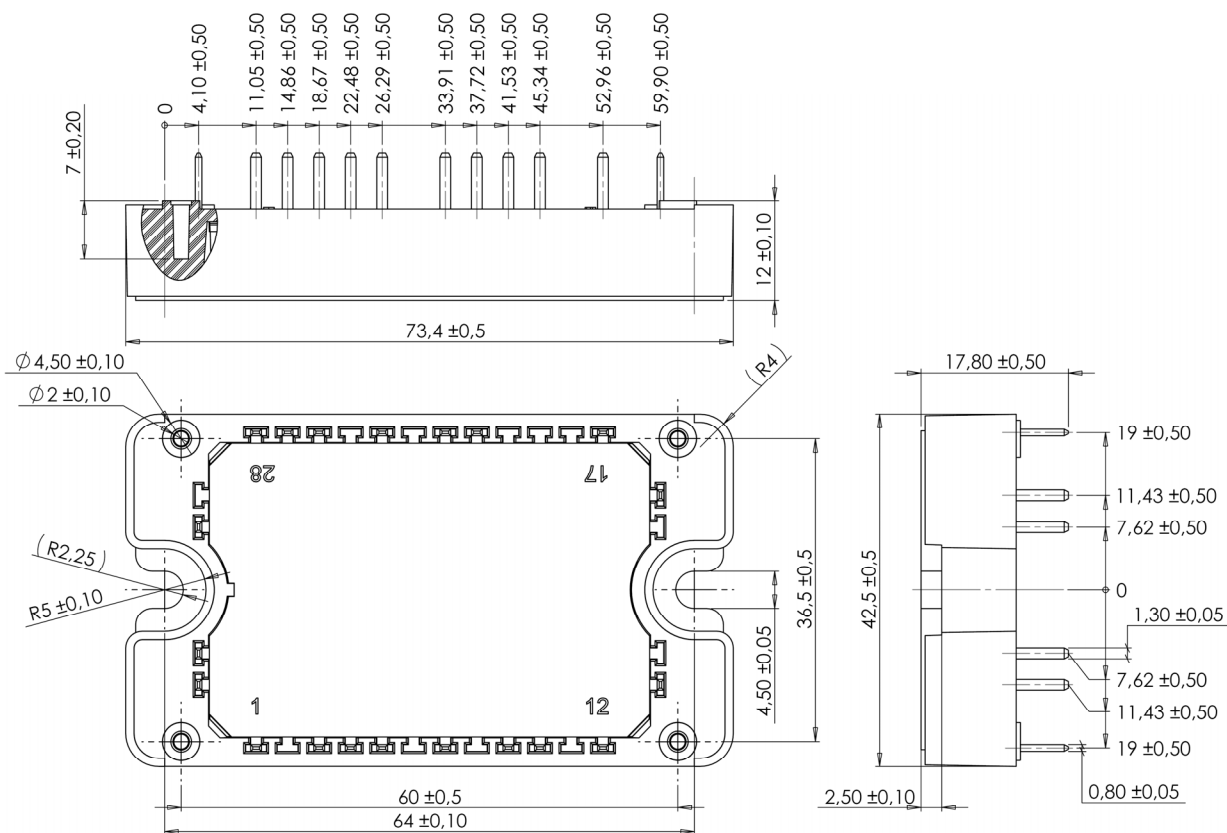
Symbol	Characteristic	Min	Typ	Max	Unit
$R_{25}$	Resistance @ 25°C		50		k $\Omega$
$\Delta R_{25}/R_{25}$			5		%
$B_{25/85}$	$T_{25} = 298.15 K$		3952		K
$\Delta B/B$			4		%

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

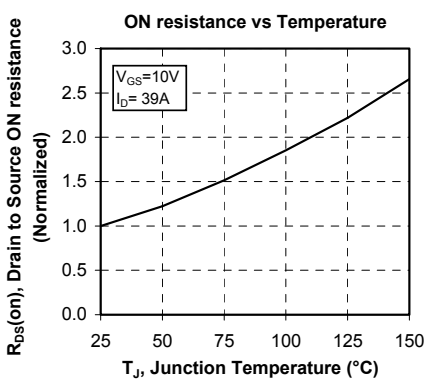
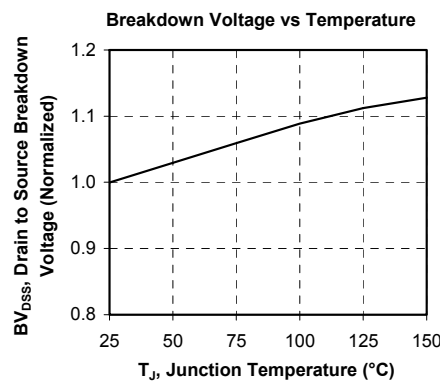
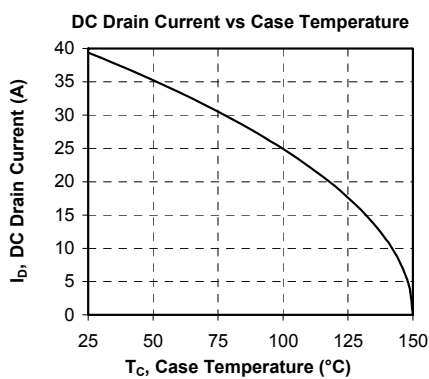
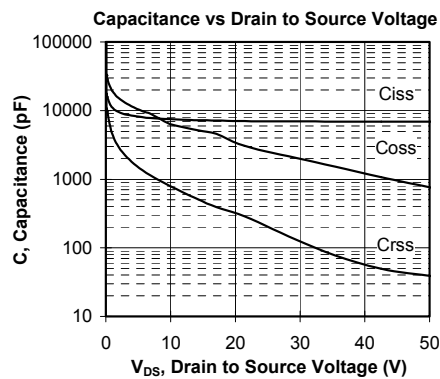
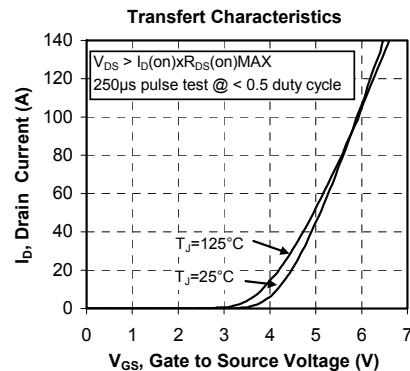
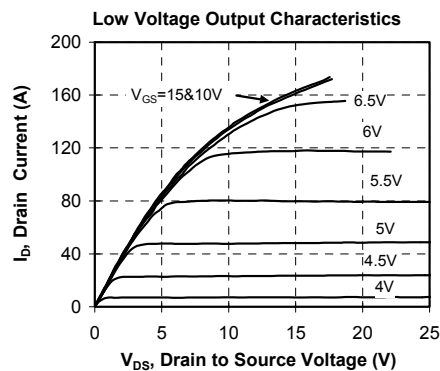
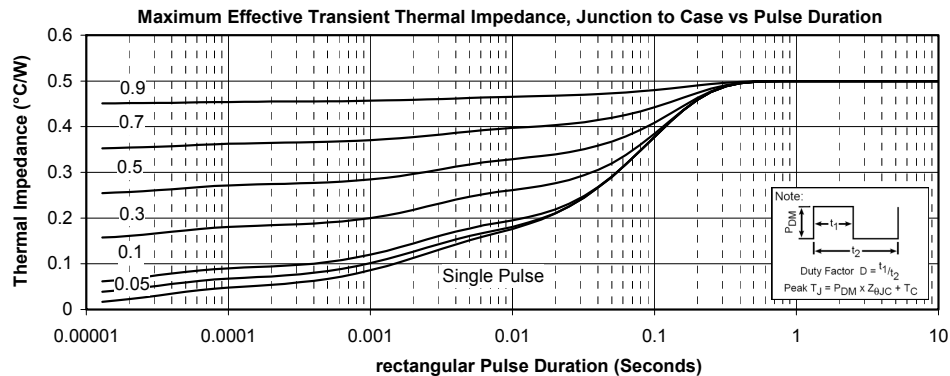
T: Thermistor temperature  
 $R_T$ : Thermistor value at T

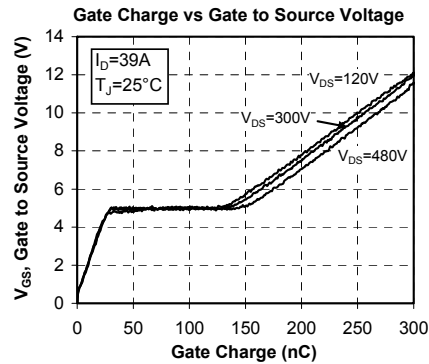
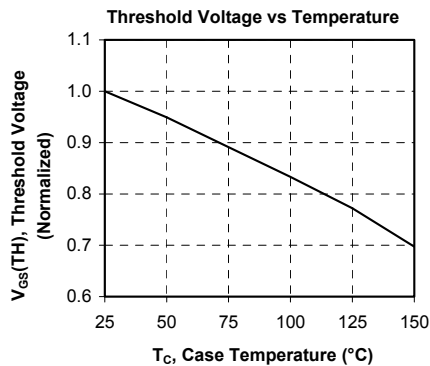
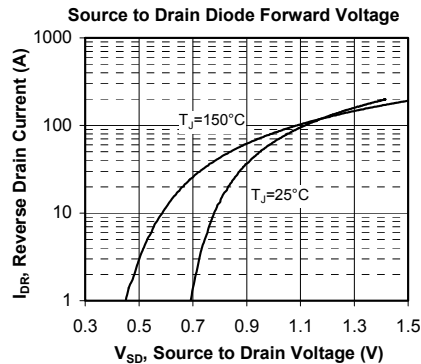
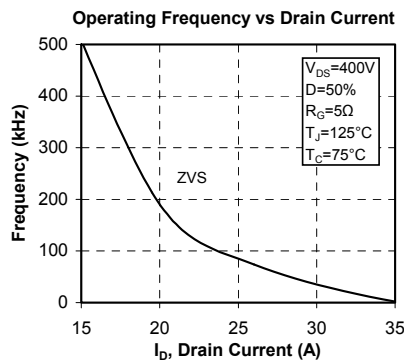
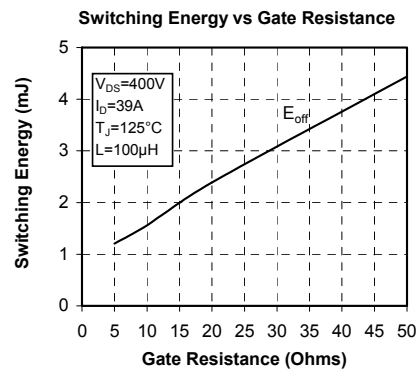
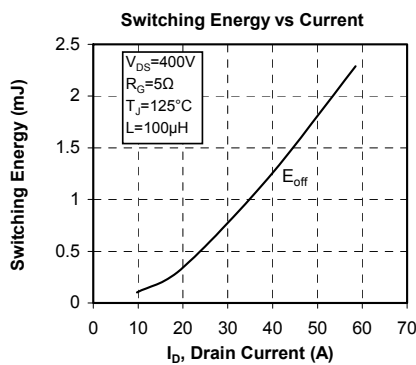
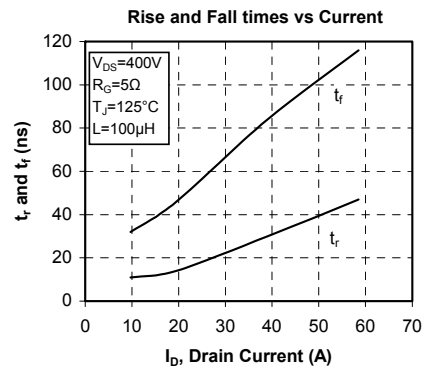
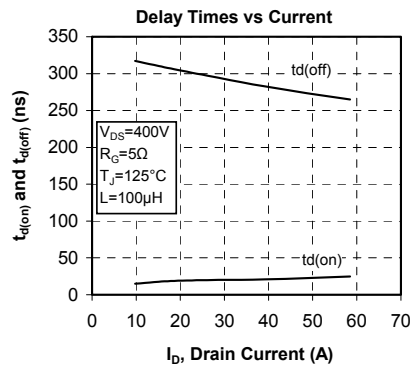
**Package characteristics**

Symbol	Characteristic			Min	Typ	Max	Unit
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 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		3	N.m
Wt	Package Weight					110	g

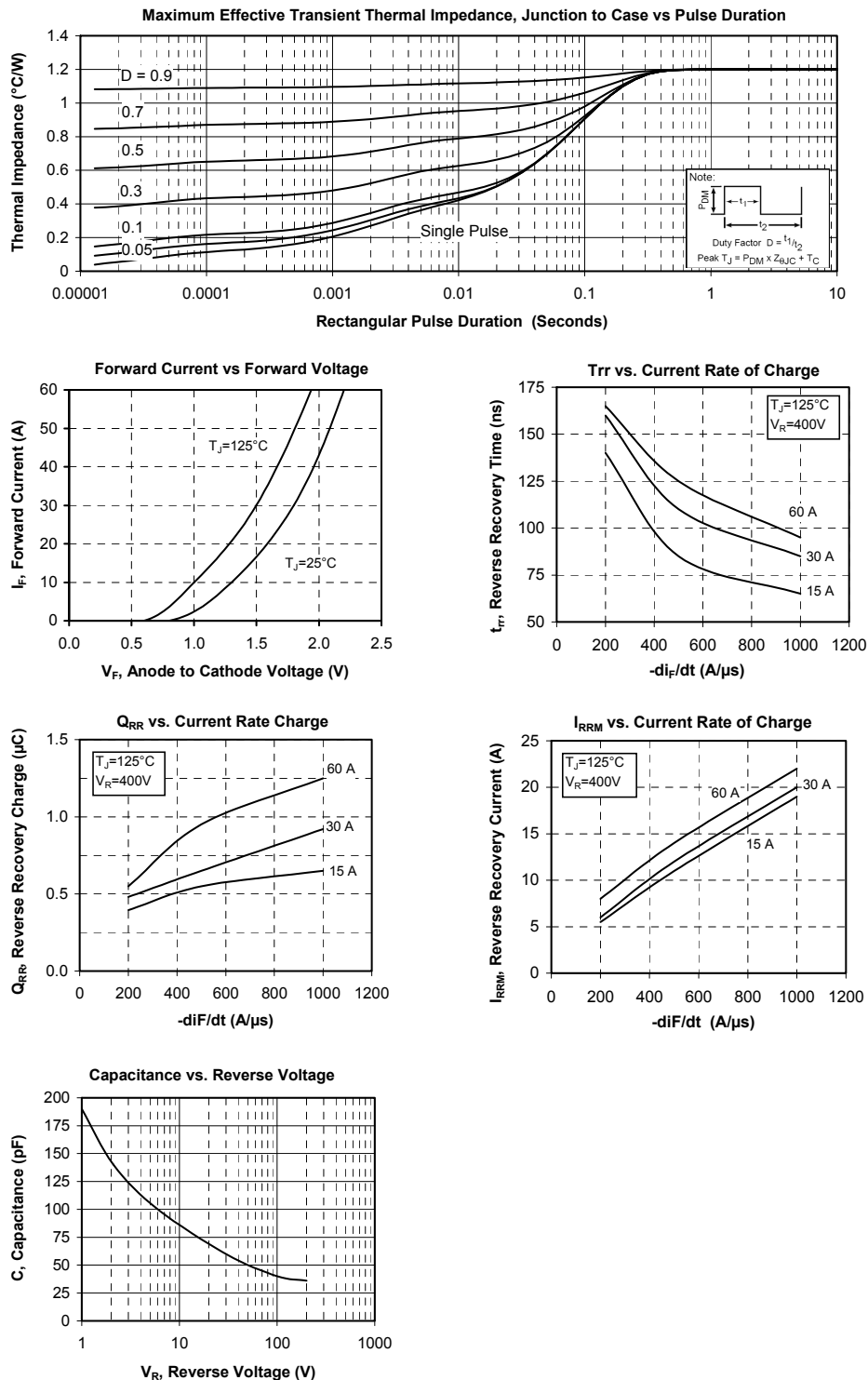
**4. SP3F Package outline (dimensions in mm)**


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





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



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