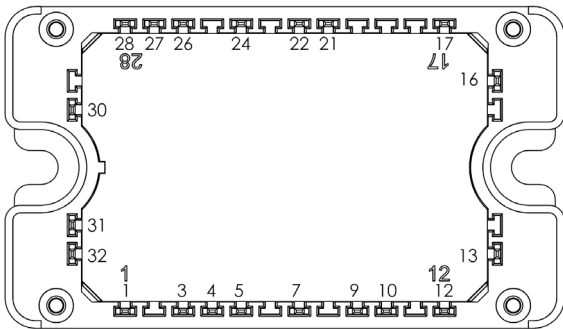
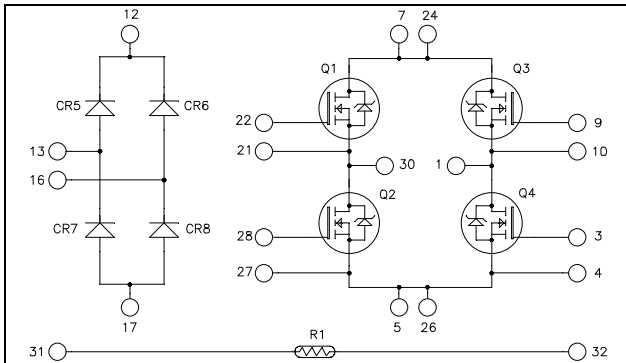


## Full bridge + rectifier bridge CoolMOS Power module

### CoolMOS™ :

$V_{DSS} = 600V$

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



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

### 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	$T_c = 25^\circ C$	39
		$T_c = 80^\circ C$	29
$I_{DM}$	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
$I_{AR}$	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			25	μA
		T <sub>j</sub> = 25°C				
		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 600V			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 V <sub>Bus</sub> = 300V I <sub>D</sub> = 39A		259		nC
Q <sub>gs</sub>	Gate – Source Charge			29		
Q <sub>gd</sub>	Gate – Drain Charge			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 R <sub>G</sub> = 5Ω		980		μJ
E <sub>off</sub>	Turn-off Switching Energy	T <sub>j</sub> = 25°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)			39		A
		T <sub>c</sub> = 25°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		580		ns
Q <sub>rr</sub>	Reverse Recovery Charge	di <sub>S</sub> /dt = 100A/μs		23		μC

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

$$I_S \leq - 39A \quad di/dt \leq 100A/\mu s \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ C$$

## 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		
		8.3ms	$T_C = 80^\circ\text{C}$
			$T_J = 45^\circ\text{C}$

**Electrical Characteristics** (per diode)

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

**Dynamic Characteristics** (per diode)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$t_{rr}$	Reverse Recovery Time	$I_F = 1\text{A}, V_R = 30\text{V}$ $di/dt = 100\text{A}/\mu\text{s}$	$T_J = 25^\circ\text{C}$		22	ns
$t_{rr}$	Reverse Recovery Time		$T_J = 25^\circ\text{C}$		25	ns
			$T_J = 125^\circ\text{C}$		160	
$Q_{rr}$	Reverse Recovery Charge	$I_F = 30\text{A}$ $V_R = 400\text{V}$ $di/dt = 200\text{A}/\mu\text{s}$	$T_J = 25^\circ\text{C}$		35	nC
			$T_J = 125^\circ\text{C}$		480	
$I_{RRM}$	Reverse Recovery Current		$T_J = 25^\circ\text{C}$		3	A
			$T_J = 125^\circ\text{C}$		6	
$t_{rr}$	Reverse Recovery Time	$I_F = 30\text{A}$ $V_R = 400\text{V}$ $di/dt = 1000\text{A}/\mu\text{s}$	$T_J = 125^\circ\text{C}$		85	ns
$Q_{rr}$	Reverse Recovery Charge				920	$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current				20	A
$R_{thJC}$	Junction to Case Thermal Resistance				1.2	$^\circ\text{C}/\text{W}$

## 3. Thermal and package characteristics

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

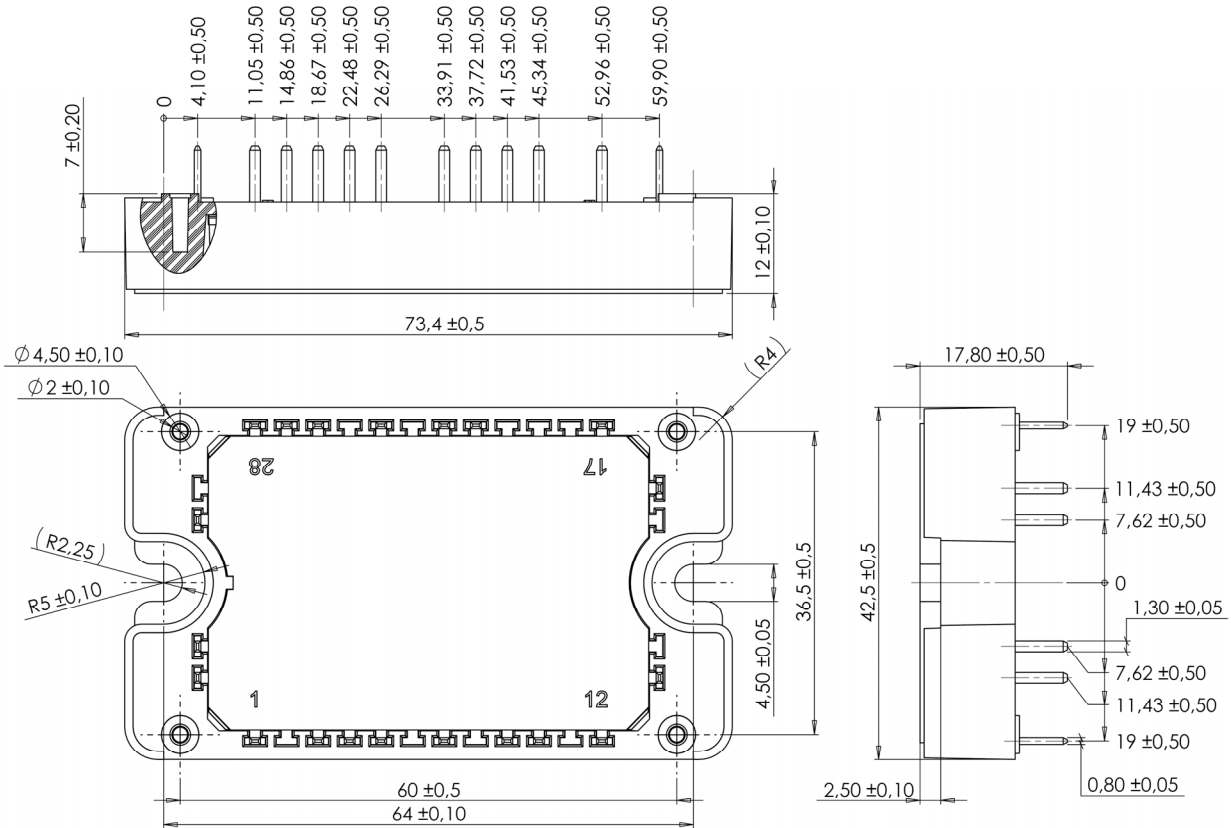
Symbol	Characteristic	Min	Typ	Max	Unit
$R_{25}$	Resistance @ 25°C		50		k $\Omega$
$\Delta R_{25}/R_{25}$			5		%
$B_{25/85}$	$T_{25} = 298.15\text{K}$		3952		K
$\Delta B/B$			4		%
					$T_C = 100^\circ\text{C}$

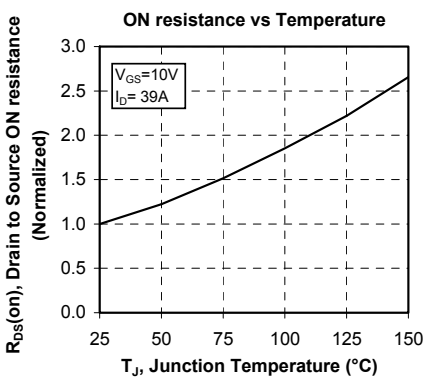
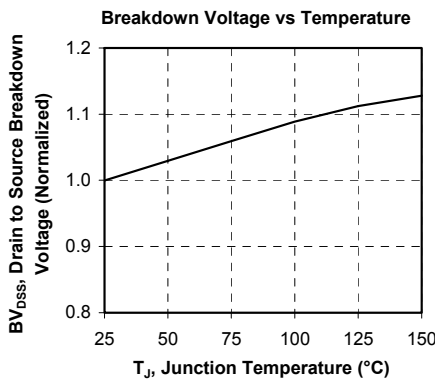
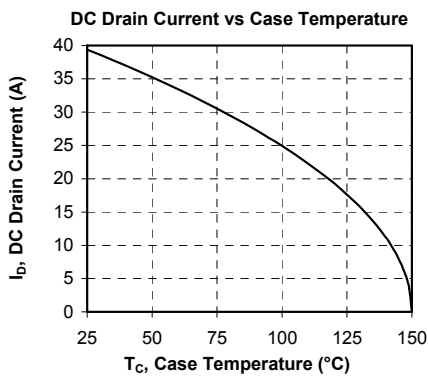
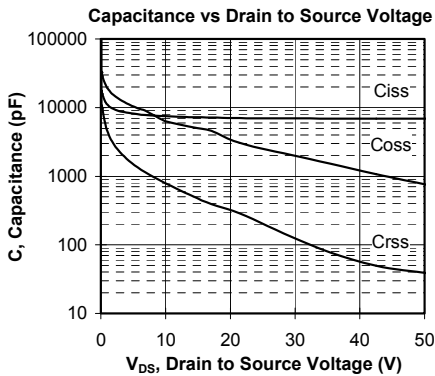
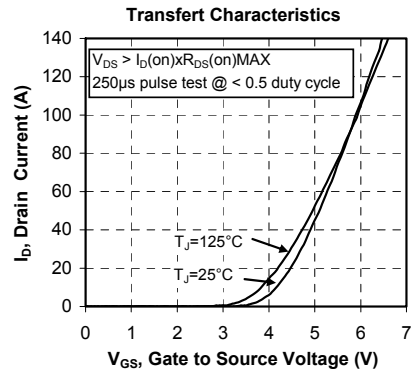
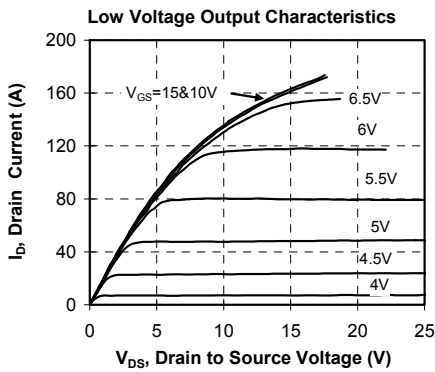
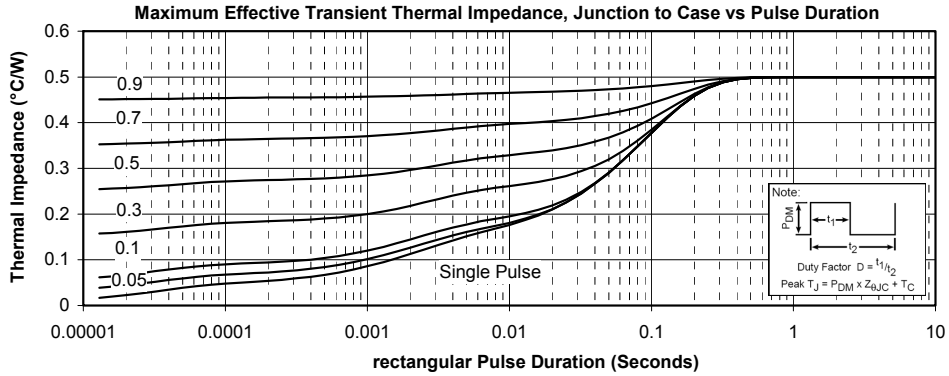
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

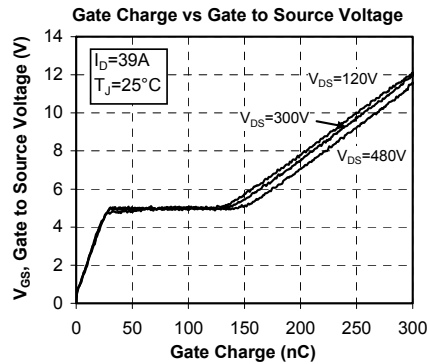
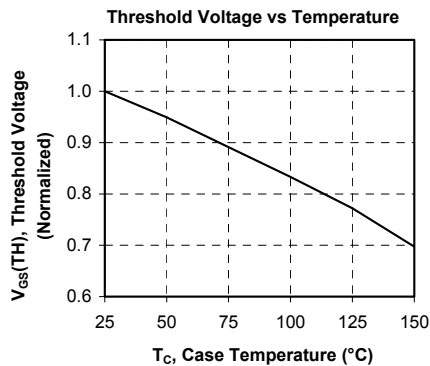
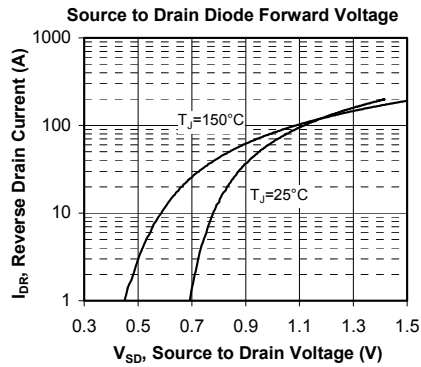
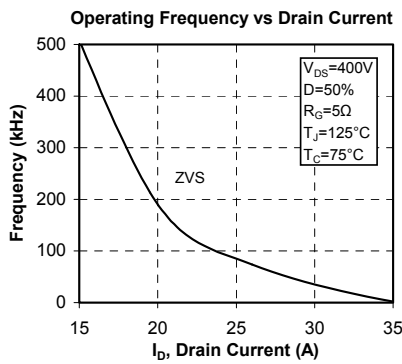
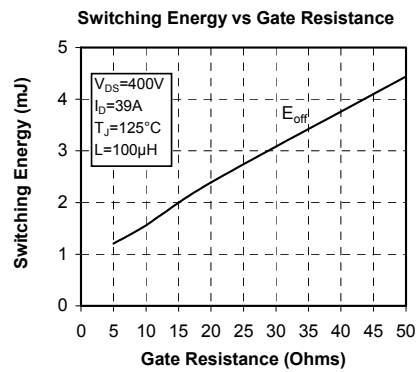
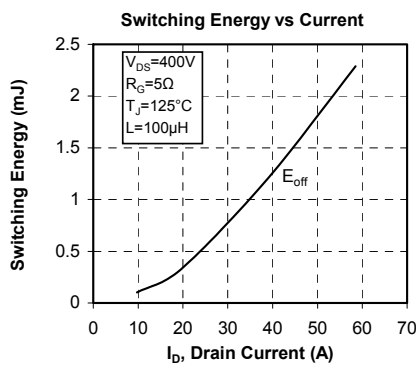
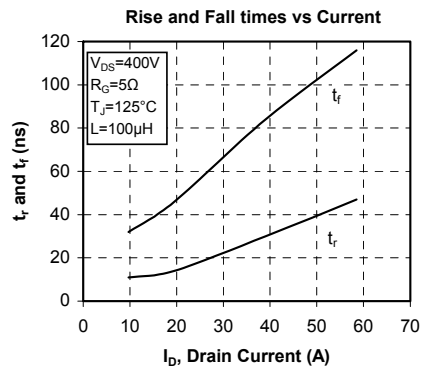
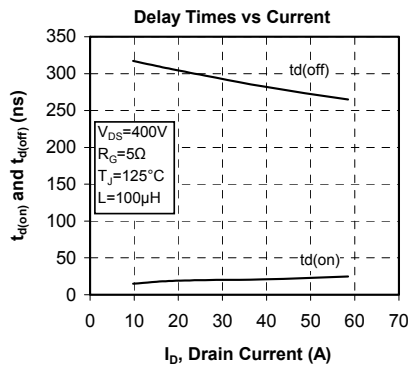
T: Thermistor temperature  
 $R_T$ : Thermistor value at T

**Package characteristics**

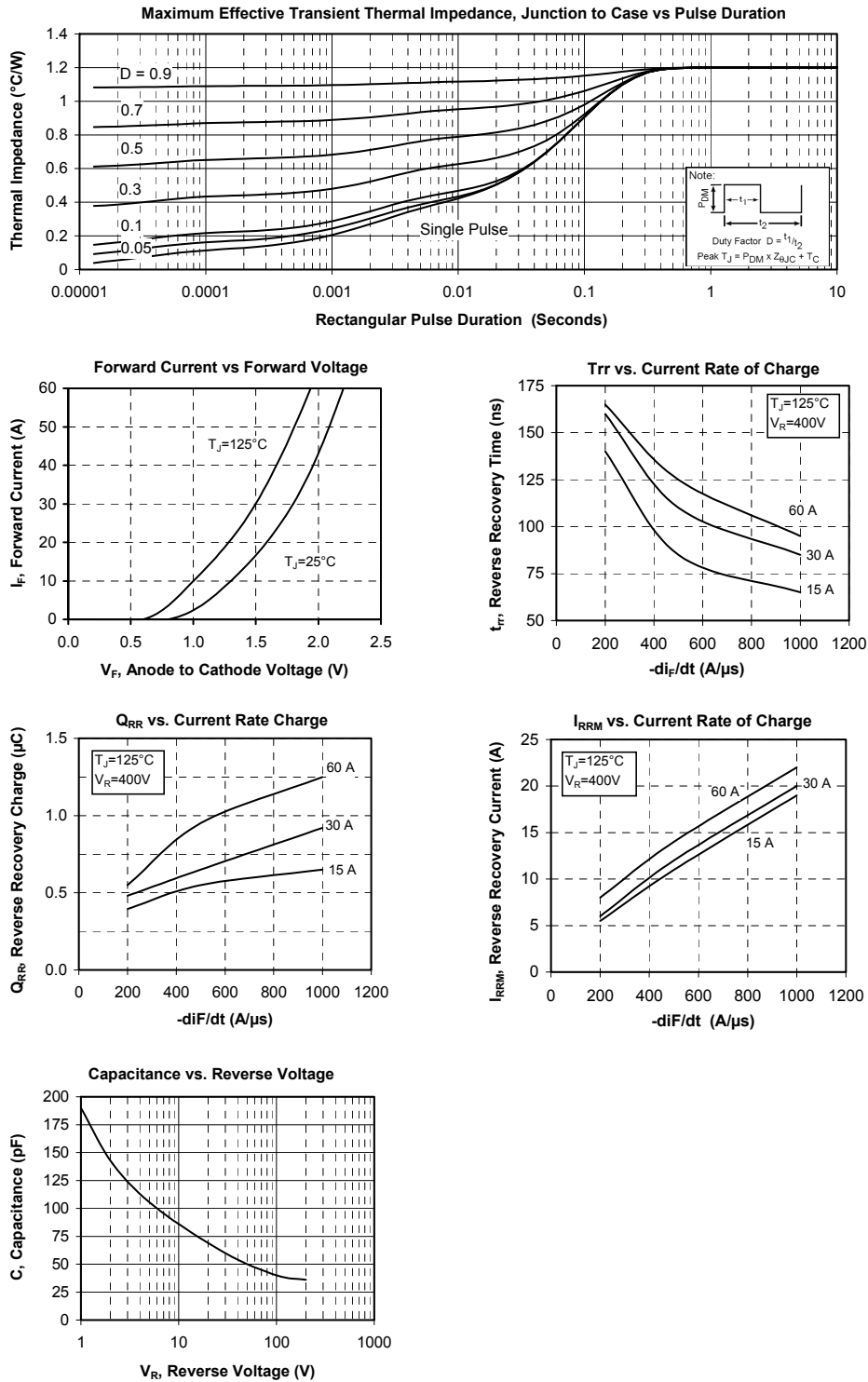
Symbol	Characteristic	Min	Typ	Max	Unit	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000			V	
T <sub>J</sub>	Operating junction temperature range	-40		150	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	Operating Case Temperature	-40		100		
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 CoolMOST™)**




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



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