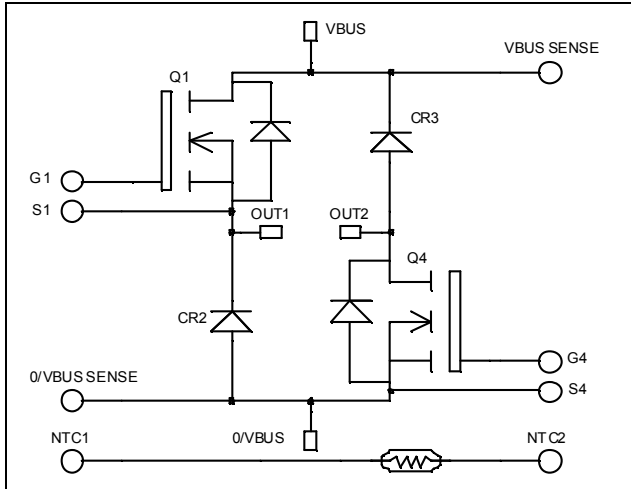


## Asymmetrical - Bridge MOSFET Power Module

$V_{DSS} = 500V$   
 $R_{DSon} = 75m\Omega$  typ @  $T_j = 25^\circ C$   
 $I_D = 46A$  @  $T_c = 25^\circ C$

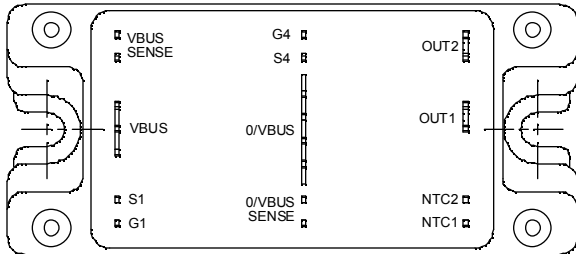


### Application

- Welding converters
- Switched Mode Power Supplies
- Switched Reluctance Motor Drives

### Features

- Power MOS 7<sup>®</sup> MOSFETs
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration




### Benefits

- Outstanding performance at high frequency operation
- 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
- RoHS Compliant

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	500	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	46
		$T_c = 80^\circ C$	34
$I_{DM}$	Pulsed Drain current	184	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	
$R_{DSon}$	Drain - Source ON Resistance	90	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	357
$I_{AR}$	Avalanche current (repetitive and non repetitive)	46	A
$E_{AR}$	Repetitive Avalanche Energy	50	$mJ$
$E_{AS}$	Single Pulse Avalanche Energy	2500	


**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)

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

**Electrical Characteristics**

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{V}, V_{DS} = 500\text{V}$	$T_j = 25^\circ\text{C}$			100	$\mu\text{A}$
		$V_{GS} = 0\text{V}, V_{DS} = 400\text{V}$	$T_j = 125^\circ\text{C}$			500	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 23\text{A}$			75	90	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 2.5\text{mA}$		3		5	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$				$\pm 100$	nA

**Dynamic Characteristics**

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}$			5600		pF
$C_{oss}$	Output Capacitance	$V_{DS} = 25\text{V}$			1200		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$			90		
$Q_g$	Total gate Charge	$V_{GS} = 10\text{V}$			123		nC
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 250\text{V}$			33		
$Q_{gd}$	Gate – Drain Charge	$I_D = 46\text{A}$			65		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b>			18		ns
$T_r$	Rise Time	$V_{GS} = 15\text{V}$			35		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 333\text{V}$			87		
$T_f$	Fall Time	$I_D = 46\text{A}$ $R_G = 5\Omega$			77		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b>			755		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy	$V_{GS} = 15\text{V}, V_{Bus} = 333\text{V}$ $I_D = 46\text{A}, R_G = 5\Omega$			726		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b>			1241		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy	$V_{GS} = 15\text{V}, V_{Bus} = 333\text{V}$ $I_D = 46\text{A}, R_G = 5\Omega$			846		

**Diode ratings and characteristics**

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage			600			V
$I_{RM}$	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	
$I_F$	DC Forward Current	$T_c = 70^\circ\text{C}$			60		A
$V_F$	Diode Forward Voltage	$I_F = 60\text{A}$			1.6	1.8	V
		$I_F = 120\text{A}$			1.9		
		$I_F = 60\text{A}$	$T_j = 125^\circ\text{C}$		1.4		
$t_{rr}$	Reverse Recovery Time	$I_F = 60\text{A}$ $V_R = 400\text{V}$	$T_j = 25^\circ\text{C}$		130		ns
			$T_j = 125^\circ\text{C}$		170		
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 200\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		220		nC
			$T_j = 125^\circ\text{C}$		920		

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	Transistor		0.35	°C/W	
		diode		0.9		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, I <sub>isol</sub> < 1mA, 50/60Hz	2500			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	M5	2.5	4.7	N.m
Wt	Package Weight				160	g

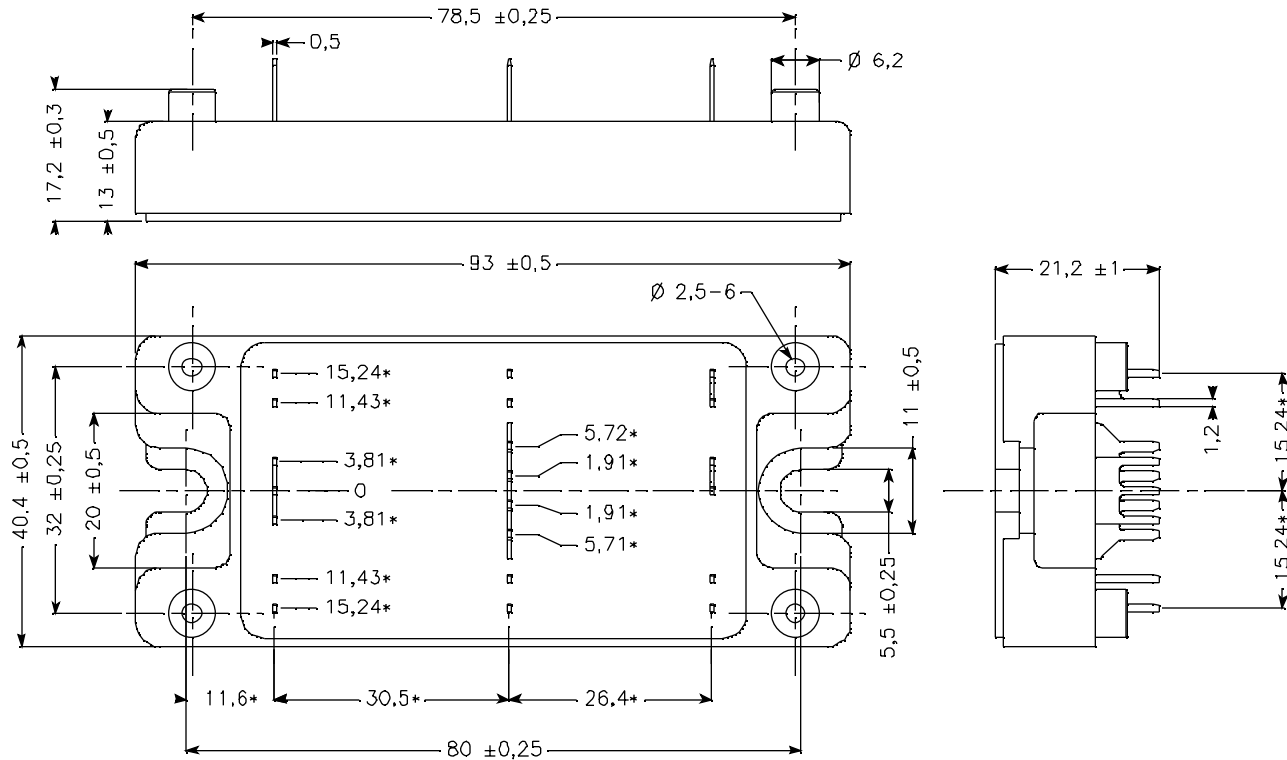
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K

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

T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

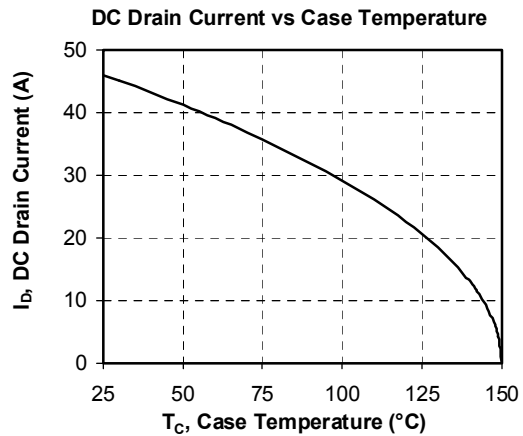
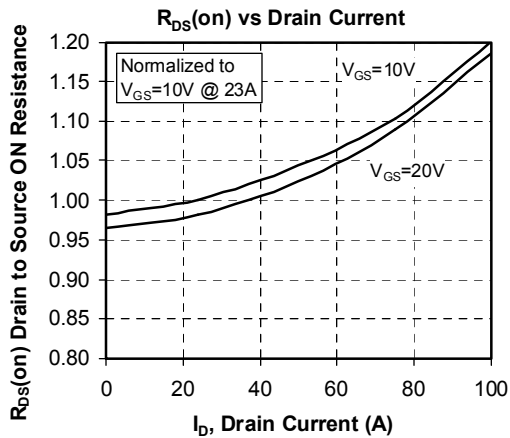
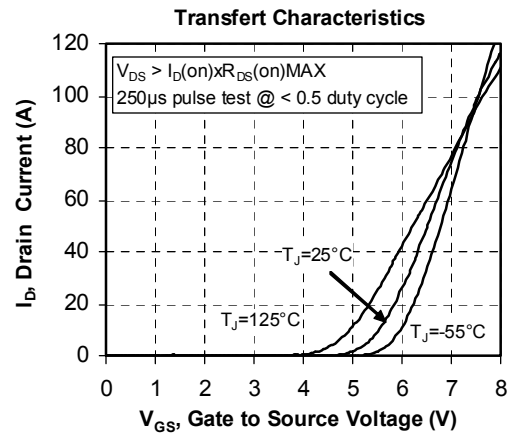
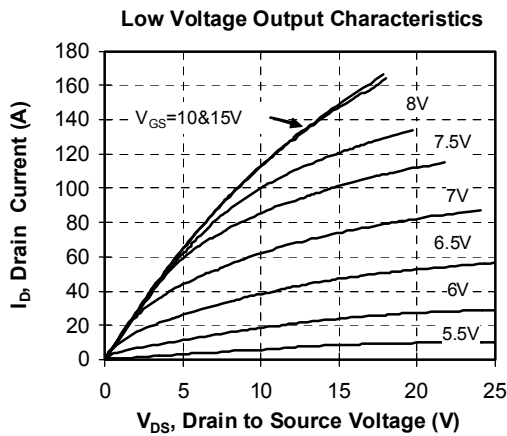
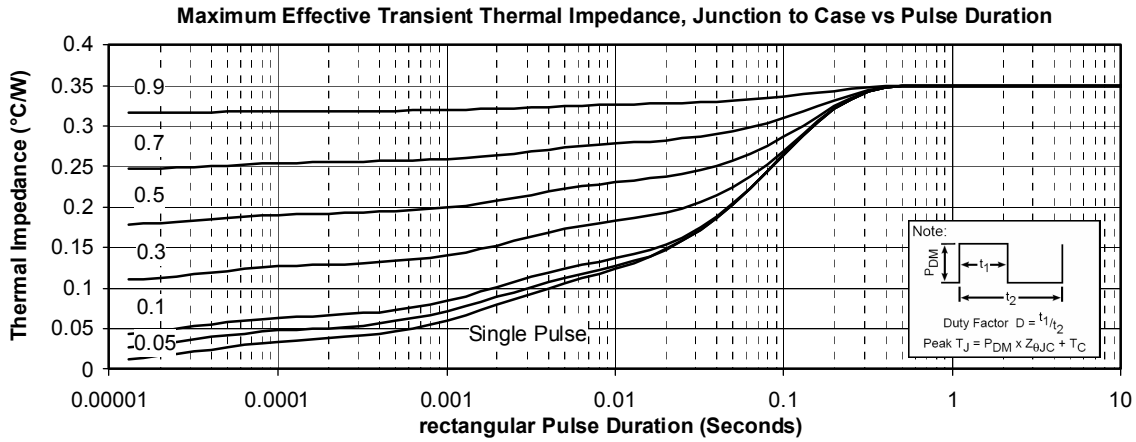
## SP4 Package outline (dimensions in mm)

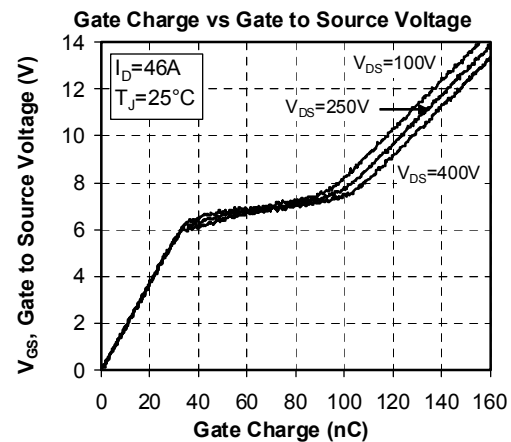
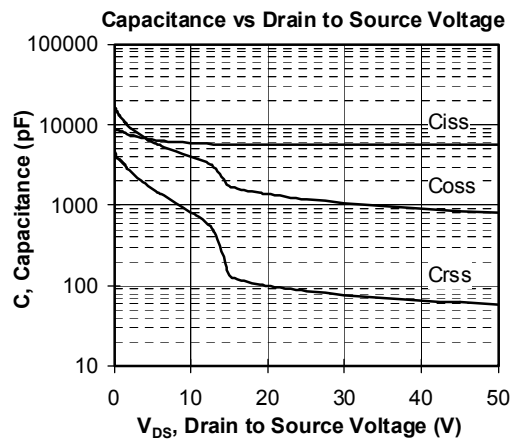
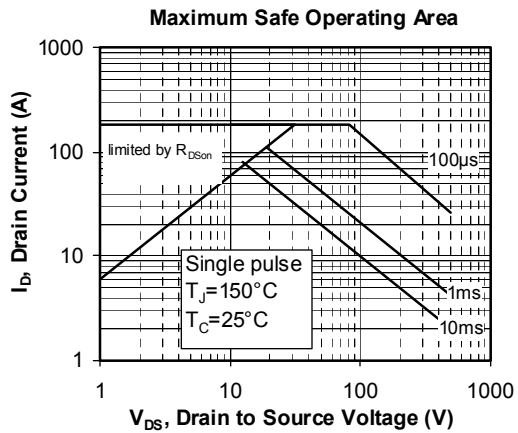
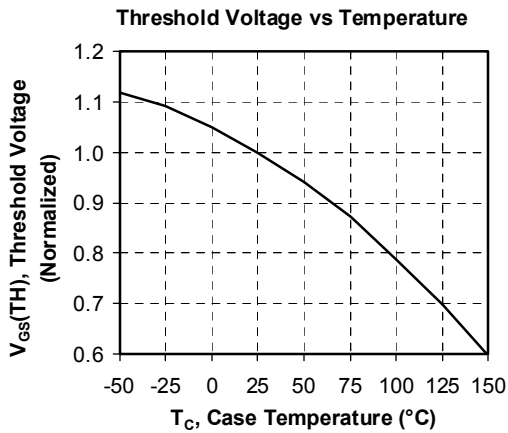
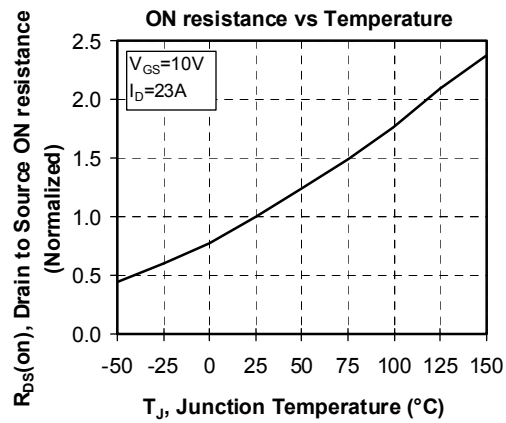
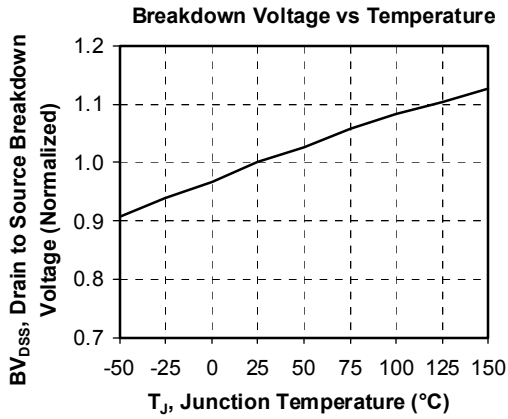


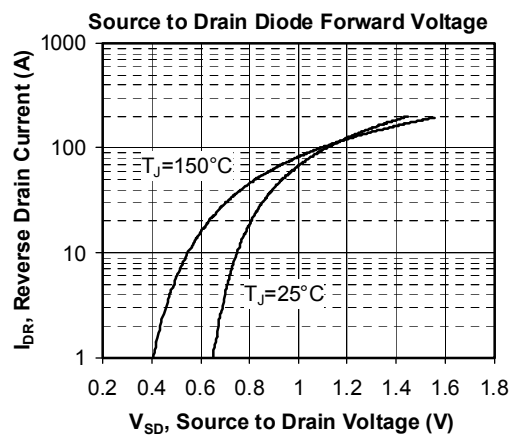
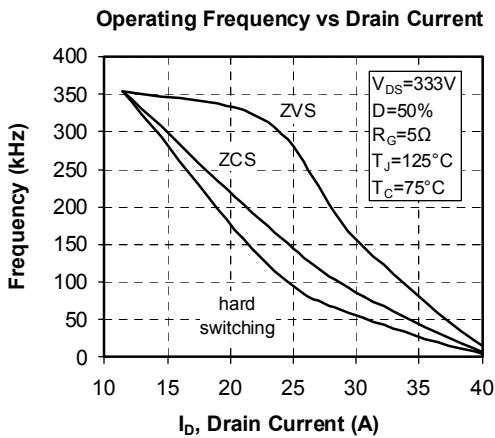
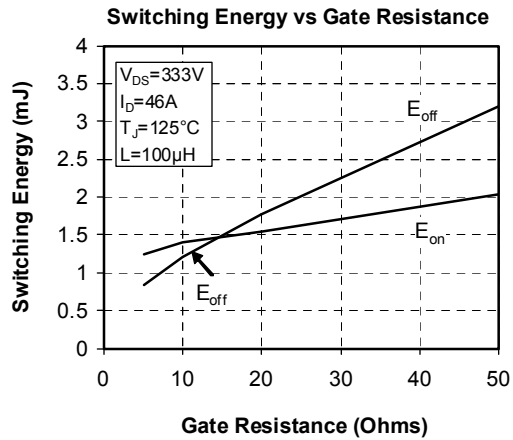
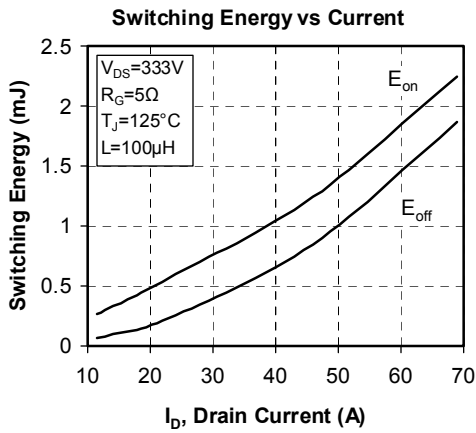
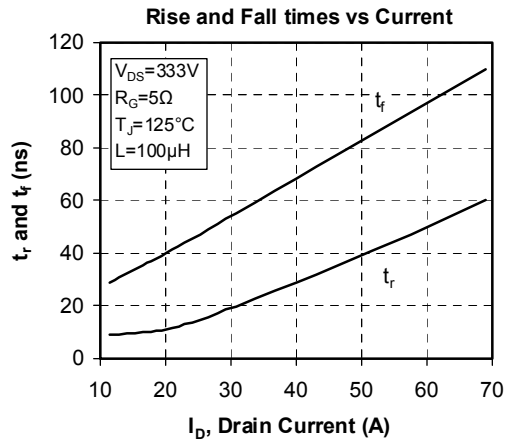
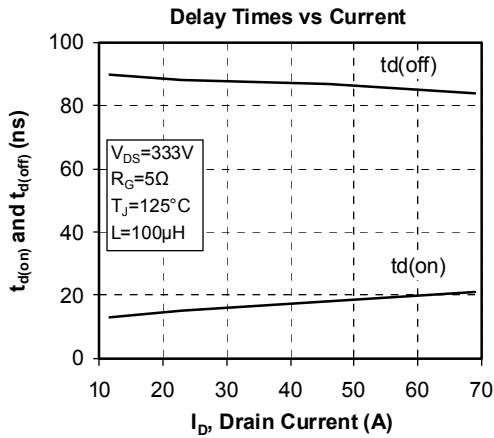
ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS:  $\oplus\ominus\varnothing 1$

See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

## Typical Performance Curve







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

Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.