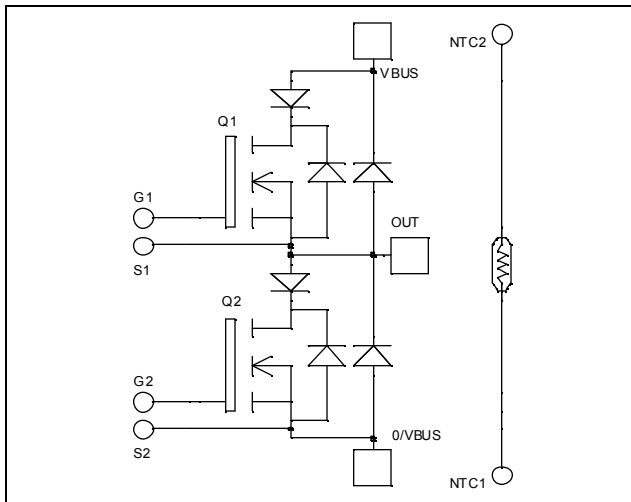


*Phase leg  
Series & parallel diodes  
MOSFET Power Module*

$$V_{DSS} = 1000V$$

$$R_{DSon} = 230m\Omega \text{ typ @ } T_j = 25^\circ C$$

$$I_D = 36A \text{ @ } T_c = 25^\circ C$$

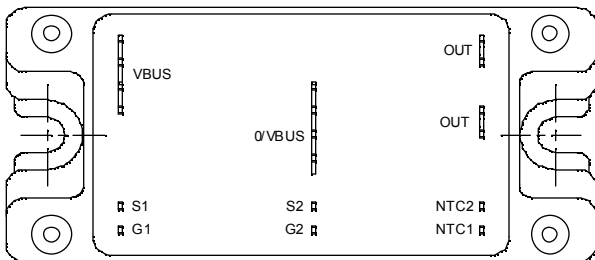


### Application

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

### 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	1000	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	36
		$T_c = 80^\circ C$	27
$I_{DM}$	Pulsed Drain current	144	
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	270	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	694
$I_{AR}$	Avalanche current (repetitive and non repetitive)	18	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**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 1000V$			200	$\mu\text{A}$
		$V_{GS} = 0V, V_{DS} = 800V$			1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 18A$		230	270	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 5\text{mA}$	3		5	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			$\pm 150$	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		8700		pF
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		1430		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		240		
$Q_g$	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 500V$ $I_D = 36A$		308		nC
$Q_{gs}$	Gate – Source Charge			52		
$Q_{gd}$	Gate – Drain Charge			194		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V$ $V_{Bus} = 667V$ $I_D = 36A$ $R_G = 2.5\Omega$		10		ns
$T_r$	Rise Time			12		
$T_{d(off)}$	Turn-off Delay Time			121		
$T_f$	Fall Time			35		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 667V$ $I_D = 36A, R_G = 2.5\Omega$		1278		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			760		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 667V$ $I_D = 36A, R_G = 2.5\Omega$		2092		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			902		

**Series diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		200			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 200V$	$T_j = 25^\circ\text{C}$		350	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		600	
$I_F$	DC Forward Current			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	$I_F = 60A$ $V_R = 133V$ $di/dt = 400A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	24		ns
			$T_j = 125^\circ\text{C}$	48		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 60A$ $V_R = 133V$ $di/dt = 400A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	66		nC
			$T_j = 125^\circ\text{C}$	300		

**Parallel diode ratings and characteristics**

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage			1000			V
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> =1000V	T <sub>j</sub> = 25°C			350	μA
			T <sub>j</sub> = 125°C			600	
I <sub>F</sub>	DC Forward Current	T <sub>c</sub> = 65°C			60		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 60A			1.9	2.3	V
		I <sub>F</sub> = 120A			2.2		
		I <sub>F</sub> = 60A	T <sub>j</sub> = 125°C		1.7		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 60A V <sub>R</sub> = 667V	T <sub>j</sub> = 25°C		290		ns
			T <sub>j</sub> = 125°C		390		
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt = 400A/μs	T <sub>j</sub> = 25°C		1340		nC
			T <sub>j</sub> = 125°C		4700		

**Thermal and package characteristics**

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	Transistor			0.18	°C/W
		Diode			0.65	
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

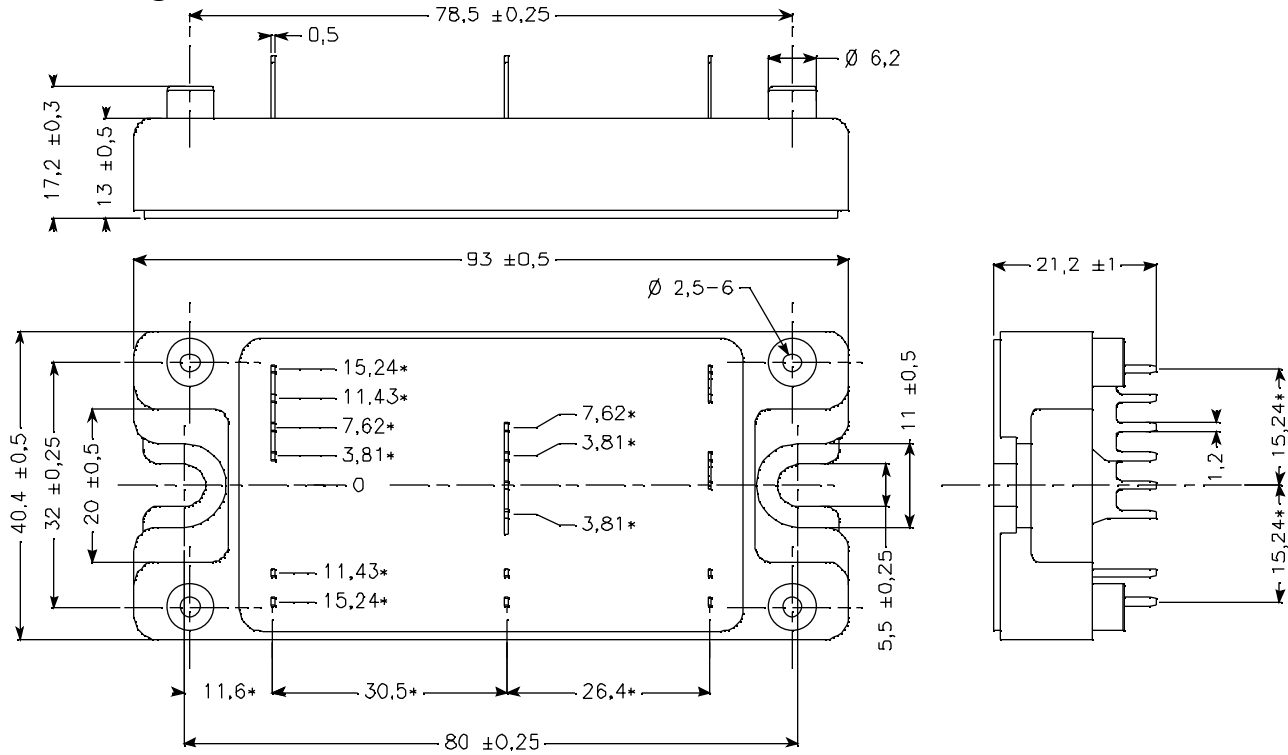
**Temperature sensor NTC** (see application note APT0406 on www.microsemi.com for more information).

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

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

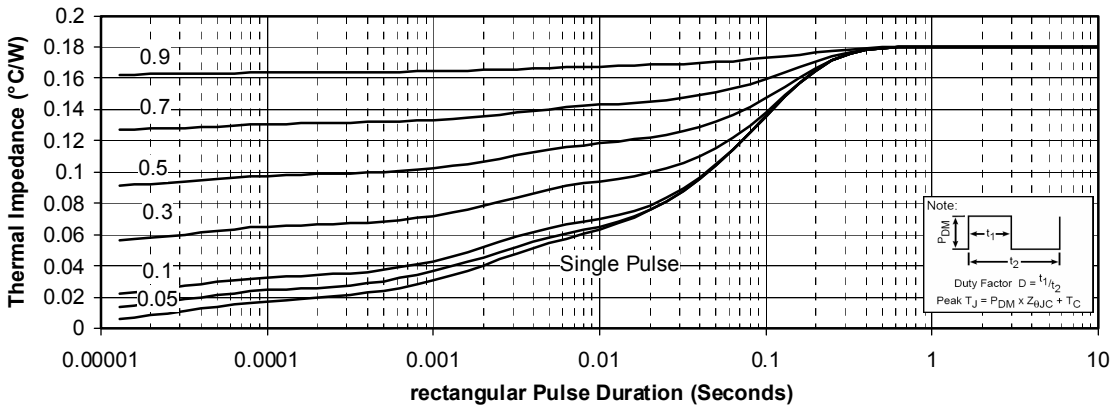
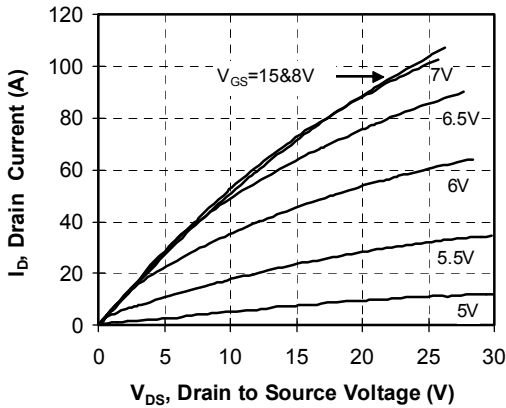
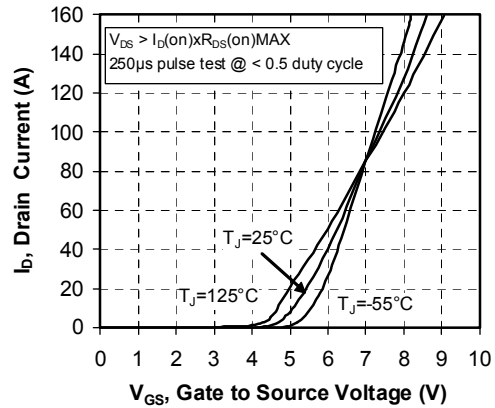
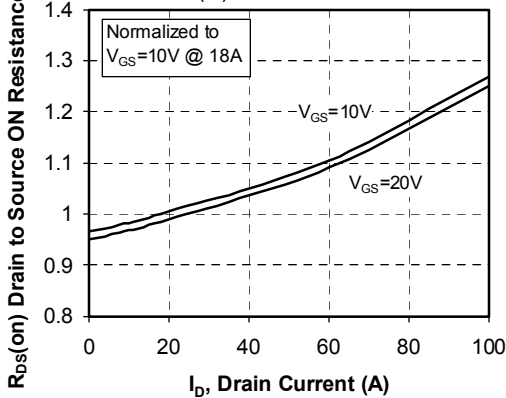
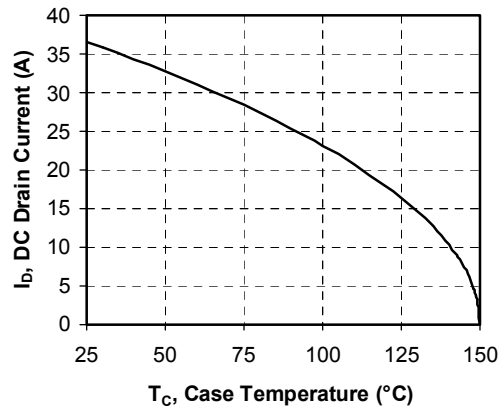
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

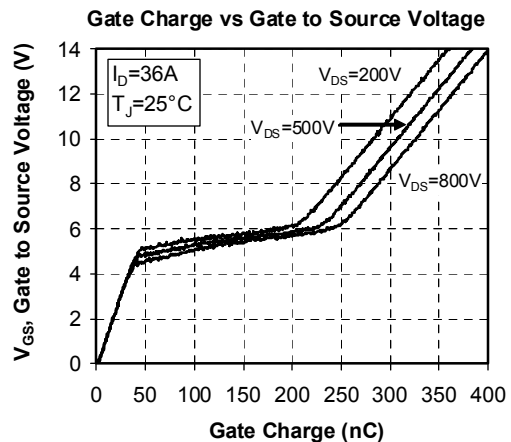
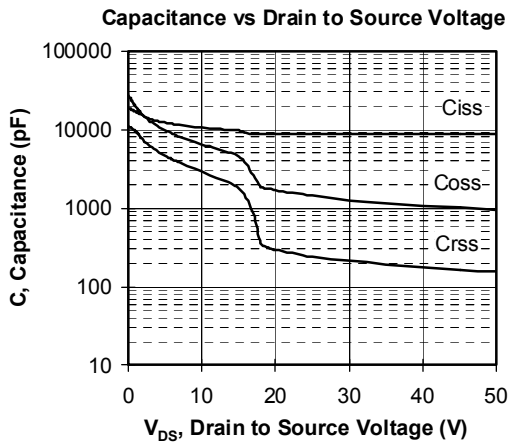
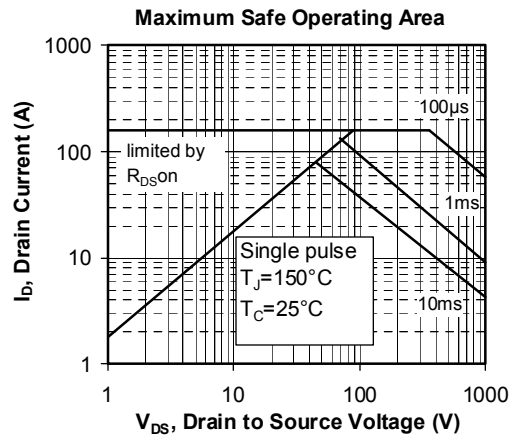
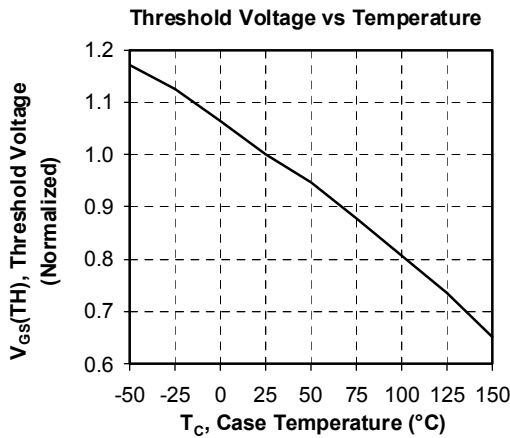
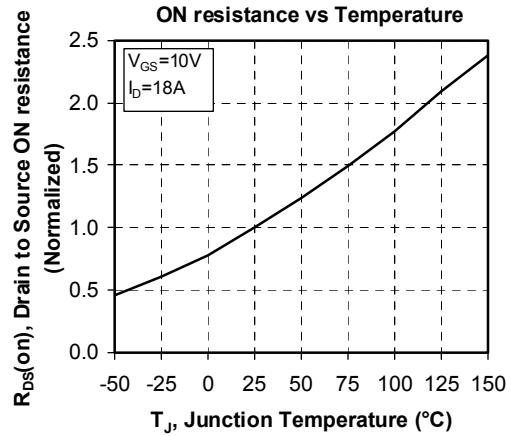
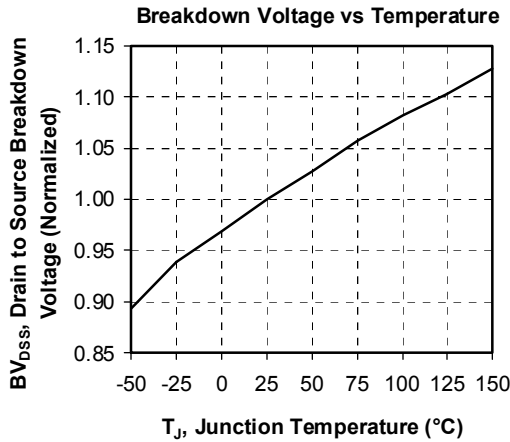
**SP4 Package outline** (dimensions in mm)

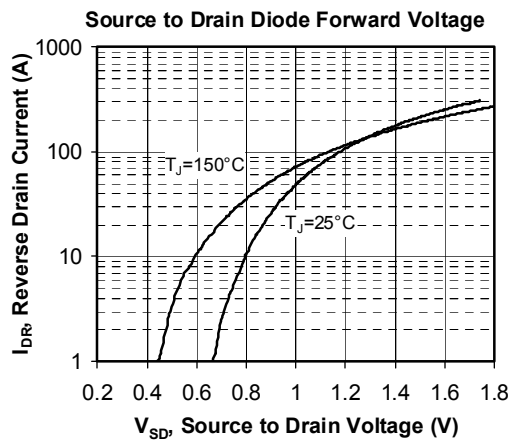
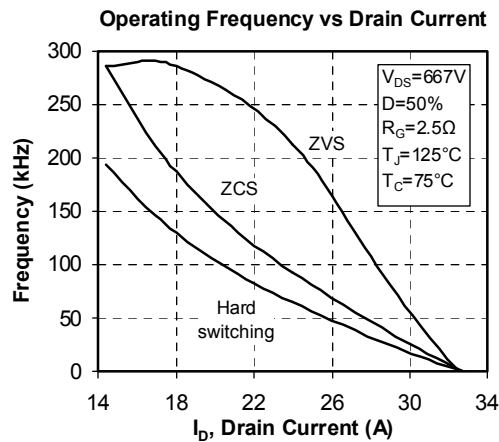
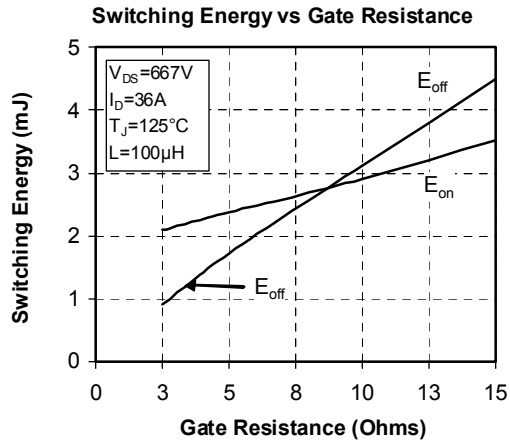
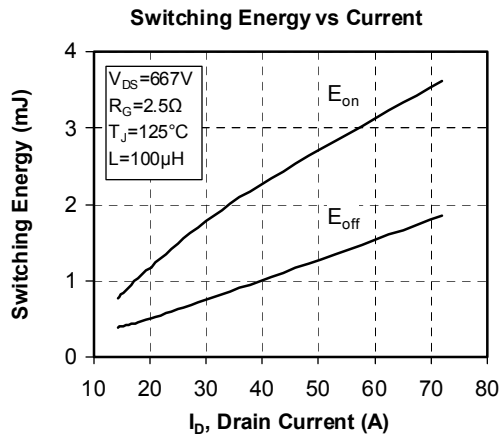
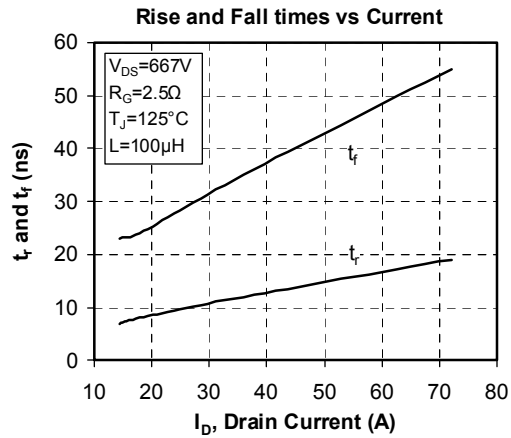
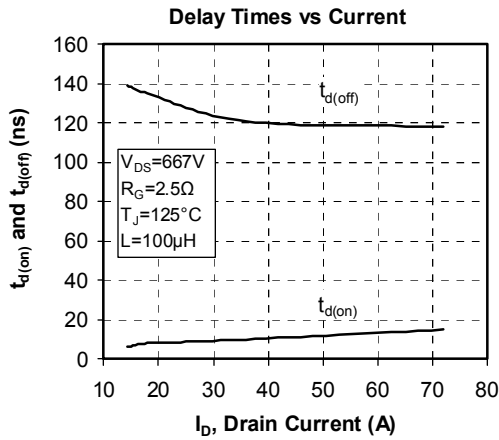


ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS :  $\varnothing \pm 0,1$

See application note APT0501 - Mounting Instructions for SP4 Power Modules on [www.microsemi.com](http://www.microsemi.com)

**Typical Performance Curve**
**Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration**

**Low Voltage Output Characteristics**

**Transfer Characteristics**

**R\_DS(on) vs Drain Current**

**DC Drain Current vs Case Temperature**






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