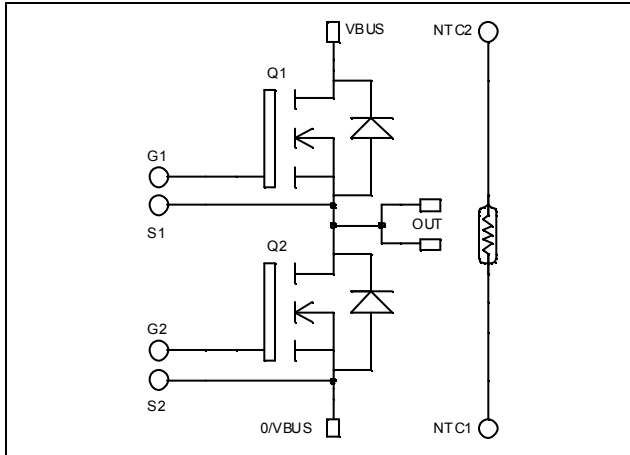


Phase leg MOSFET Power Module

$V_{DSS} = 500V$
 $R_{DSon} = 38m\Omega$ typ @ $T_j = 25^\circ C$
 $I_D = 90A$ @ $T_c = 25^\circ C$

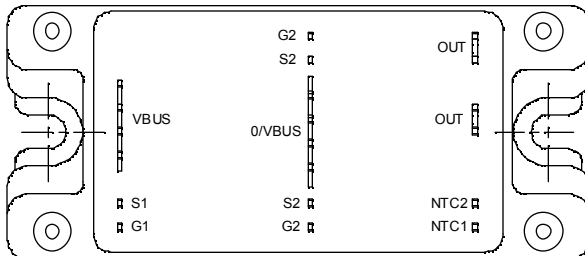


Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- Power MOS 7[®] FREDFETs
 - Low R_{DSon}
 - Low input and Miller capacitance
 - Low gate charge
 - Fast intrinsic reverse diode
 - 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	$T_c = 25^\circ C$	90
		$T_c = 80^\circ C$	67
I_{DM}	Pulsed Drain current	360	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	45	$m\Omega$
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	694
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

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	$V_{GS} = 0\text{V}, V_{DS} = 500\text{V}$			200	μA
		$V_{GS} = 0\text{V}, V_{DS} = 400\text{V}$			1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 45\text{A}$		38	45	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 5\text{mA}$	3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$			± 150	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$		11.2		nF
C_{oss}	Output Capacitance	$V_{DS} = 25\text{V}$		2.4		
C_{rss}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.18		
Q_g	Total gate Charge	$V_{GS} = 10\text{V}$		246		nC
Q_{gs}	Gate – Source Charge	$V_{Bus} = 250\text{V}$		66		
Q_{gd}	Gate – Drain Charge	$I_D = 90\text{A}$		130		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15\text{V}$ $V_{Bus} = 333\text{V}$ $I_D = 90\text{A}$ $R_G = 2\Omega$		18		ns
T_r	Rise Time			35		
$T_{d(off)}$	Turn-off Delay Time			87		
T_f	Fall Time			77		
E_{on}	Turn-on Switching Energy	Inductive switching @ 25°C $V_{GS} = 15\text{V}, V_{Bus} = 333\text{V}$ $I_D = 90\text{A}, R_G = 2\Omega$		1510		μJ
E_{off}	Turn-off Switching Energy			1452		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15\text{V}, V_{Bus} = 333\text{V}$ $I_D = 90\text{A}, R_G = 2\Omega$		2482		μJ
E_{off}	Turn-off Switching Energy			1692		

Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_S	Continuous Source current (Body diode)	$T_c = 25^\circ\text{C}$			90	A
		$T_c = 80^\circ\text{C}$			67	
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = -90\text{A}$			1.3	V
dv/dt	Peak Diode Recovery ①				15	V/ns
t_{rr}	Reverse Recovery Time	$I_S = -90\text{A}$ $V_R = 333\text{V}$ $di_S/dt = 200\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		233	ns
			$T_j = 125^\circ\text{C}$		499	
Q_{rr}	Reverse Recovery Charge	$I_S = -90\text{A}$ $V_R = 333\text{V}$ $di_S/dt = 200\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		3.8	μC
			$T_j = 125^\circ\text{C}$		11.4	

 ① dv/dt numbers reflect the limitations of the circuit rather than the device itself.

$$I_S \leq -90\text{A} \quad di/dt \leq 700\text{A}/\mu\text{s} \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R _{thJC}	Junction to Case Thermal Resistance			0.18	°C/W	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, I _{isol} < 1mA, 50/60Hz	2500			V	
T _J	Operating junction temperature range	-40		150	°C	
T _{STG}	Storage Temperature Range	-40		125		
T _C	Operating Case Temperature	-40		100		
Torque	Mounting torque	To Heatsink	M5	2.5	4.7	N.m
Wt	Package Weight			160		g

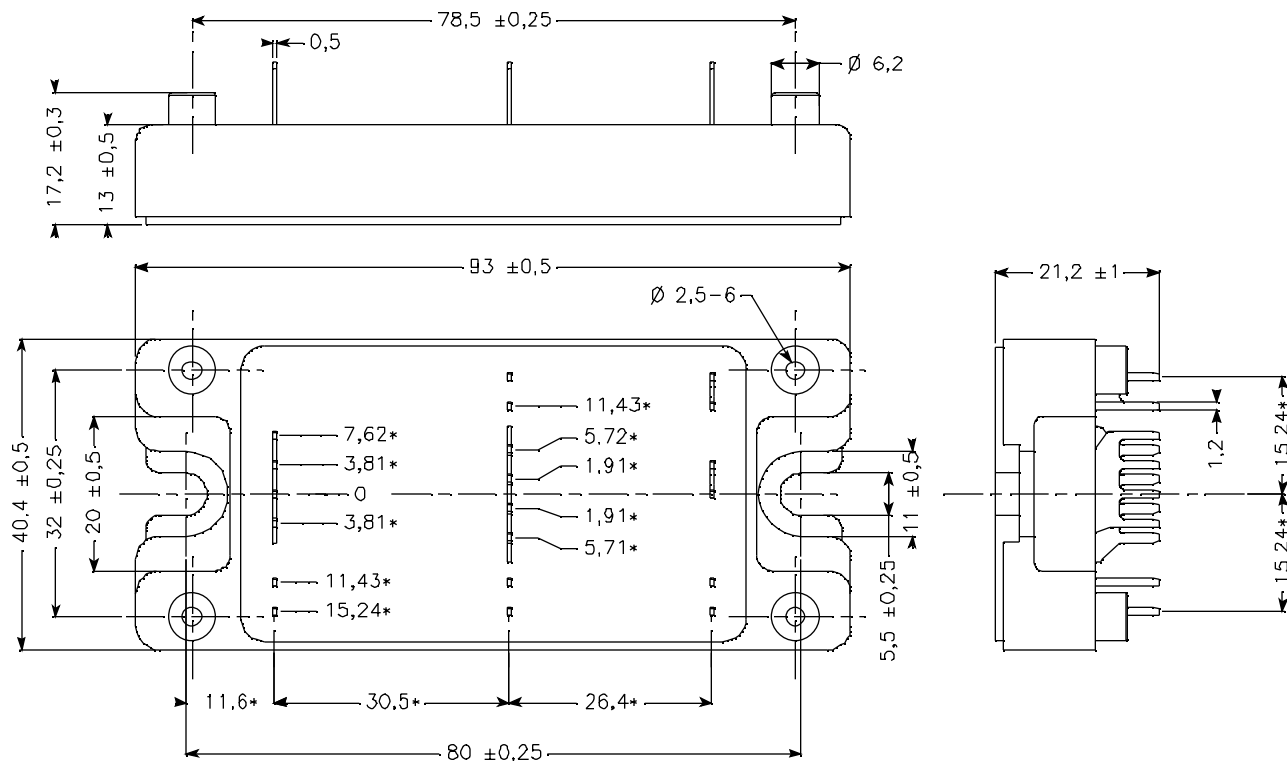
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
B _{25/85}	T ₂₅ = 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_T: Thermistor value at T

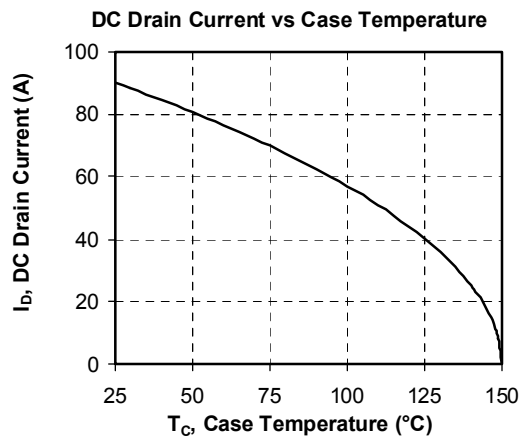
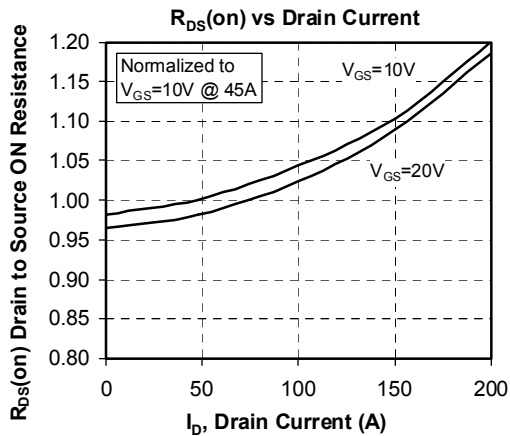
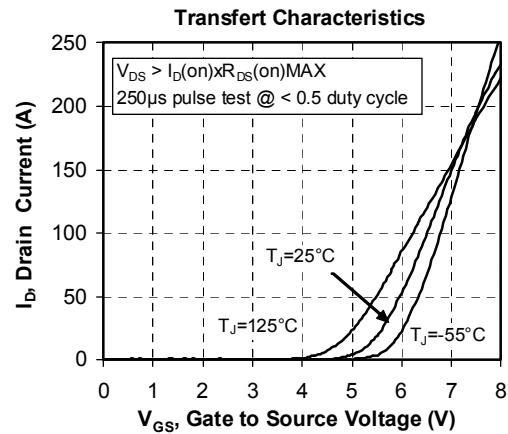
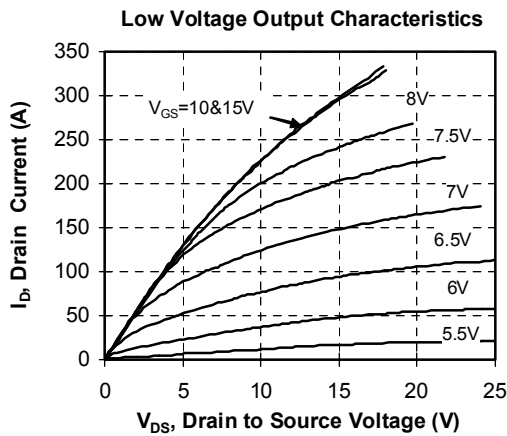
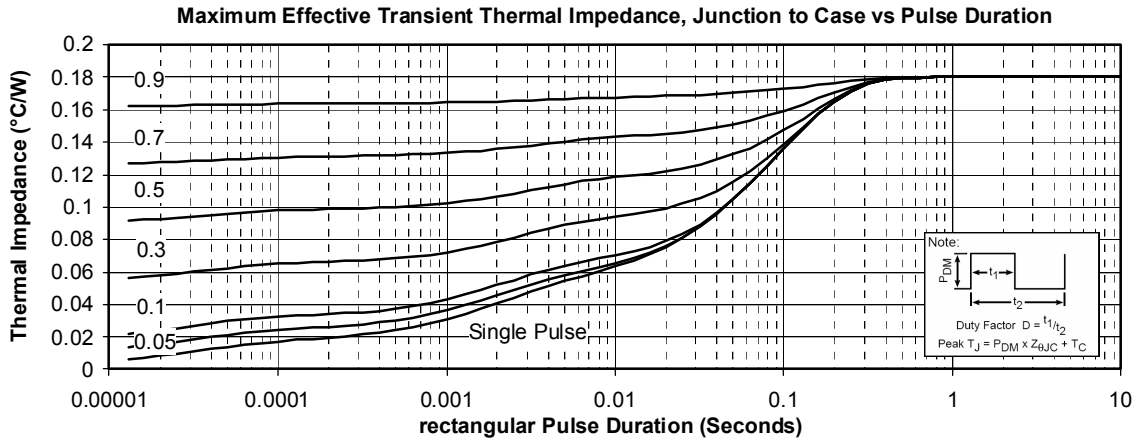
SP4 Package outline (dimensions in mm)

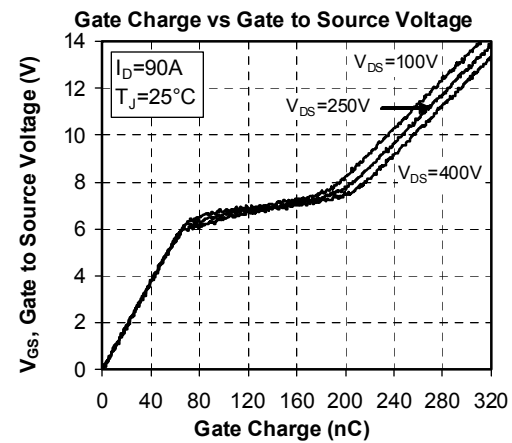
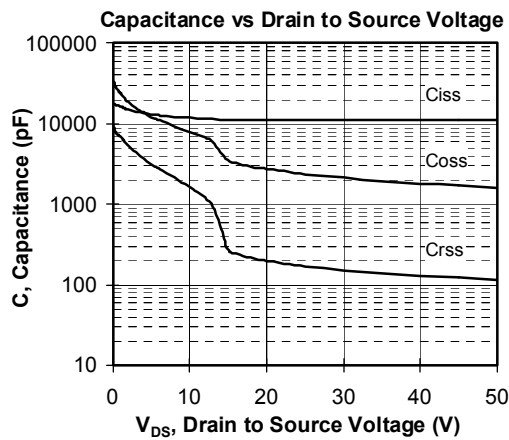
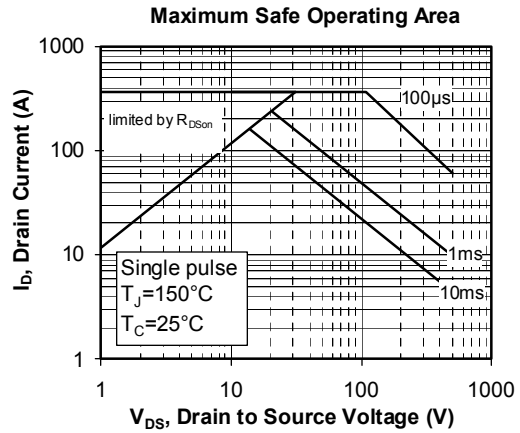
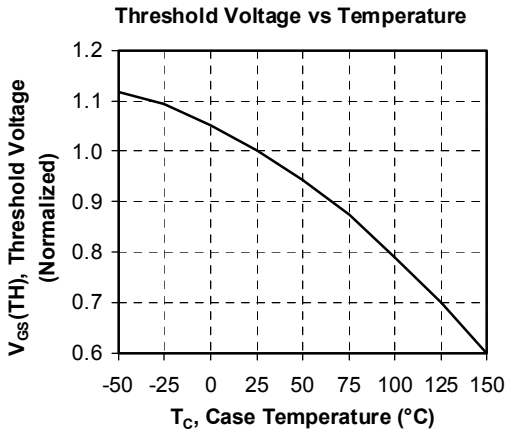
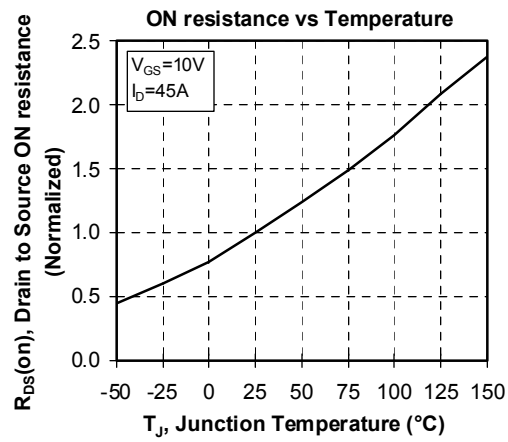
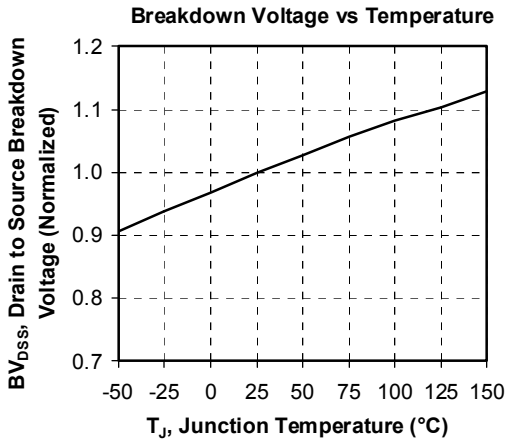


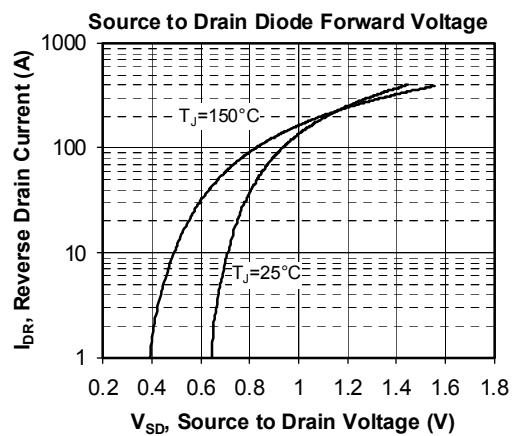
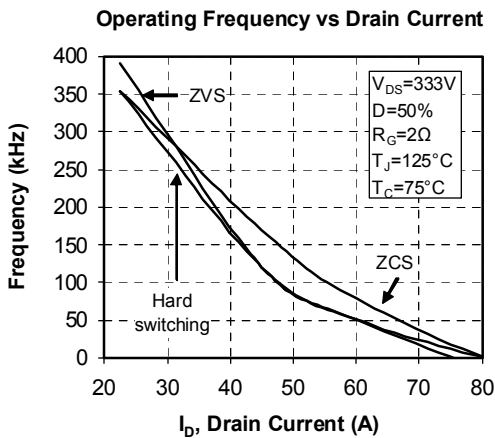
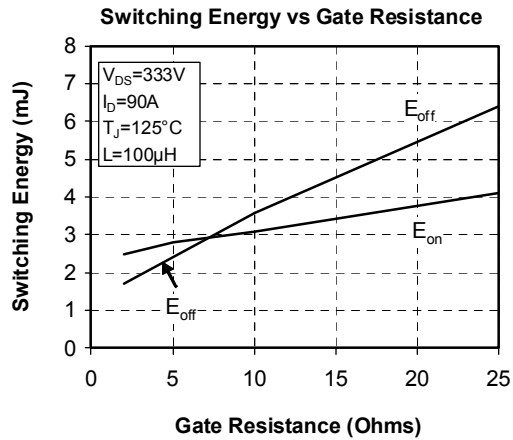
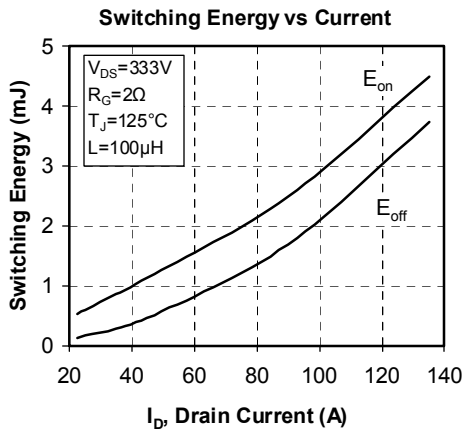
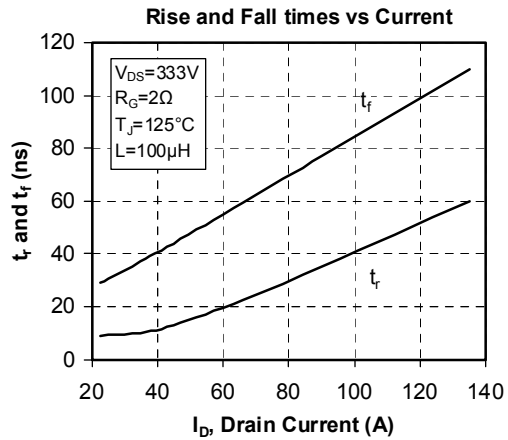
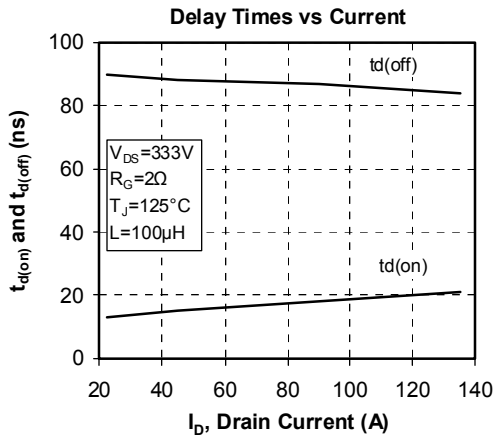
ALL DIMENSIONS MARKED "*" ARE TOLERANCED AS: ± 0.1

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

Typical Performance Curve







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