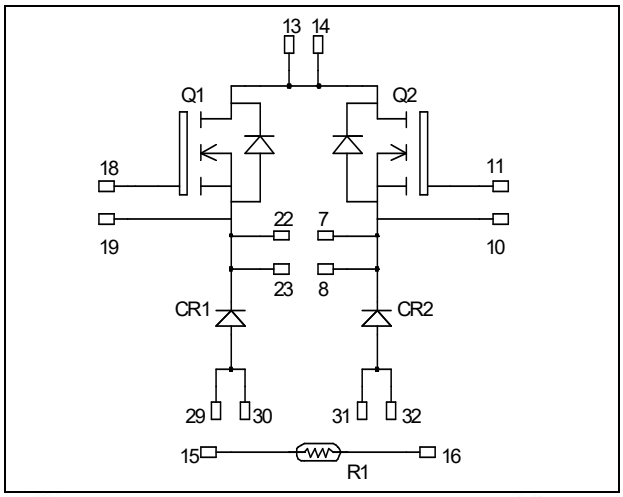
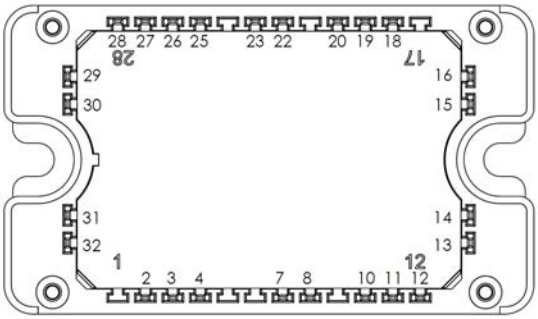
Dual Buck chopper MOSFET Power Module

V_{DSS} = 100V
R_{DSon} = 9mΩ typ @ Tj = 25°C
I_D = 139A @ Tc = 25°C





All multiple inputs and outputs must be shorted together
Example: 13/14 ; 29/30 ; 22/23 …

Application

- AC and DC motor control
- Switched Mode Power Supplies

Features

- **Power MOS V® 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
- Internal thermistor for temperature monitoring

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
- Each leg can be easily paralleled to achieve a single buck of twice the current capability
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings (per MOSFET)

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Voltage		100	V
I_D	Continuous Drain Current	T_c = 25°C	139	A
		T_c = 80°C	100 *	
I_{DM}	Pulsed Drain current		430	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		10	mΩ
P_D	Power Dissipation	T_c = 25°C	390	W
I_{AR}	Avalanche current (repetitive and non repetitive)		100	A
E_{AR}	Repetitive Avalanche Energy		50	mJ
E_{AS}	Single Pulse Avalanche Energy		3000	

* Specification of MOSFET device but output current must be limited due to size of output pins.

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

Electrical Characteristics (per MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 100V			100	µA
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 69.5A		9	10	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 2.5mA	2		4	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0V			±150	nA

Dynamic Characteristics (per MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		9875		pF
C_{oss}	Output Capacitance			3940		
C_{rss}	Reverse Transfer Capacitance			1470		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 50V I_D = 139A		350		nC
Q_{gs}	Gate – Source Charge			60		
Q_{gd}	Gate – Drain Charge			180		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 66V I_D = 139A R_G = 5Ω		35		ns
T_r	Rise Time			70		
$T_{d(off)}$	Turn-off Delay Time			95		
T_f	Fall Time			125		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 66V I_D = 139A, R_G = 5Ω		552		µJ
E_{off}	Turn-off Switching Energy			604		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 66V I_D = 139A, R_G = 5Ω		608		µJ
E_{off}	Turn-off Switching Energy			641		
R_{thJC}	Junction to Case Thermal Resistance				0.32	°C/W

Chopper Diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage					200	V
I_{RM}	Reverse Leakage Current	V_R = 200V				250	µA
I_F	DC Forward Current		Tc = 80°C		100		A
V_F	Diode Forward Voltage	I_F = 100A			1		V
		I_F = 200A			1.4		
		I_F = 100A	T_j = 125°C		0.9		
t_{rr}	Reverse Recovery Time	I_F = 100A V_R = 133V di/dt = 200A/µs	T_j = 25°C		60		ns
			T_j = 125°C		110		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		200		nC
			T_j = 125°C		840		
R_{thJC}	Junction to Case Thermal Resistance					0.55	°C/W

Thermal and package characteristics

Symbol	Characteristic			Min	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range			-40	150	°C
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max - 25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	125	
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

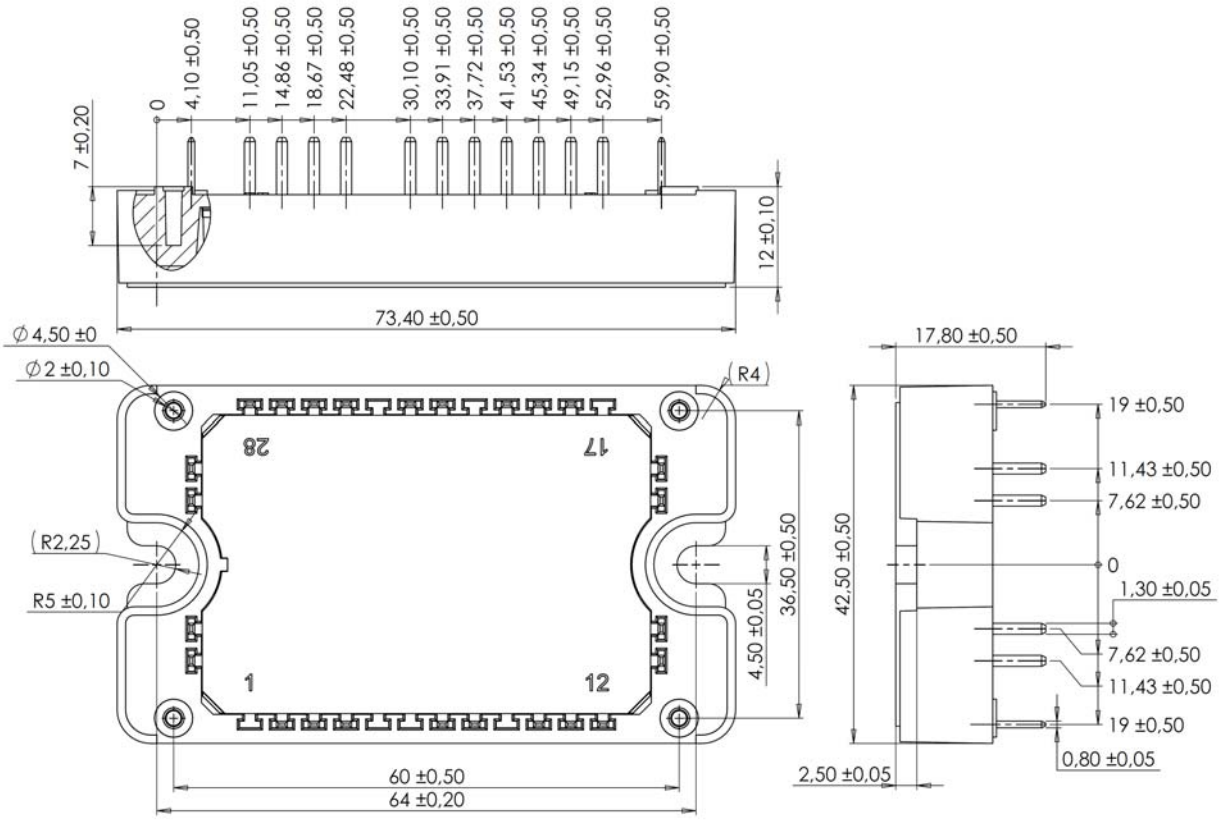
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

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

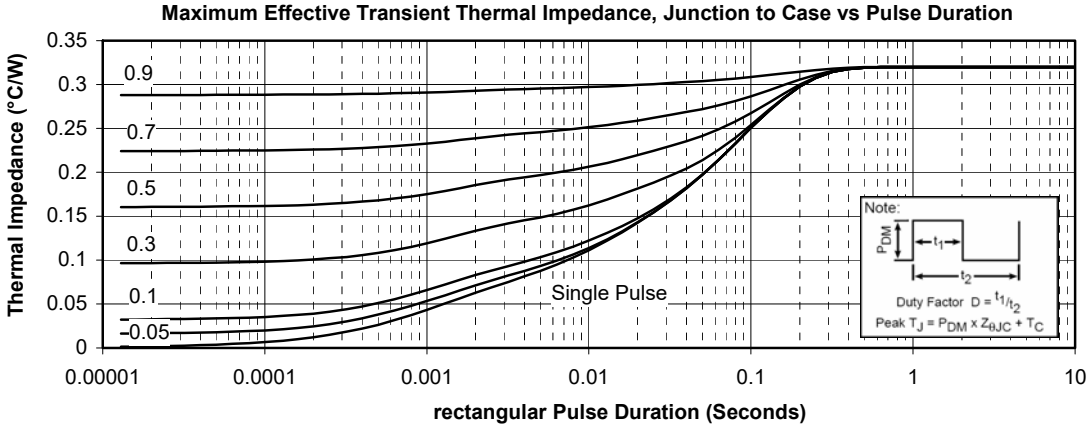
T: Thermistor temperature
R_T: Thermistor value at T

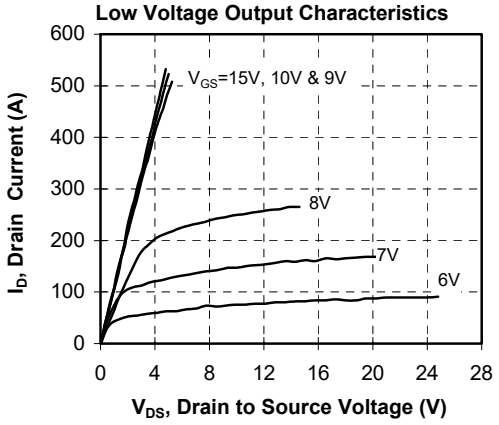
Package outline (dimensions in mm)

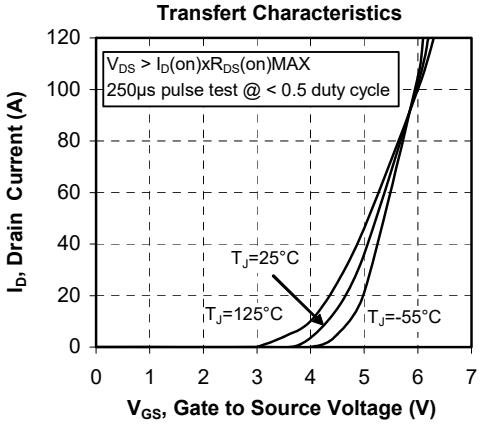


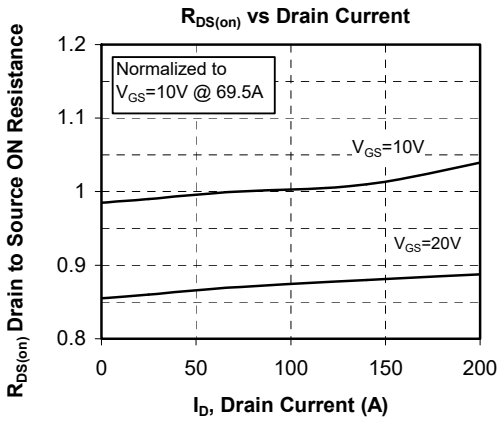
See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

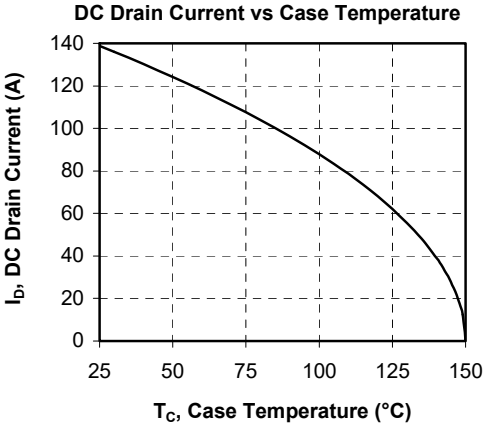
Typical Performance Curve



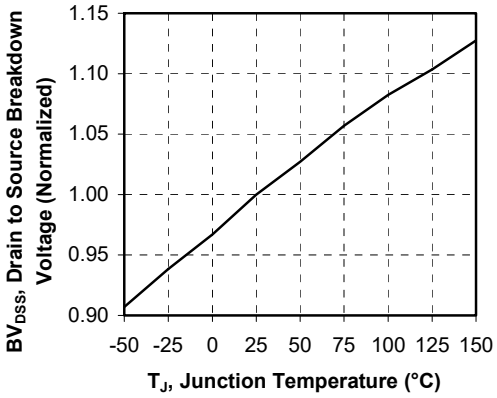




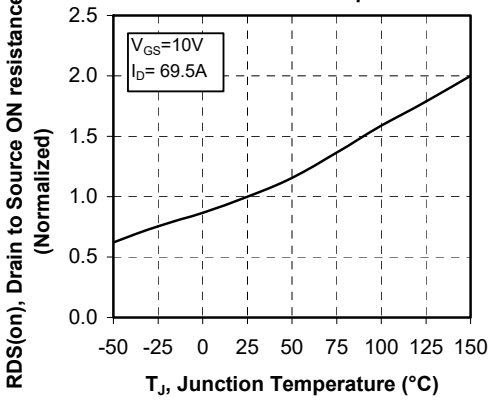




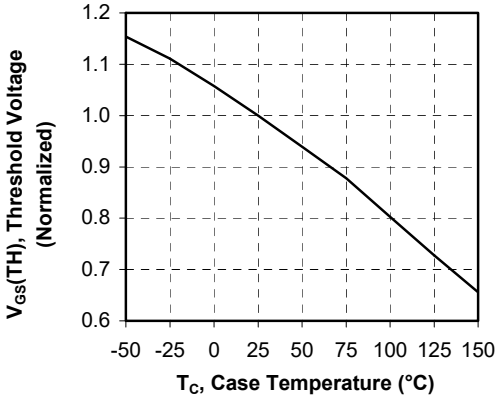
Breakdown Voltage vs Temperature



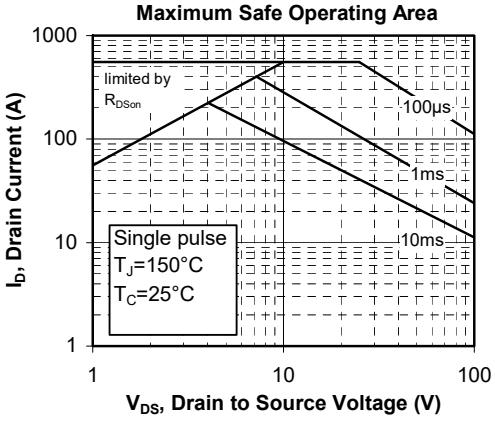
ON resistance vs Temperature



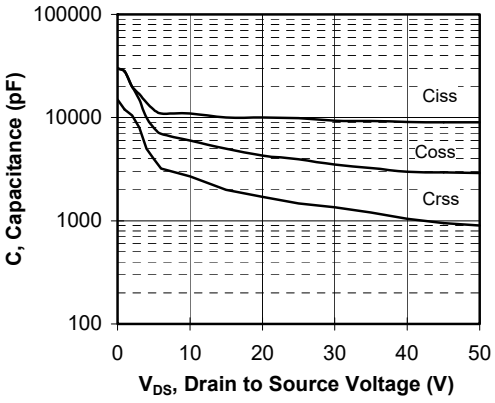
Threshold Voltage vs Temperature



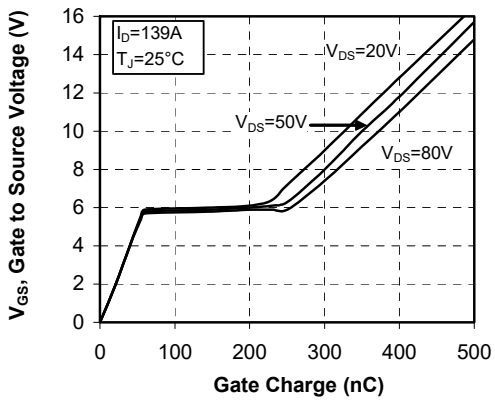
Maximum Safe Operating Area



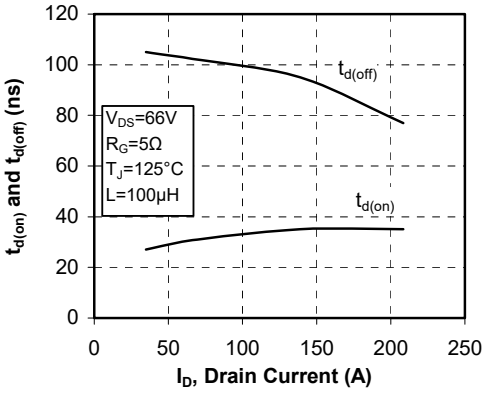
Capacitance vs Drain to Source Voltage



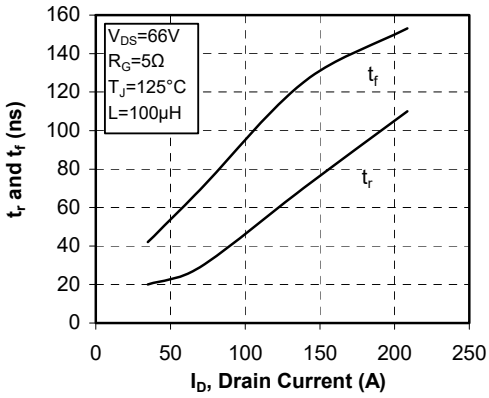
Gate Charge vs Gate to Source Voltage



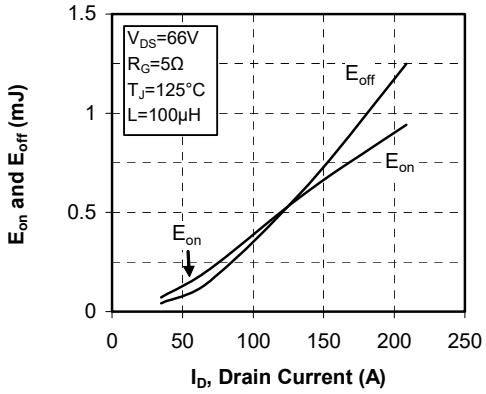
Delay Times vs Current



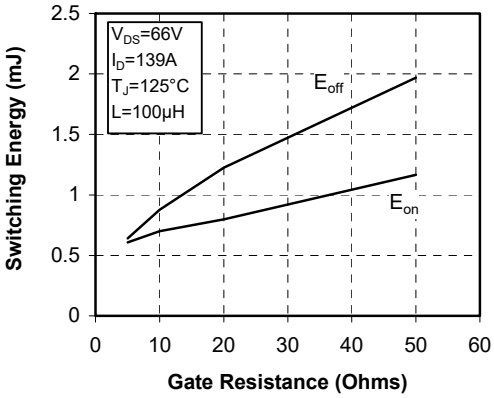
Rise and Fall times vs Current



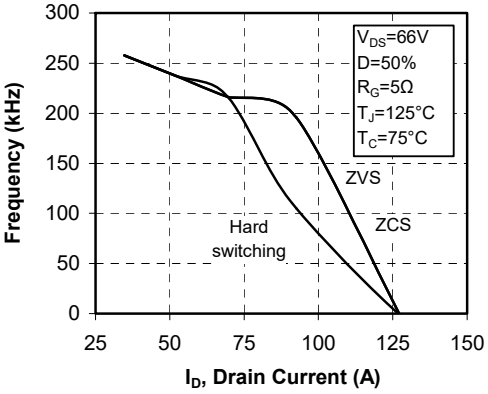
Switching Energy vs Current



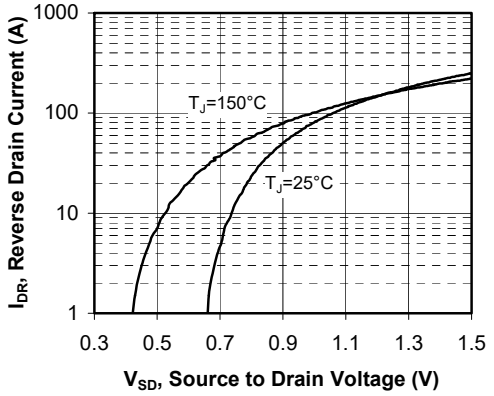
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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