

## Triple phase leg MOSFET Power Module

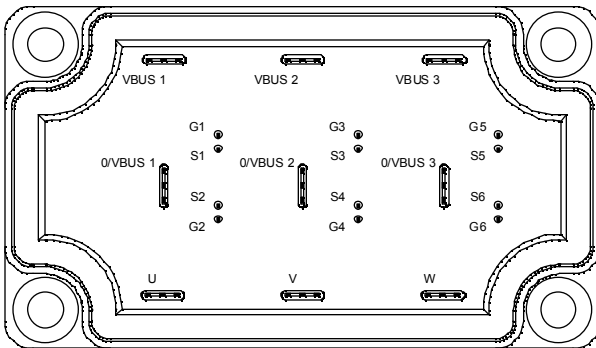
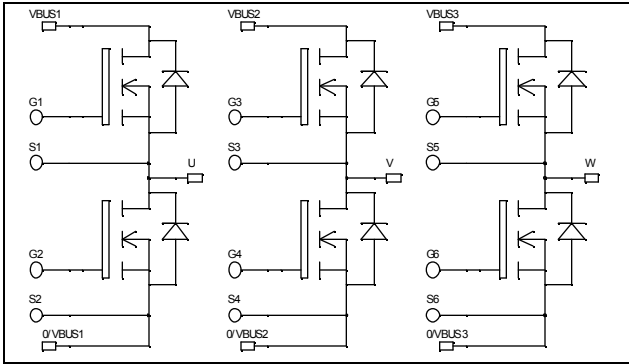
$V_{DSS} = 200V$   
 $R_{DSon} = 16m\Omega \text{ typ @ } T_j = 25^\circ C$   
 $I_D = 104A \text{ @ } T_c = 25^\circ C$

### Application

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

### Features

- Power MOS 7<sup>®</sup> 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
- 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
- Very low (12mm) profile
- Each leg can be easily paralleled to achieve a phase leg of three times the current capability
- Module can be configured as a three phase bridge
- Module can be configured as a boost followed by a full bridge
- RoHS Compliant

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	200	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	104
		$T_c = 80^\circ C$	77
$I_{DM}$	Pulsed Drain current	416	
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	19	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	390
$I_{AR}$	Avalanche current (repetitive and non repetitive)	104	A
$E_{AR}$	Repetitive Avalanche Energy	50	mJ
$E_{AS}$	Single Pulse Avalanche Energy	3000	


**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	$V_{GS} = 0\text{V}, V_{DS} = 200\text{V}$			250	$\mu\text{A}$
		$V_{GS} = 0\text{V}, V_{DS} = 160\text{V}$			1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 52\text{A}$		16	19	$\text{m}\Omega$
$V_{GS(th)}$	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**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}$ $V_{DS} = 25\text{V}$ $f = 1\text{MHz}$		7220		pF
$C_{oss}$	Output Capacitance			2330		
$C_{rss}$	Reverse Transfer Capacitance			146		
$Q_g$	Total gate Charge	$V_{GS} = 10\text{V}$ $V_{Bus} = 100\text{V}$ $I_D = 104\text{A}$		140		nC
$Q_{gs}$	Gate – Source Charge			53		
$Q_{gd}$	Gate – Drain Charge			67		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15\text{V}$ $V_{Bus} = 133\text{V}$ $I_D = 104\text{A}$ $R_G = 5\Omega$		32		ns
$T_r$	Rise Time			64		
$T_{d(off)}$	Turn-off Delay Time			88		
$T_f$	Fall Time			116		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 15\text{V}, V_{Bus} = 133\text{V}$ $I_D = 104\text{A}, R_G = 5\Omega$		849		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			929		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15\text{V}, V_{Bus} = 133\text{V}$ $I_D = 104\text{A}, R_G = 5\Omega$		936		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			986		

**Source - Drain diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_S$	Continuous Source current (Body diode)		$T_c = 25^\circ\text{C}$		104	A
			$T_c = 80^\circ\text{C}$		77	
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = -104\text{A}$			1.3	V
$dv/dt$	Peak Diode Recovery ①				5	V/ns
$t_{rr}$	Reverse Recovery Time	$I_S = -104\text{A}$ $V_R = 133\text{V}$ $di/dt = 100\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		230	ns
			$T_j = 125^\circ\text{C}$		450	
$Q_{rr}$	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$	0.9		$\mu\text{C}$
			$T_j = 125^\circ\text{C}$	3.4		

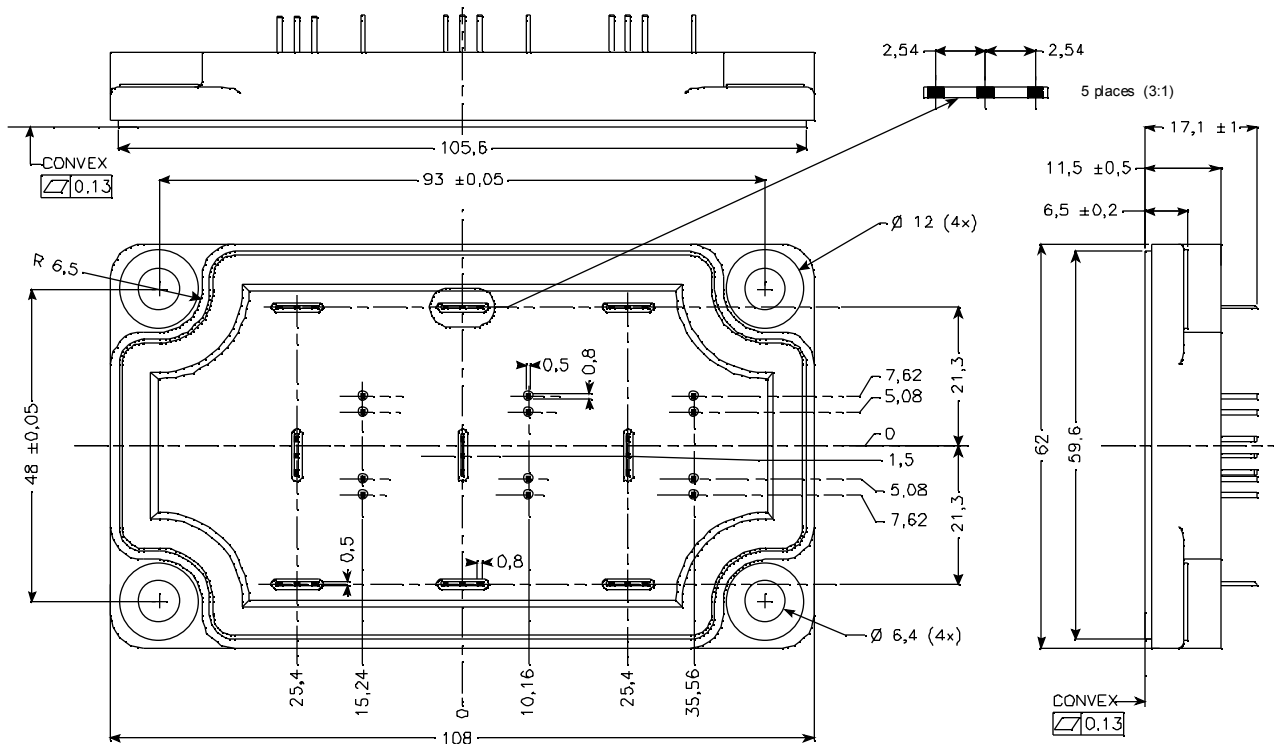
 ①  $dv/dt$  numbers reflect the limitations of the circuit rather than the device itself.

$$I_S \leq -104\text{A} \quad di/dt \leq 700\text{A}/\mu\text{s} \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

**Thermal and package characteristics**

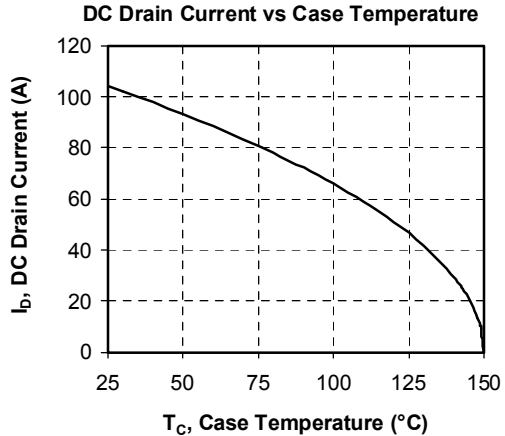
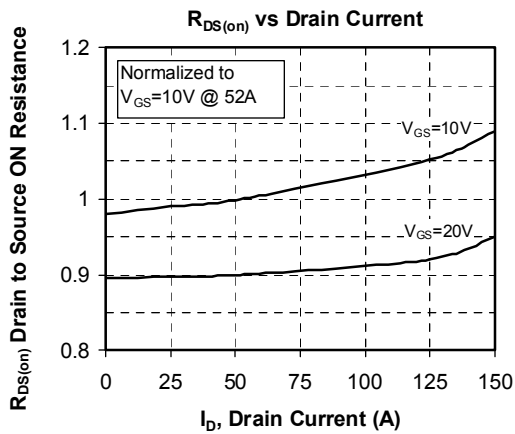
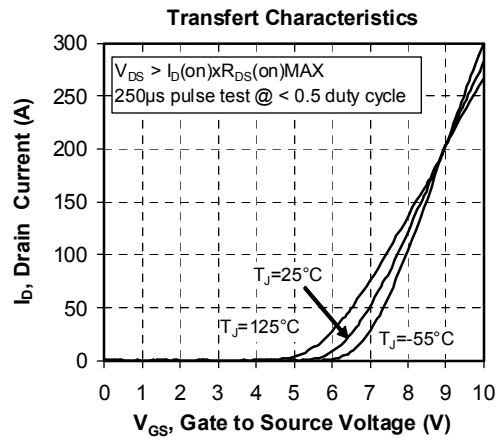
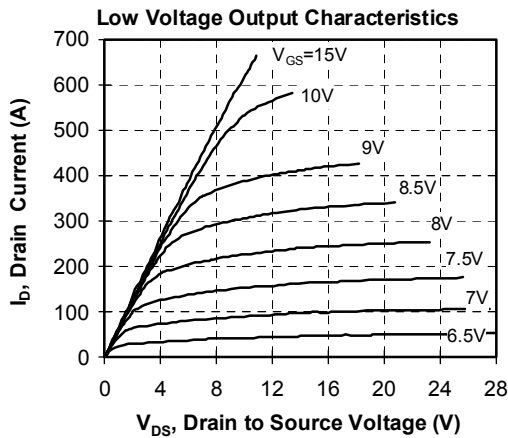
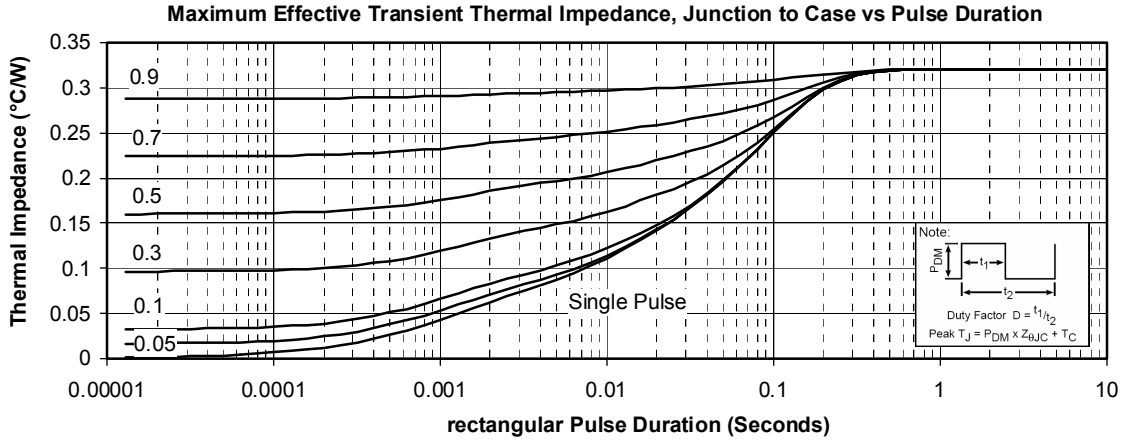
Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance			0.32	°C/W	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, I <sub>isol</sub> <1mA, 50/60Hz	2500			V	
T <sub>J</sub>	Operating junction temperature range	-40		150	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M6	3	5	N.m
Wt	Package Weight				250	g

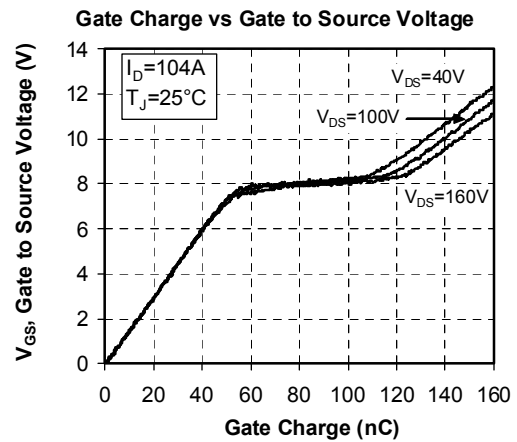
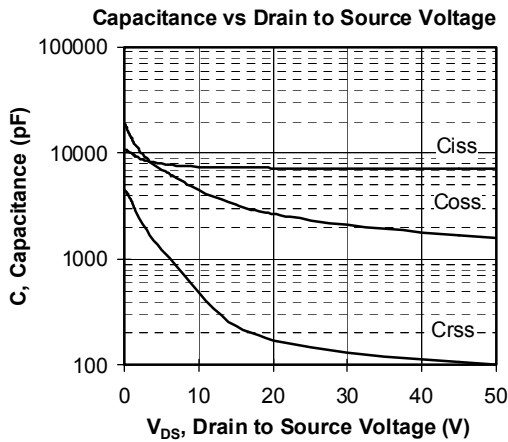
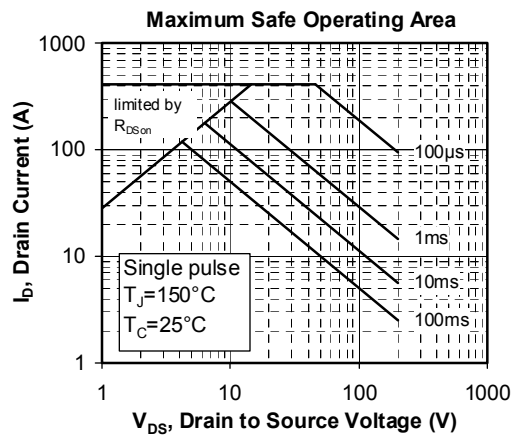
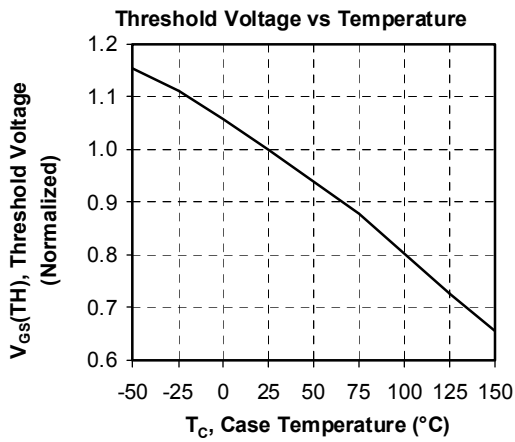
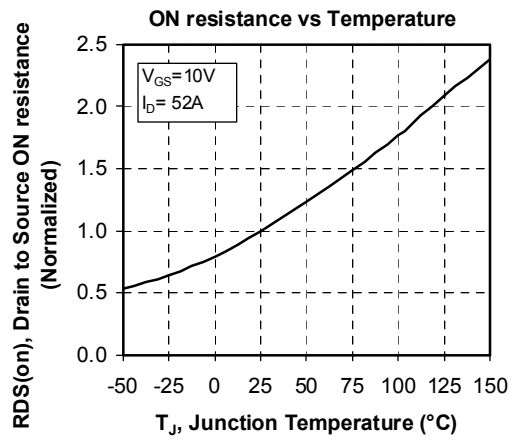
**SP6-P Package outline (dimensions in mm)**

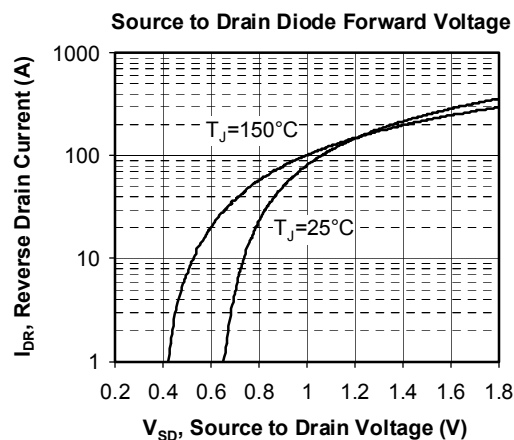
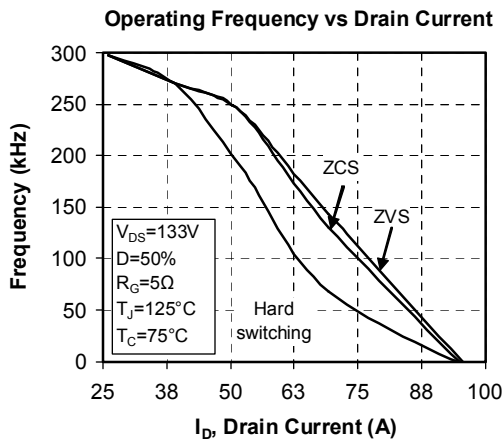
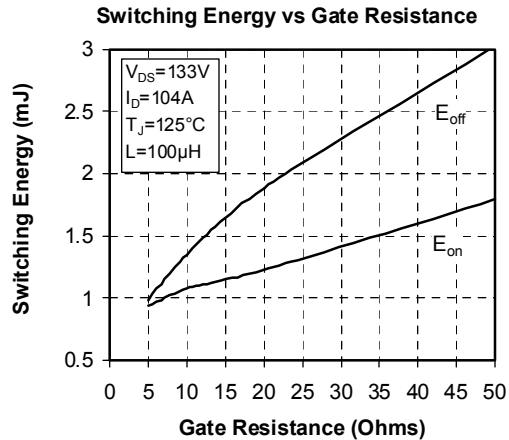
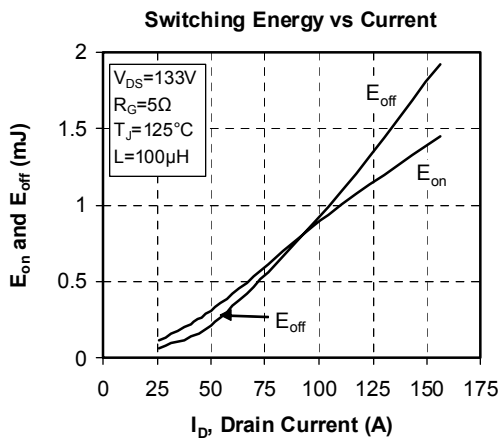
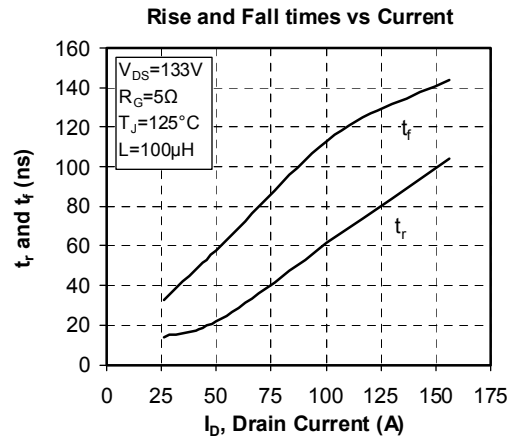
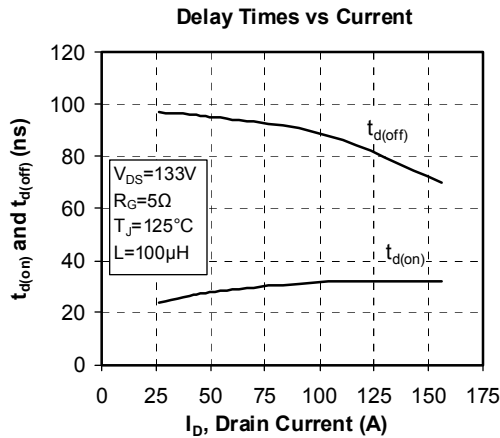


See application note 1902 - Mounting Instructions for SP6-P (12mm) Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve







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