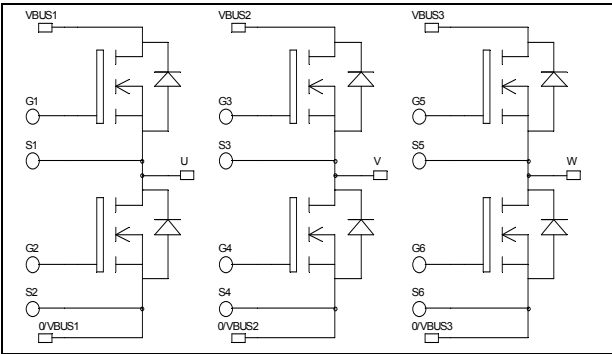


## Triple phase leg MOSFET Power Module

**$V_{DSS} = 500V$**   
 **$R_{DSon} = 65m\Omega$  typ @  $T_j = 25^\circ C$**   
 **$I_D = 51A$  @  $T_c = 25^\circ C$**

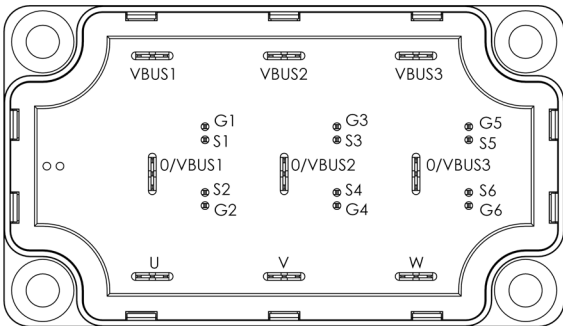


### Application

- 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	500	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	51
		$T_c = 80^\circ C$	38
$I_{DM}$	Pulsed Drain current	204	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	78	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	390
$I_{AR}$	Avalanche current (repetitive and non repetitive)	51	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	$V_{GS} = 0V, V_{DS} = 500V$			100	$\mu\text{A}$
		$V_{GS} = 0V, V_{DS} = 400V$			500	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 25.5A$		65	78	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 2.5\text{mA}$	3		5	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			$\pm 100$	$\text{nA}$

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{MHz}$		7000		$\text{pF}$
$C_{oss}$	Output Capacitance			1400		
$C_{rss}$	Reverse Transfer Capacitance			90		
$Q_g$	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 250V$ $I_D = 51A$		140		$\text{nC}$
$Q_{gs}$	Gate – Source Charge			40		
$Q_{gd}$	Gate – Drain Charge			70		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ 125°C</b> $V_{GS} = 15V$ $V_{Bus} = 333V$ $I_D = 51A$ $R_G = 3\Omega$		21		$\text{ns}$
$T_r$	Rise Time			38		
$T_{d(off)}$	Turn-off Delay Time			75		
$T_f$	Fall Time			93		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ 25°C</b> $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 51A, R_G = 3\Omega$		1035		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			845		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ 125°C</b> $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 51A, R_G = 3\Omega$		1556		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			1013		

**Source - Drain diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
$I_S$	Continuous Source current (Body diode)	$T_c = 25^\circ\text{C}$			51	A	
		$T_c = 80^\circ\text{C}$			38		
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0V, I_S = -51A$			1.3	V	
$dv/dt$	Peak Diode Recovery ❶				15	V/ns	
$t_{rr}$	Reverse Recovery Time	$I_S = -51A$ $V_R = 333V$ $di/dt = 100A/\mu\text{s}$	$T_j = 25^\circ\text{C}$			270	$\text{ns}$
			$T_j = 125^\circ\text{C}$			540	
$Q_{rr}$	Reverse Recovery Charge	$I_S = -51A$ $V_R = 333V$ $di/dt = 100A/\mu\text{s}$	$T_j = 25^\circ\text{C}$		2.6	$\mu\text{C}$	
			$T_j = 125^\circ\text{C}$		9.6		

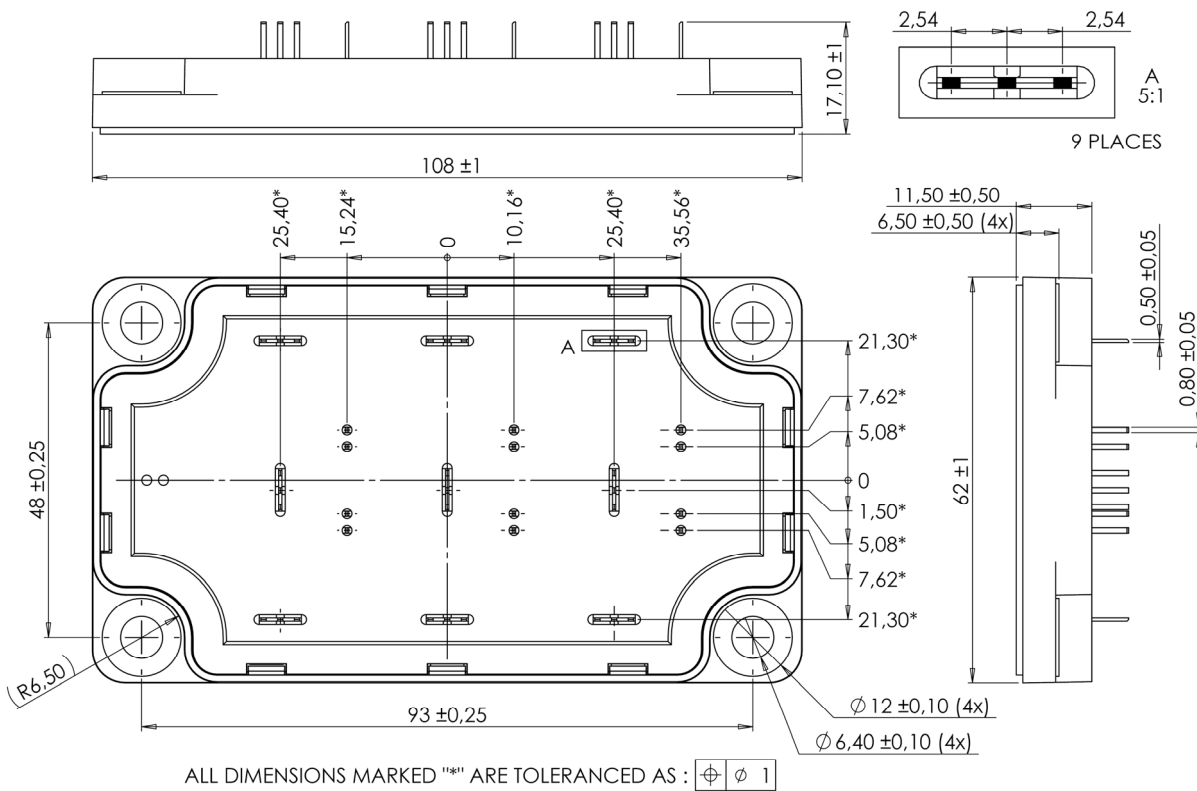
❶  $dv/dt$  numbers reflect the limitations of the circuit rather than the device itself.

$I_S \leq -51A$     $di/dt \leq 700A/\mu\text{s}$     $V_R \leq V_{DSS}$     $T_j \leq 150^\circ\text{C}$

## Thermal and package characteristics

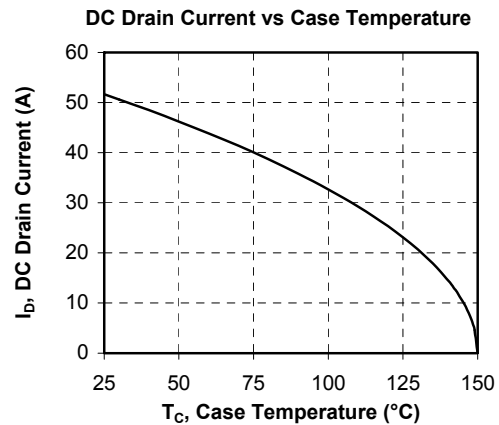
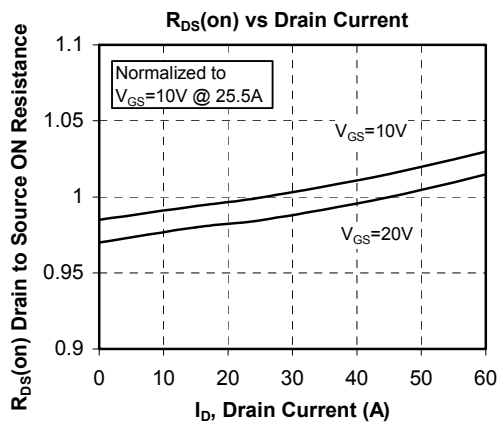
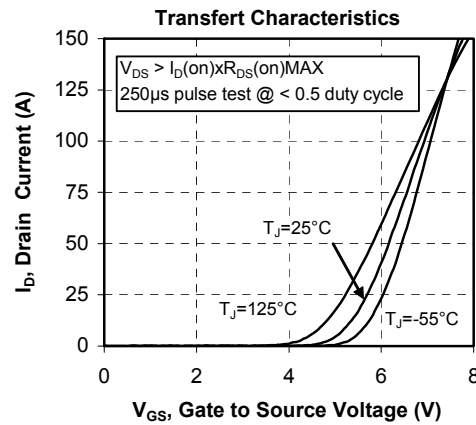
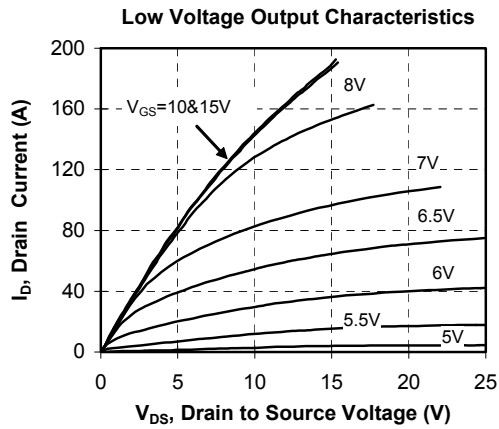
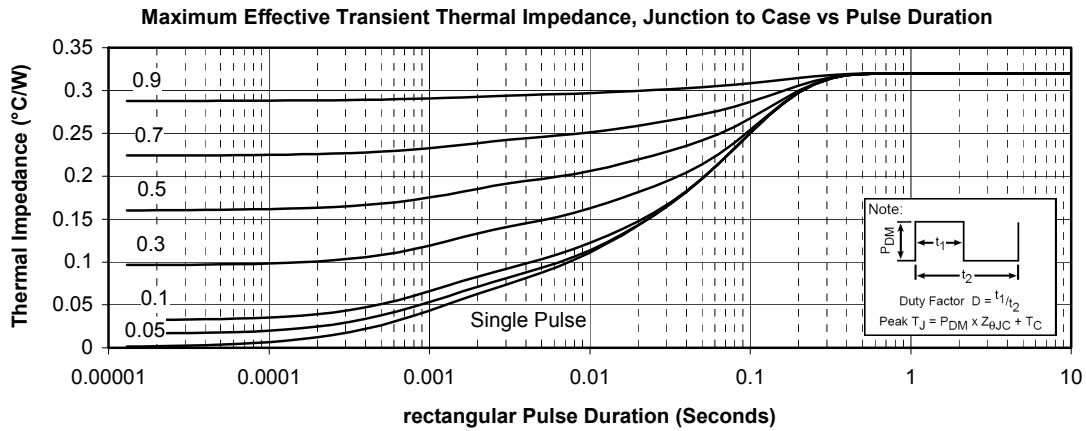
Symbol	Characteristic		Min	Typ	Max	Unit
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT			0.32	°C/W
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz		4000			V
T <sub>J</sub>	Operating junction temperature range		-40		150	°C
T <sub>STG</sub>	Storage Temperature 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

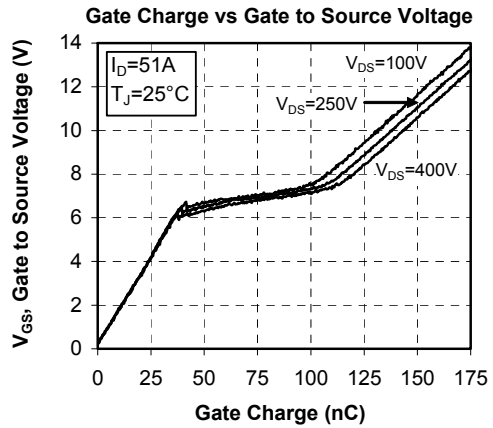
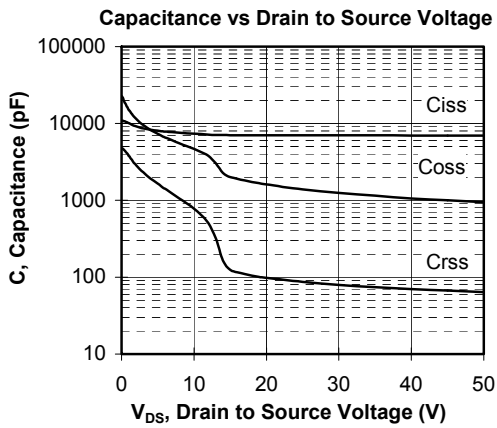
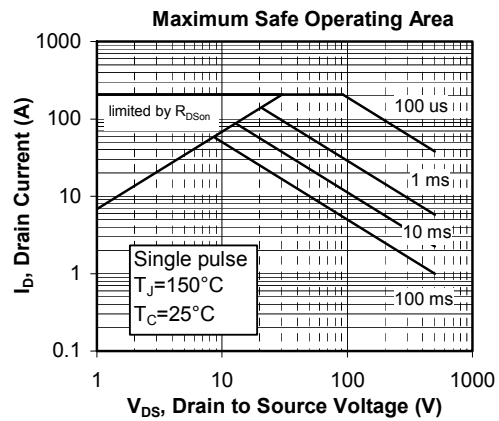
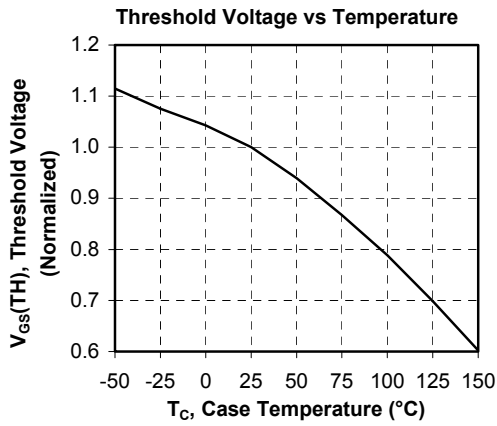
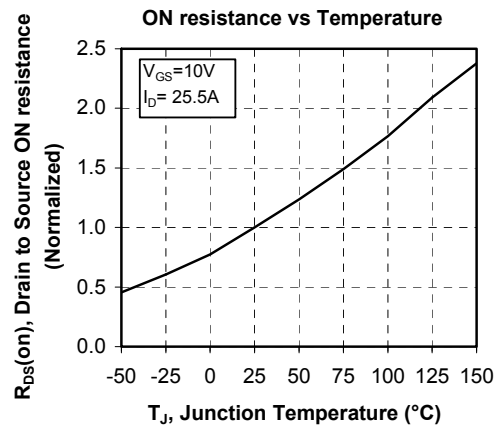
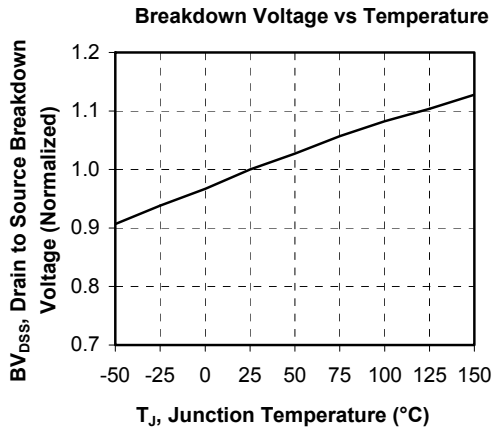
## SP6-P Package outline (dimensions in mm)

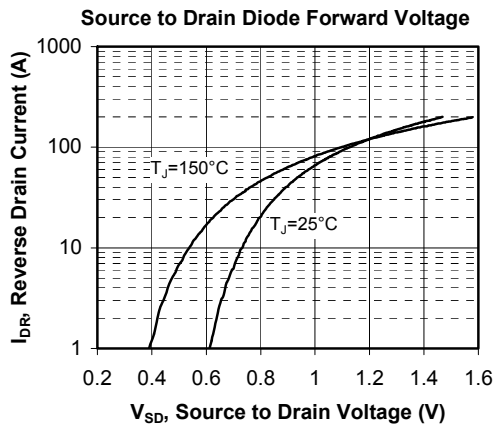
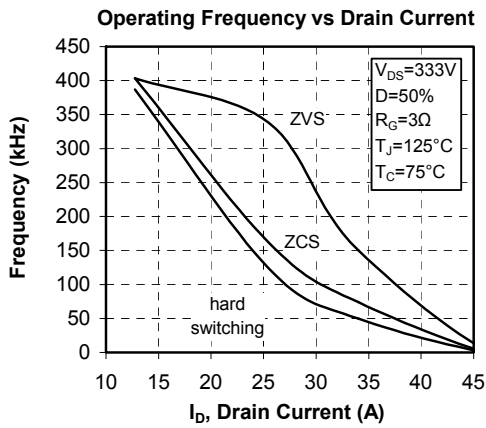
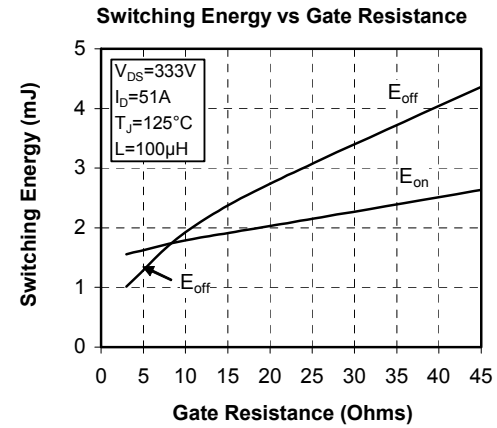
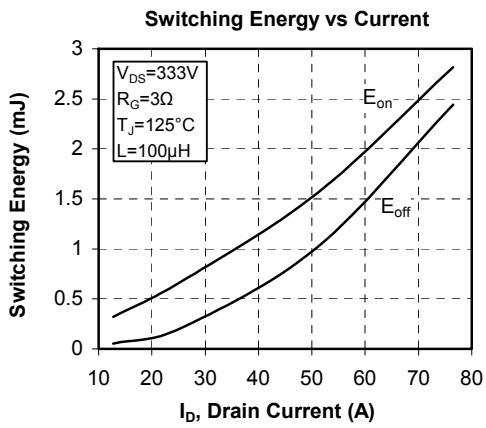
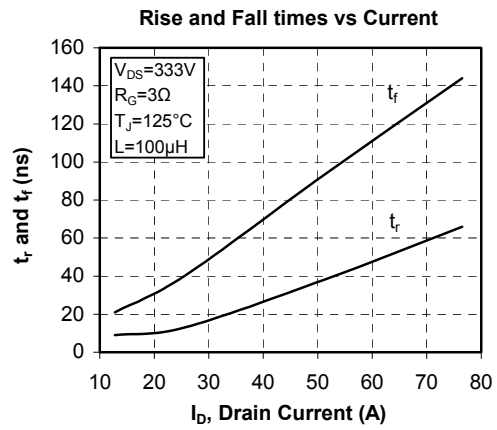
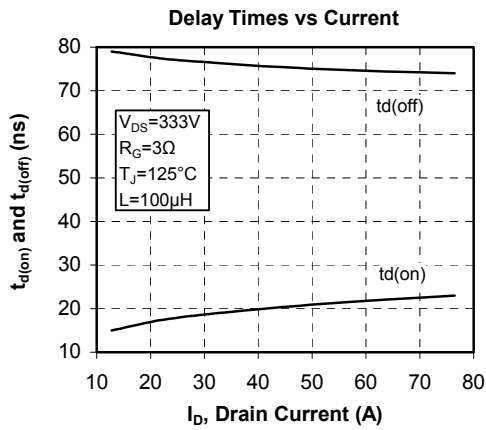


See application note 1902 - Mounting Instructions for SP6-P (12mm) Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve







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