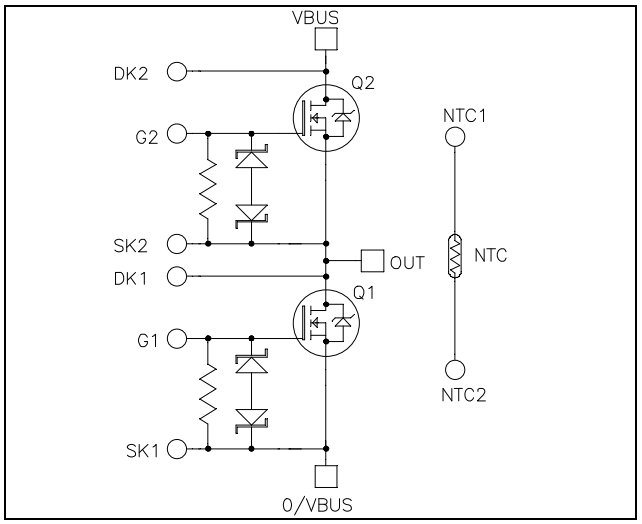
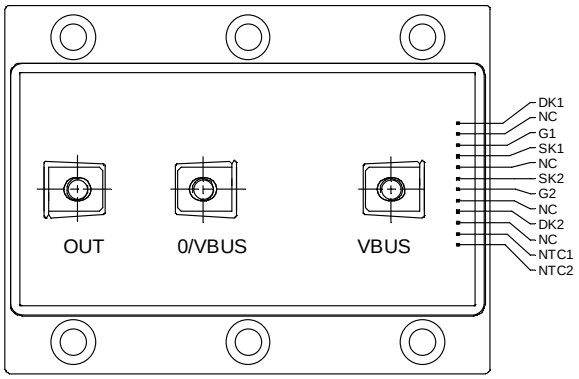
Phase leg MOSFET Power Module

V_{DSS} = 500V
R_{DSon} = 25mΩ max @ Tj = 25°C
I_D = 149A @ Tc = 25°C





Application

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

Features

- Power MOS V® FREDFETs
  - Low R_{DSon}
  - Low input and Miller capacitance
  - Low gate charge
  - Fast intrinsic diode
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Kelvin Drain for VDS monitoring
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- 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 for signal and M5 for power for easy PCB mounting
- 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°C	149	A
		T_c = 80°C	111	
I_{DM}	Pulsed Drain current		450	
V_{GS}	Gate - Source Voltage		±15*	V
R_{DSon}	Drain - Source ON Resistance		25	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	1250	W
I_{AR}	Avalanche current (repetitive and non repetitive)		149	A
E_{AR}	Repetitive Avalanche Energy		30	mJ
E_{AS}	Single Pulse Avalanche Energy		1300	

* Limited by internal zener protection.

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°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	T_j = 25°C			1000	µA
		V_{GS} = 0V,V_{DS} = 400V	T_j = 125°C			2500	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 74.5A				25	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 8mA		2		4	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ± 15V, V_{DS} = 0V				±250	nA
R	Gate Source input impedance				10		kΩ

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		29.6		nF
C_{oss}	Output Capacitance			4.1		
C_{rss}	Reverse Transfer Capacitance			1.6		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 250V I_D = 149A		1200		nC
Q_{gs}	Gate – Source Charge			200		
Q_{gd}	Gate – Drain Charge			560		
$T_{d(on)}$	Turn-on Delay Time	**Resistive Switching** V_{GS} = 15V V_{Bus} = 250V I_D = 149A R_G = 0.22 Ω		15		ns
T_r	Rise Time			20		
$T_{d(off)}$	Turn-off Delay Time			50		
T_f	Fall Time			10		

Source - Drain diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_S	Continuous Source current (Body diode)		Tc = 25°C			149	A
			Tc = 80°C			111	
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_S = - 149A				1.3	V
dv/dt	Peak Diode Recovery ❶					5	V/ns
t_{rr}	Reverse Recovery Time	I_S = - 149A V_R = 250V di_S/dt = 800A/µs	T_j = 25°C			250	ns
			T_j = 125°C			500	
Q_{rr}	Reverse Recovery Charge	I_S = - 149A V_R = 250V di_S/dt = 800A/µs	T_j = 25°C		10.4		µC
			T_j = 125°C		36		

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \le$ - 149A di/dt ≤ 700A/µs $V_R \le V_{DSS}$ $T_j \le$ 150°C

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resisatnce					0.1	°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		3.5	N.m
		For terminals	M5	2		3.5	
Wt	Package Weight					550	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)