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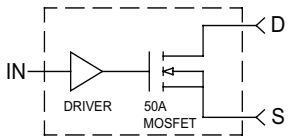
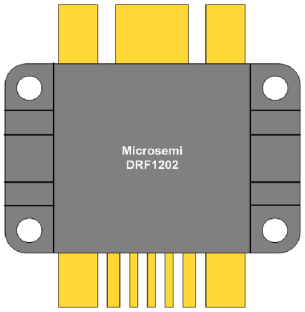
DRF1202

500V, 50A, 30MHz

MOSFET Driver Hvbrid

The DRF1202 hybrid includes a high power gate driver and the power MOSFET. The driver output can be configured as Inverting and Non-Inverting. It was designed to provide the system designer increased flexibility and lowered cost over a non-integrated solution.





FEATURES

- **Switching Frequency: DC TO 15MHz**
- **Low Pulse Width Distortion**
- **Single Power Supply**
- **1V CMOS Schmitt Trigger Input 1V Hysteresis**
- **Inverting Non-Inverting Select**
- **RoHS Compliant**
- **Switching Speed 3-4ns**
- **B_{Vds} = 500V**
- **I_{ds} = 50A avg.**
- **$R_{ds(on)} \leq .25$ Ohm**
- **P_D = 1180W**

TYPICAL APPLICATIONS

- **Class C, D and E RF Generators**
- **Switch Mode Power Amplifiers**
- **Pulse Generators**
- **Ultrasound Transducer Drivers**
- **Acoustic Optical Modulators**

Driver Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
V_{DD}	Supply Voltage	15	V
IN, FN	Input Single Voltages	-.7 to +5.5	
$I_{O\,PK}$	Output Current Peak	8	A
T_{JMAX}	Operating and Storage Temperature	175	°C

Driver Specifications

Symbol	Parameter	Min	Typ	Max	Unit
V_{DD}	Supply Voltage	10		15	V
IN	Input Voltage	3		5.5	
$IN_{(R)}$	Input Voltage Rising Edge		3		ns
$IN_{(F)}$	Input Voltage Falling Edge		3		
I_{DDQ}	Quiescent Current		2		mA
I_O	Output Current		8		A
C_{iss}	Input Capacitance		3		
R_{IN}	Input Parallel Resistance		1		MΩ
$V_{T(ON)}$	Input, Low to High Out (See Truth Table)	0.8		1.1	V
$V_{T(OFF)}$	Input, High to Low Out (See Truth Table)	1.9		2.2	
T_{DLY}	Time Delay (throughput)		38		ns
t_r	Rise Time		2.5		ns
t_f	Fall Time		2.5		
T_D	Prop. Delay		35		

Driver Output Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
C_{out}	Output Capacitance		2500		pF
R_{out}	Output Resistance		.8		Ω
L_{out}	Output Inductance		3		nH
F_{MAX}	Operating Frequency CL = 3000nF + 50Ω	30			MHz
F_{MAX}	Operating Frequency RL = 50Ω	50			

Driver Thermal Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$R_{\theta JC}$	Thermal Resistance Junction to Case		1.5		°C/W
$R_{\theta JHS}$	Thermal Resistance Junction to Heat Sink		2.5		
T_{JSTG}	Storage Temperature		-55 to 150		°C
P_{DJHS}	Maximum Power Dissipation @ T_{SINK} = 25°C		60		W
P_{DJC}	Total Power Dissipation @ T_C = 25°C		100		

MOSFET Absolute Maximum Ratings

Symbol	Parameter	Min	Typ	Max	Unit
BV_{DSS}	Drain Source Voltage	500			V
I_D	Continuous Drain Current T_C = 25°C @ I_D = 25A			50	A
$R_{DS(on)}$	Drain-Source On State Resistance			0.18	Ω
T_{jmax}	Operating Temperature			175	°C

MOSFET Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{gs} = 0		2000		pF
C_{oss}	Output Capacitance	V_{DS} = 50V		350		
C_{rss}	Reverse Transfer Capacitance	f = 1 MHz		75		

MOSFET Thermal Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$R_{\theta JC}$	Thermal Resistance Junction to Case			0.11	°C/W
$R_{\theta JHS}$	Thermal Resistance Junction to Heat Sink			0.23	
T_{JSTG}	Storage Temperature			-55 to 150	°C
P_{DHS}	Maximum Power Dissipation @ T_{SINK} = 25°C			650	W
P_{DC}	Total Power Dissipation @ T_C = 25°C			1360	

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

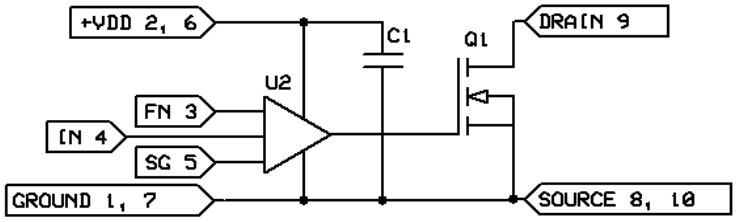


Figure 1, DRF1202 Simplified Circuit Diagram

The Simplified DRF1202 Circuit Diagram is illustrated above. By including the driver high speed by-pass capacitor (C1), their contribution to the internal parasitic loop inductance of the driver output is greatly reduced. This, coupled with the tight geometry of the hybrid, allows optimal gate drive to the MOSFET. This low parasitic approach, coupled with the Schmitt trigger input (IN), Kelvin signal ground (SG) and the Anti-Ring Function, provide improved stability and control in Kilowatt to Multi-Kilowatt, high Frequency applications. The IN pin is the input for the control signal and is applied to a Schmitt Trigger. Both the FN and IN pins are referenced to Kelvin ground (SG.) The signal is then applied to the intermediate drivers and level shifters; this section contains proprietary circuitry designed specifically for the ring abatement. The power drivers provide high current to the gate of the MOSFETS.

Dynamic Characteristics

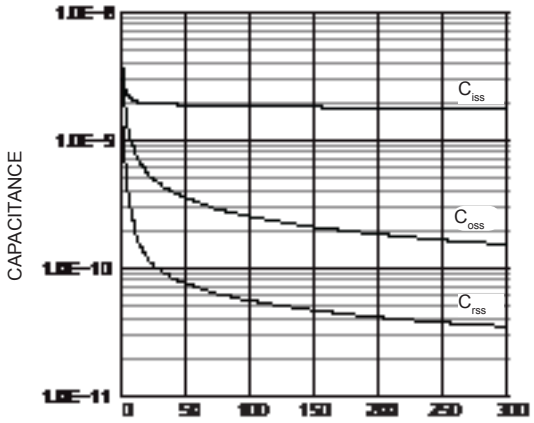


Figure 2, Typical Capacitance vs. Drain-to-Source Voltage

Truth Table *Referenced to SG		
FN (pin 3)*	**IN (pin 4)***	**MOSFET**
HIGH	HIGH	ON
HIGH	LOW	OFF
LOW	HIGH	OFF
LOW	LOW	ON

The Function (FN, pin 3) is the invert or non-invert select Pin, it is Internally held high.

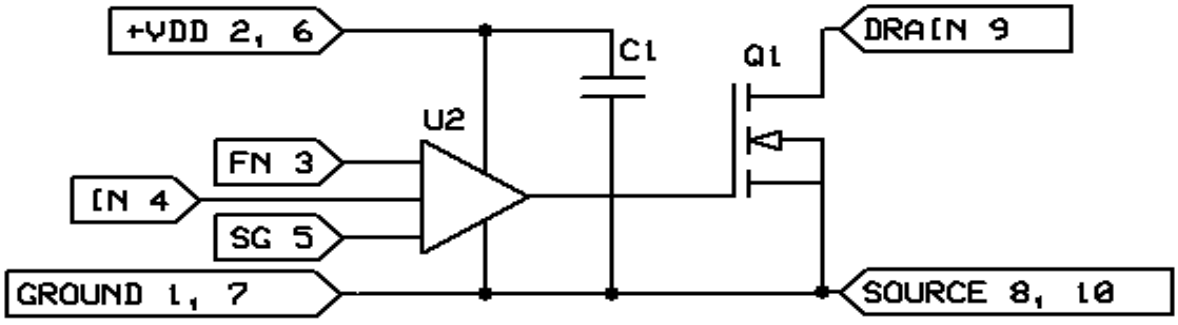


Figure 3, DRF1202 Test Circuit

The Test Circuit illustrated above was used to evaluate the DRF1202 (available as an evaluation Board DRF12XX / EVALSW.) The input control signal is applied to the DRF1202 via IN(4) and SG(5) pins using RG188. This provides excellent noise immunity and control of the signal ground currents.

The $+V_{DD}$ inputs (2,6) are by-passed (C1,C2, C4-C9), this is in addition to the internal by-passing mentioned previously. The capacitors used for this function must be capable of supporting the RMS currents and frequency of the gate load. R_L set for I_{DM} at V_{DS} max this load is used to evaluate the output performance of the DRF1202.

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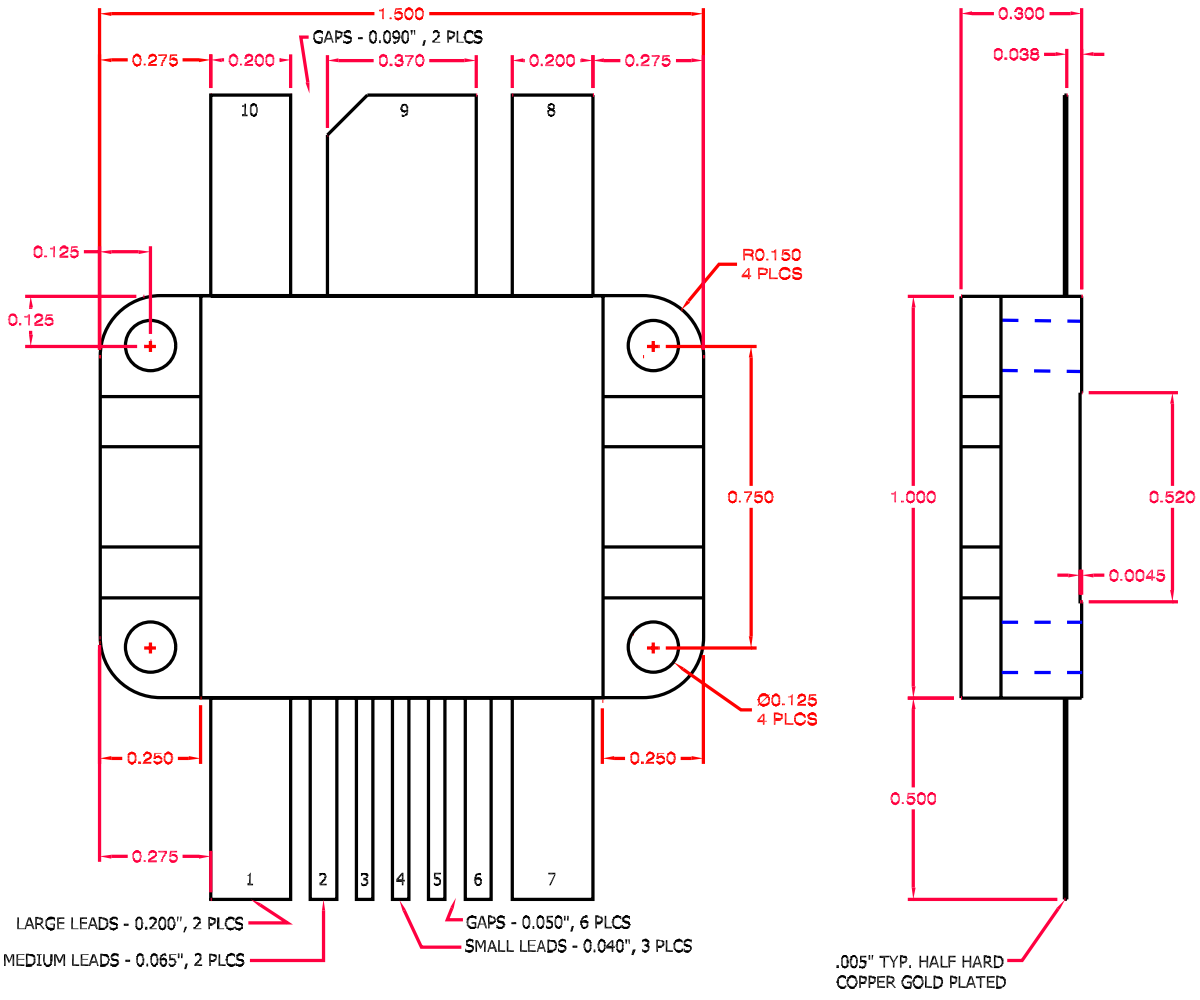
Pin Assignments	
Pin 1	Ground
Pin 2	+Vdd
Pin 3	FN
Pin 4	IN
Pin 5	SG
Pin 6	+Vdd
Pin 7	Ground
Pin 8	Source
Pin 9	Drain
Pin 10	Source



All dimensions are ± .005

Figure 4, DRF1202 Mechanical Outline

HAZARDOUS MATERIAL WARNING

The ceramic portion of the device between leads and mounting flange is beryllium oxide. Beryllium oxide dust is highly toxic when inhaled. Care must be taken during handling and mounting to avoid damage to this area. These devices must never be thrown away with general industrial or domestic waste. BeO substrate weight: 1.973g. Percentage of total module weight which is BeO: 31%.

Disclaimer:

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