
USER GUIDE FOR IR3624 EVALUATION BOARD USING IRF8910 SO-8 DUAL MOSFET AND 2x 22uF CERAMIC OUTPUT CAPACITORS

DESCRIPTION

The IR3624 IC is a synchronous Buck controller, providing a cost-effective, high performance and flexible solution.

Key features offered by the IR3624 Include programmable soft start ramp, fixed 600kHz switching frequency requiring no external components and input under-voltage lockout for proper start up.

An output over-current protection function is implemented by sensing the voltage developed across the on-resistance of the synchronous rectifier MOSFET for optimum cost and performance.

This user guide contains the schematic and bill of materials for the IR3624 evaluation board. The guide describes operation and use of the evaluation board itself. Detailed application information for the IR3624 integrated circuit is available in the IR3624 data sheet.

Evaluation Board Specifications:

$$V_{IN} = +12V, (13.2V \text{ Max})$$

$$V_{OUT} = +1.8V @ 6A$$

CONNECTIONS:

JP1 V_{IN} (+12V)
Ground

JP2 V_{OUT} (+1.8V)
Ground

J1 LX (inductor input node)
Ground

CONNECTION DIAGRAM

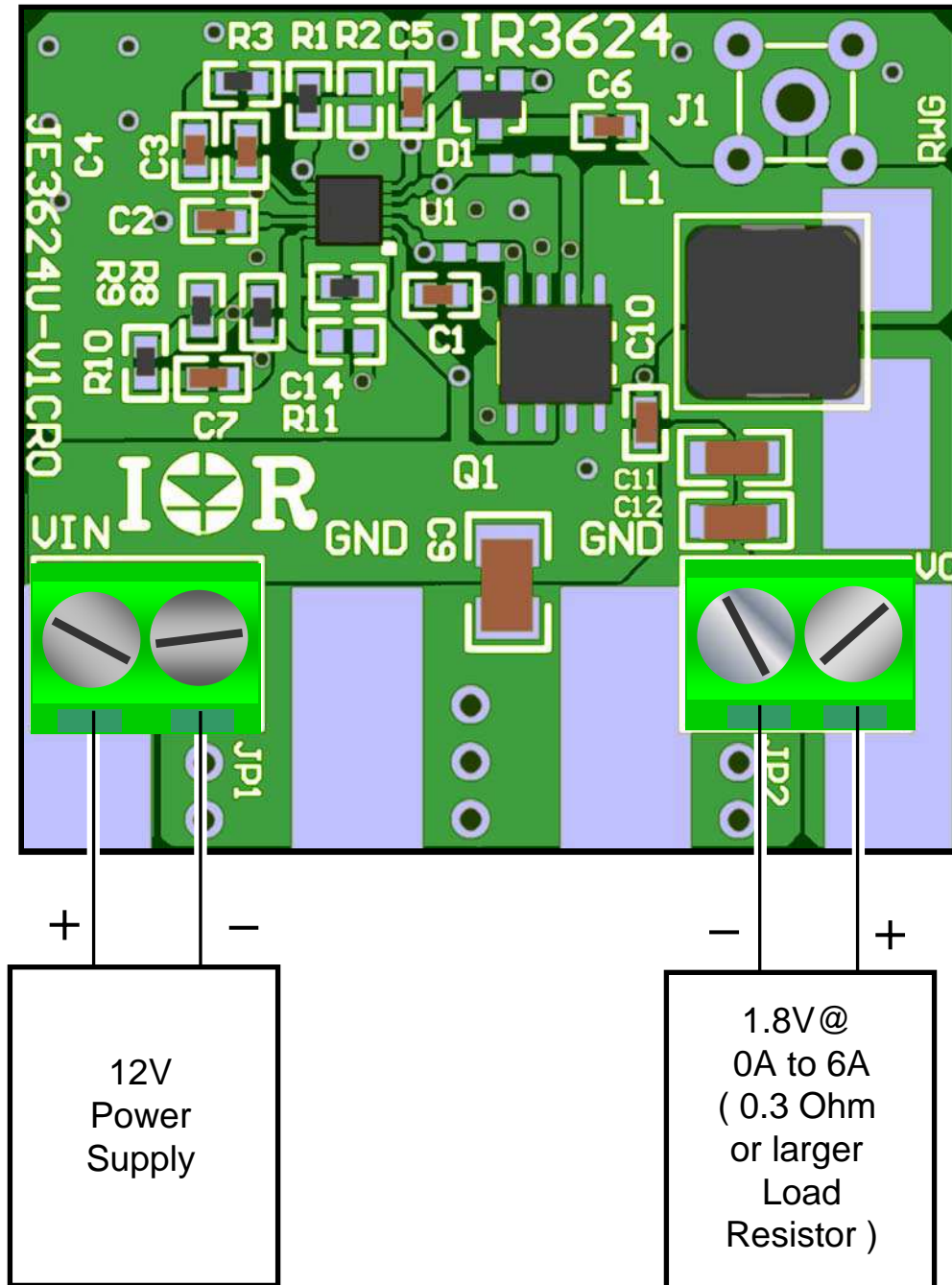


Figure 1 – Connection diagram of evaluation board for IR3624

LAYOUT

The PCB is 4-layer FR4 board. The IR3624 IC, the switching MOSFETS, and the associated passive components are mounted on the top side of the board. The bottom layer is used primarily for the signal and power grounds. The single point of connection between the signal ground and the power ground is located on the bottom layer.

Power supply decoupling capacitors, the charge pump capacitor and feedback components are located close to the IR3624 IC. The feedback resistors are connected to the output voltage at the point of regulation and are located close to the IC.

The switch MOSFET and the synchronous rectifier MOSFET are packaged together in a single SO-8 footprint device. The input and output energy storage capacitors and the power inductor are located close to the MOSFET package.

To improve efficiency, the circuit board is designed to minimize the length of the on-board power ground current path. Breaks in the solder mask are provided to allow easy soldered connections to external power supply and load devices.

Single point of connection
 between Analog Ground
 and Power Ground

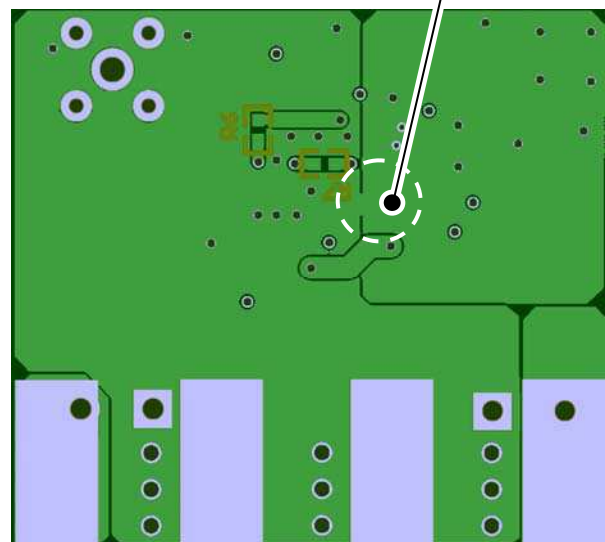
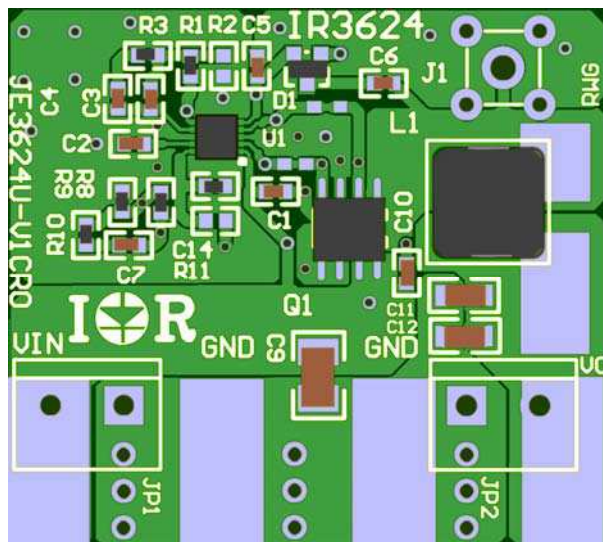


Figure 2 – Top and Bottom layers of the IR3624 evaluation board.

LAYOUT - GROUNDS

The two mid-layers are used primarily for Analog and Power ground. The two grounds are kept separated from each other. They are connected at a single point on the bottom layer as shown in Figure 2.

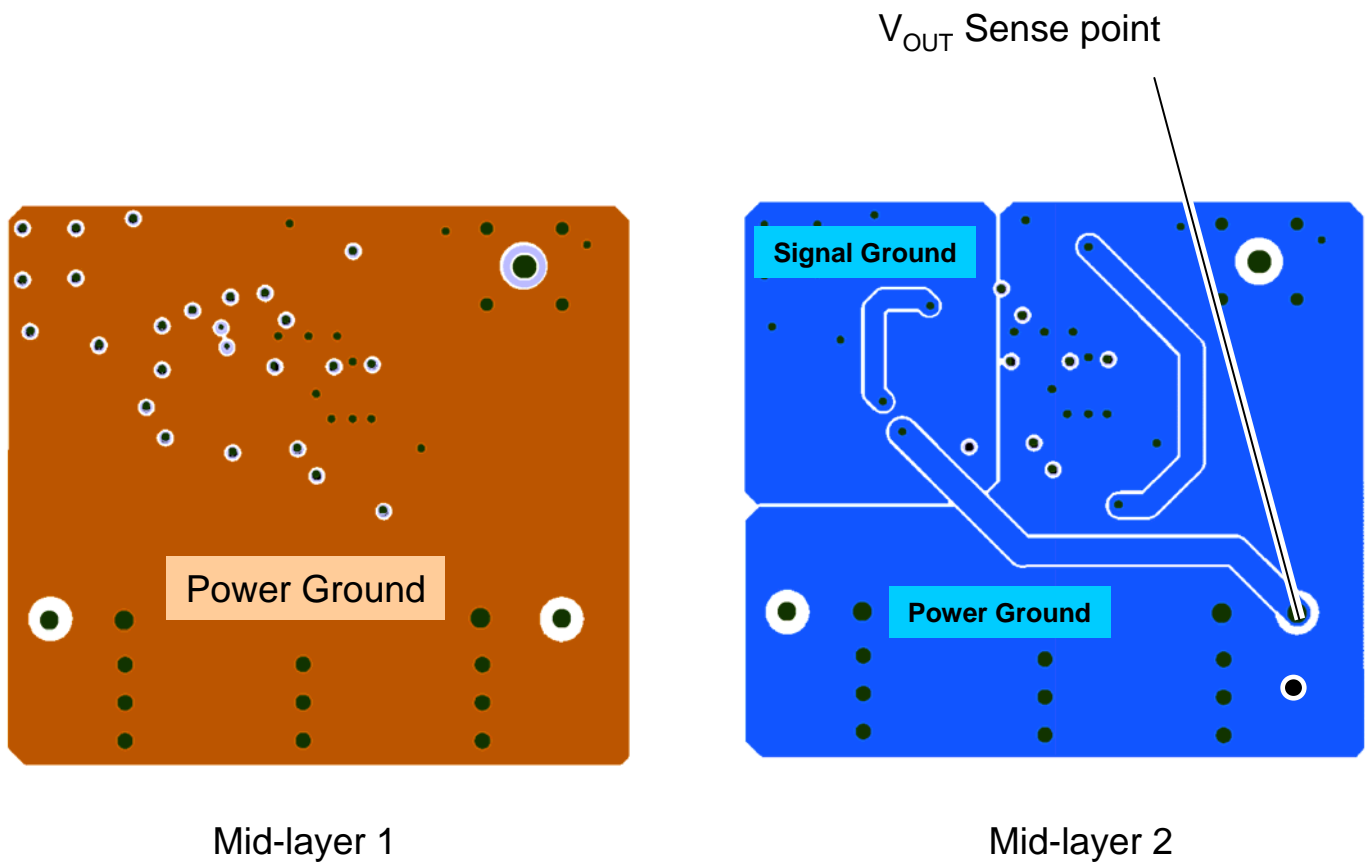
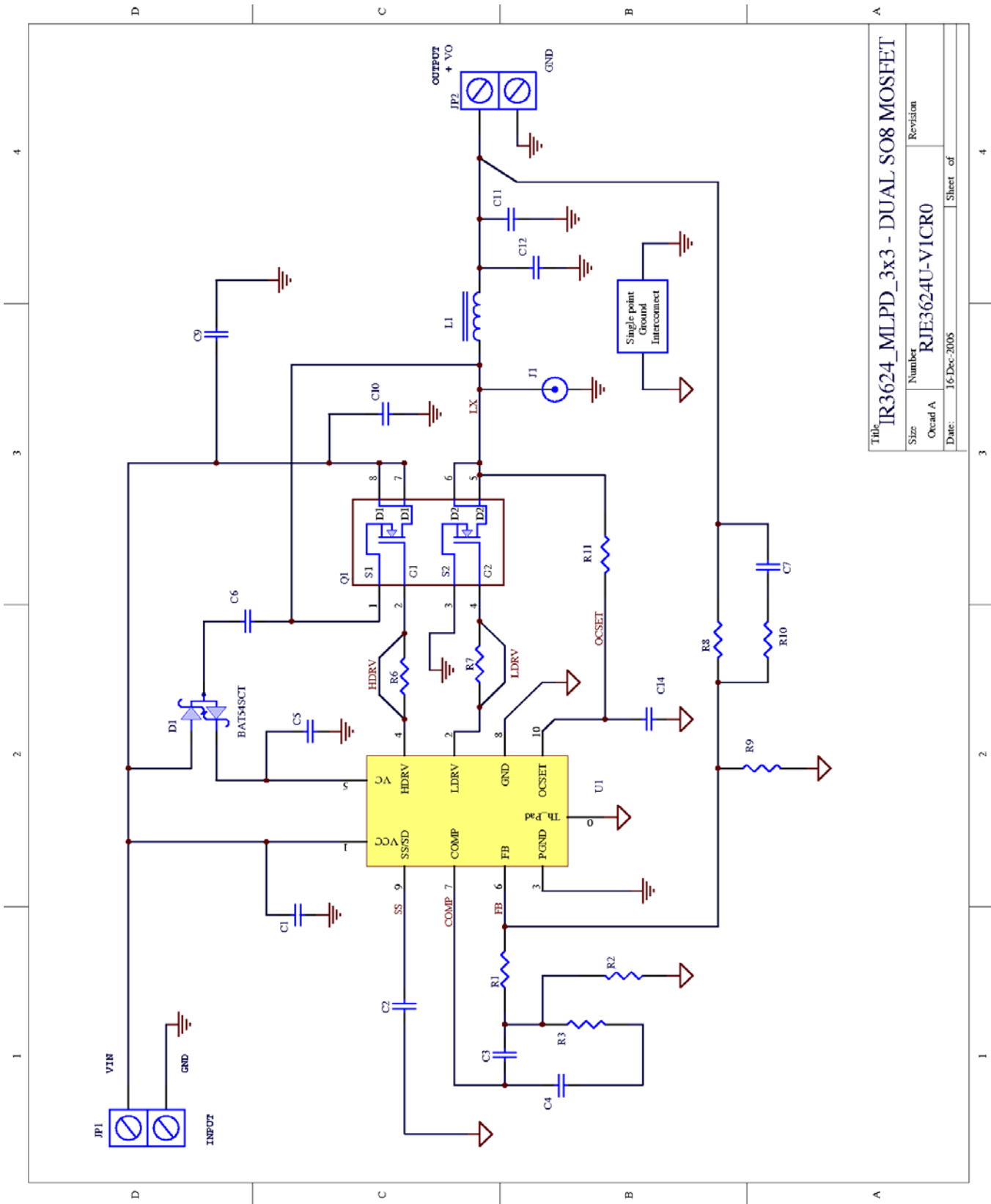


Figure 3 – Internal layers of IR3624 evaluation board.



Title		Revision	
IR3624_MLPD_3x3 - DUAL SO8 MOSFET	Number	RJE3624U-V1CR0	
Size	Occur A		
Date:	16-Dec-2005	Sheet	of

Figure 4 – Schematic of the IR3624 evaluation board

BILL OF MATERIALS

Ref Desig	Value	Description	Qty	Part#	Source
U1	Buck Synchronous	Controller, 10 lead MLPD	1	IR3624MPBF	International Rectifier
Q1	20V ,13.4mOhm	MOSFET	1	IRF8910	International Rectifier
D1	Schottky	SOT-23 Dual Diode	1	BAT54SCT	International Rectifier
L1	0.82uH	Inductor	1	STS703-R82M	ACT
C9	10uF, 25V, X5R,	EIA, 1210	1	ECJ4YB1E106M	Panasonic
C11, 12	22uF,6.3V,X5R,	EIA 0805	2	ECJ2FBOJ226M	Panasonic
C4	3900pF,50V,X5R	EIA 0603	1	ECJ-1VB1H392K	Panasonic
C3	100pF, 50V NP0	EIA 0603	1	ECJ-1VB1H101J	Panasonic
C7	330pF, 50V NP0	EIA 0603	1	ECJ-1VC1H331J	Panasonic
C10	1 uF, 16V X5R	EIA 0603	1	ECJ-1VB1C105K	Panasonic
C1, 2	0.1 uF, 16V Y5V	EIA 0603	2	ECJ-1VF1C104Z	Panasonic
C5, 6	0.1 uF, 50V Y5V	EIA 0603	2	ECJ-1VF1H104Z	Panasonic
R1	0 Ohm	EIA 0603	1	any	
R3	5.11 kOhm	EIA 0603	1	any	
R8	28.0 kOhm	EIA 0603	1	any	
R9	14.0 kOhm	EIA 0603	1	any	
R10	2.00 kOhm	EIA 0603	1	any	
R11	9.09 kOhm	EIA 0603	1	any	
JP1, 2	2-wire	Terminal Block	2	ED1973-ND	Digi-Key
PCB		Circuit Board	1	RJE3624U-V1CR0	International Rectifier
NONE		Adhesive rubber foot	4	SJ67-A2	3M "BUMPON"
C14		EIA 0603	Unused		
R2		EIA 0603	Unused		
R6		EIA 0603	Unused		
R7		EIA 0603	Unused		
J1		O-Scope-probe tip jack	Unused	131-5031-00	Tektronix

TYPICAL OPERATING WAVEFORMS

$V_{in}=13.2V$, $V_o=1.8V$, $I_o=0-6A$, $F_s=600\text{ kHz}$, Room Temperature, No Air Flow

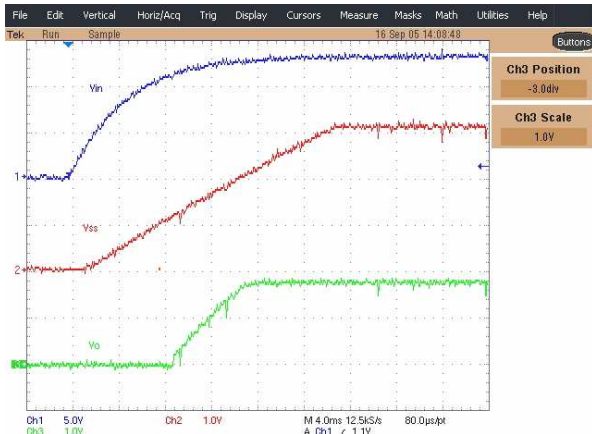


Fig.5: Start up at 6A Load
Ch₁:V_{in}, Ch₂:V_{ss}, Ch₃:V_o



Fig.6: Pre-Bias Start up
Ch₁:V_{in}, Ch₂:V_{ss}, Ch₃:V_o

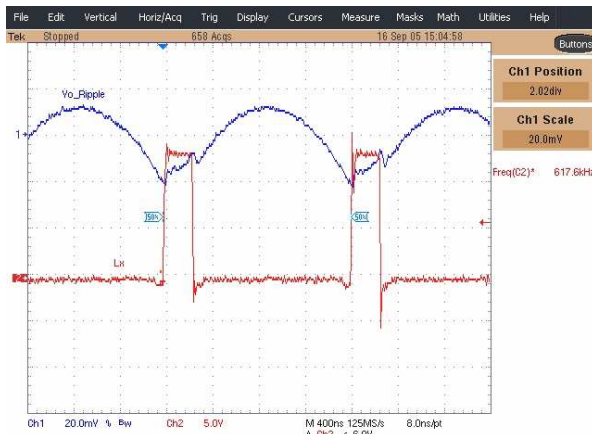


Fig.7: Output Voltage Ripple at 6A load
Ch₁: V_o, Ch₂:Inductor Point (L_x)

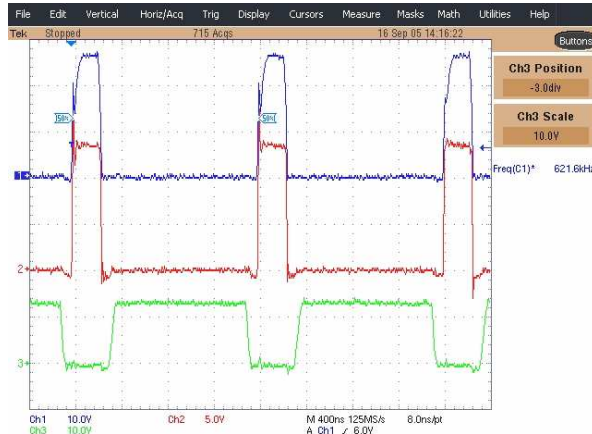


Fig.8: Gate signals at 6A load
Ch₁:HDrv, Ch₂:Lx, Ch₃:LDrv

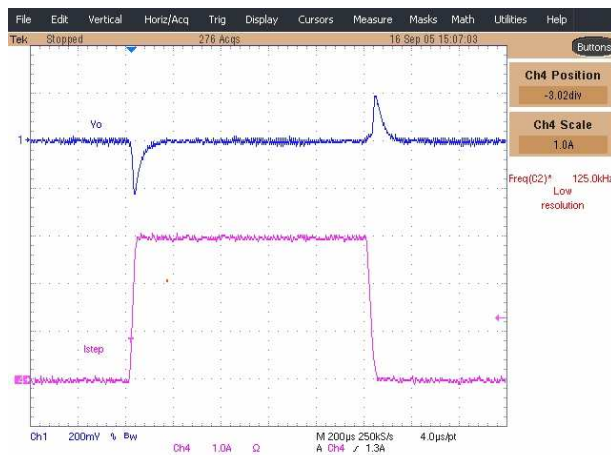


Fig.9: Transient Response
Ch₁:V_o, Ch₄:I_{step} (0-3A)



Fig.10: Shorted Output, Hiccup Condition
Ch₁:V_o, Ch₂:V_{ss}, Ch₄:I_o

TYPICAL OPERATING WAVEFORMS

$V_{in}=13.2V$, $V_o=1.8V$, $I_o=0-6A$, $F_s=600\text{ kHz}$, Room Temperature, No Air Flow

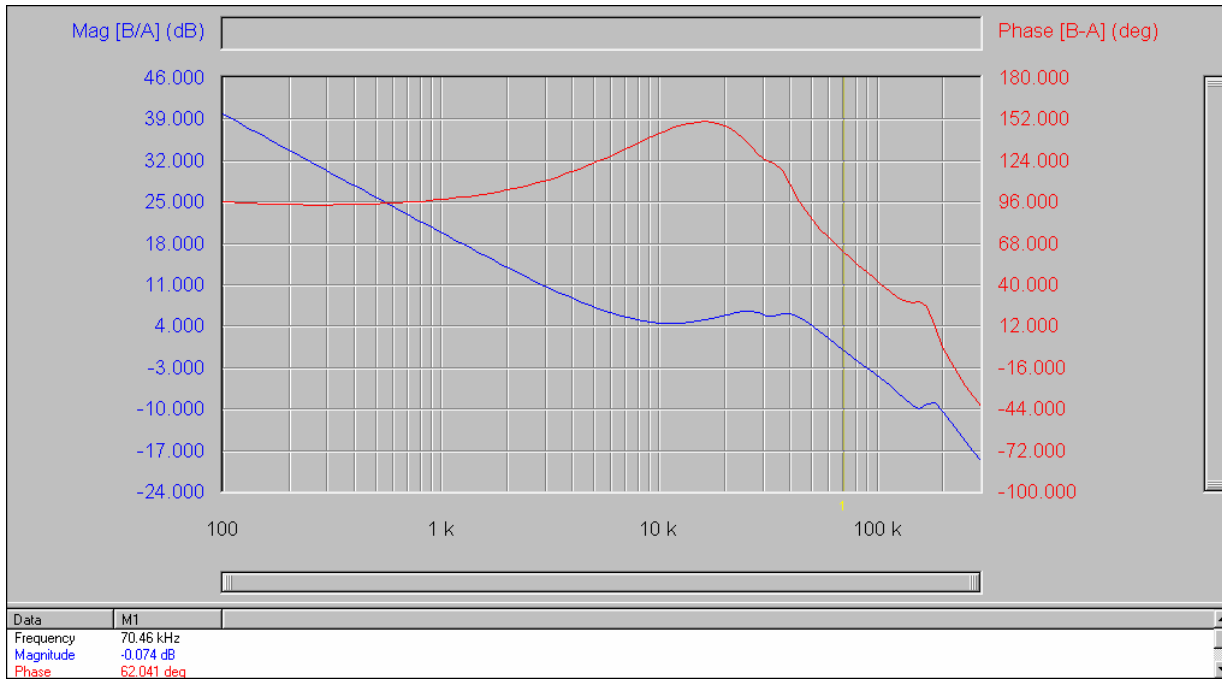


Fig.11: Bode Plot at 10% of load shows a bandwidth of 70kHz and phase margin of 62 degree

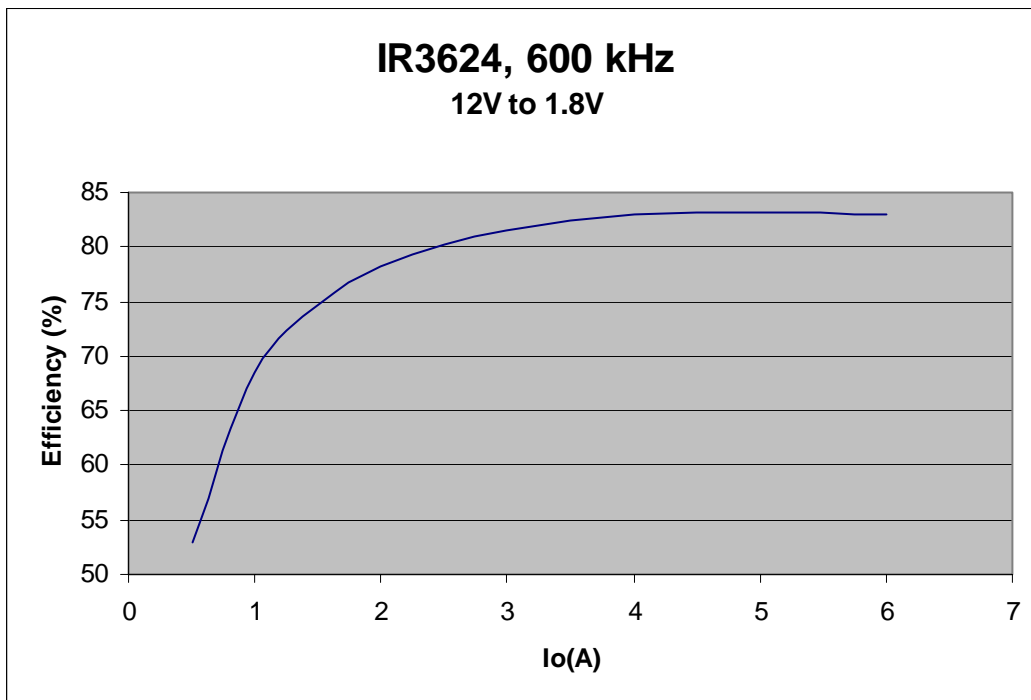
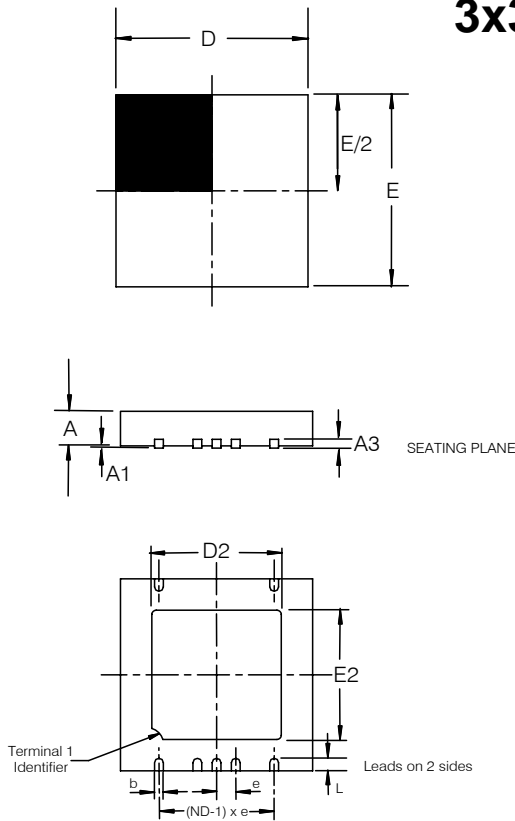


Fig.12: Efficiency at room temperature, no air flow

**(IR3624M) MLPD Package
3x3-10Lead**



S Y M B O L	VEED-5					
	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.90	1.00	.032	.035	.039
A1	0.00	0.02	0.05	.000	.0008	.0019
A3	0.20 REF			.008 REF		
b	0.18	0.25	0.30	.0071	.0098	.0118
D2	2.20	—	2.70	.087	—	.106
D	3.00 BSC			.118 BSC		
E	3.00 BSC			.118 BSC		
E2	1.40	—	1.75	.055	—	.068
L	0.30	0.40	0.50	.012	.016	.019
e	0.50 PITCH			.020 PITCH		
N	10			10		
ND	5			5		

TAPE & REEL ORIENTATION

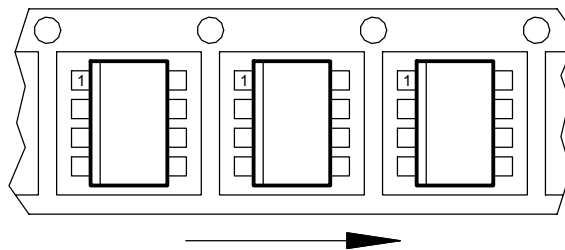


Figure A

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903

This product has been designed and qualified for the Industrial market.

Visit us at www.irf.com for sales contact information

Data and specifications subject to change without notice. 02/01