

8-PIN SYNCHRONOUS PWM CONTROLLER

FEATURES

- Synchronous Controller in 8-Pin Package
- Operating with single 5V or 12V supply voltage
- Internal 200KHz Oscillator (400KHz for IRU3037A)
- Soft-Start Function
- Fixed Frequency Voltage Mode
- 500mA Peak Output Drive Capability
- Protects the output when control FET is shorted
- SOIC 8-Lead also available LEAD-FREE

APPLICATIONS

- DDR memory source sink Vtt application
- Low cost on-board DC to DC such as 5V to 3.3V, 2.5V or 1.8V
- Graphic Card
- Hard Disk Drive

DESCRIPTION

The IRU3037 controller IC is designed to provide a low cost synchronous Buck regulator for on-board DC to DC converter applications. With the migration of today's ASIC products requiring low supply voltages such as 1.8V and lower, together with currents in excess of 3A, traditional linear regulators are simply too lossy to be used when input supply is 5V or even in some cases with 3.3V input supply. The IRU3037 together with dual N-channel MOSFETs such as IRF7313, provide a low cost solution for such applications. This device features an internal 200KHz oscillator (400KHz for "A" version), under-voltage lockout for both Vcc and Vc supplies, an external programmable soft-start function as well as output under-voltage detection that latches off the device when an output short is detected.

TYPICAL APPLICATION

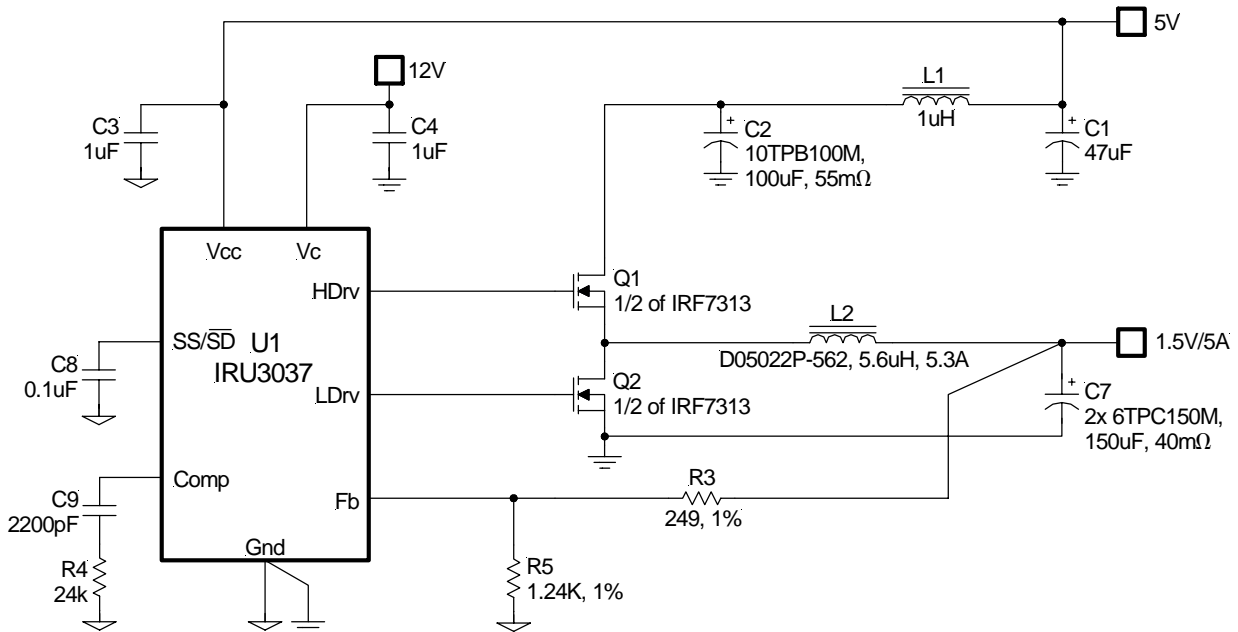


Figure 1 - Typical application of IRU3037 or IRU3037A.

PACKAGE ORDER INFORMATION

T _A (°C)	DEVICE	LEADFREE DEVICE	PACKAGE	FREQUENCY
0 To 70	IRU3037CF	IRU3037CFPbF	8-Pin Plastic TSSOP (F)	200KHz
0 To 70	IRU3037CS	IRU3037CSPbF	8-Pin Plastic SOIC NB (S)	200KHz
0 To 70	IRU3037ACF	IRU3037ACFPbF	8-Pin Plastic TSSOP (F)	400KHz
0 To 70	IRU3037ACS	IRU3037ACSPbF	8-Pin Plastic SOIC NB (S)	400KHz

ABSOLUTE MAXIMUM RATINGS

Vcc Supply Voltage	25V
Vc Supply Voltage	30V (not rated for inductive load)
Storage Temperature Range	-65°C To 150°C
Operating Junction Temperature Range	0°C To 125°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device.

PACKAGE INFORMATION

8-PIN PLASTIC TSSOP (F)	8-PIN PLASTIC SOIC (S)
<p style="text-align: center;">$\theta_{JA}=124^{\circ}\text{C/W}$</p>	<p style="text-align: center;">$\theta_{JA}=160^{\circ}\text{C/W}$ (Also available LEAD-FREE)</p>

ELECTRICAL SPECIFICATIONS

Unless otherwise specified, these specifications apply over $V_{CC}=5V$, $V_C=12V$ and $T_A=0$ to 70°C . Typical values refer to $T_A=25^{\circ}\text{C}$. Low duty cycle pulse testing is used which keeps junction and case temperatures equal to the ambient temperature.

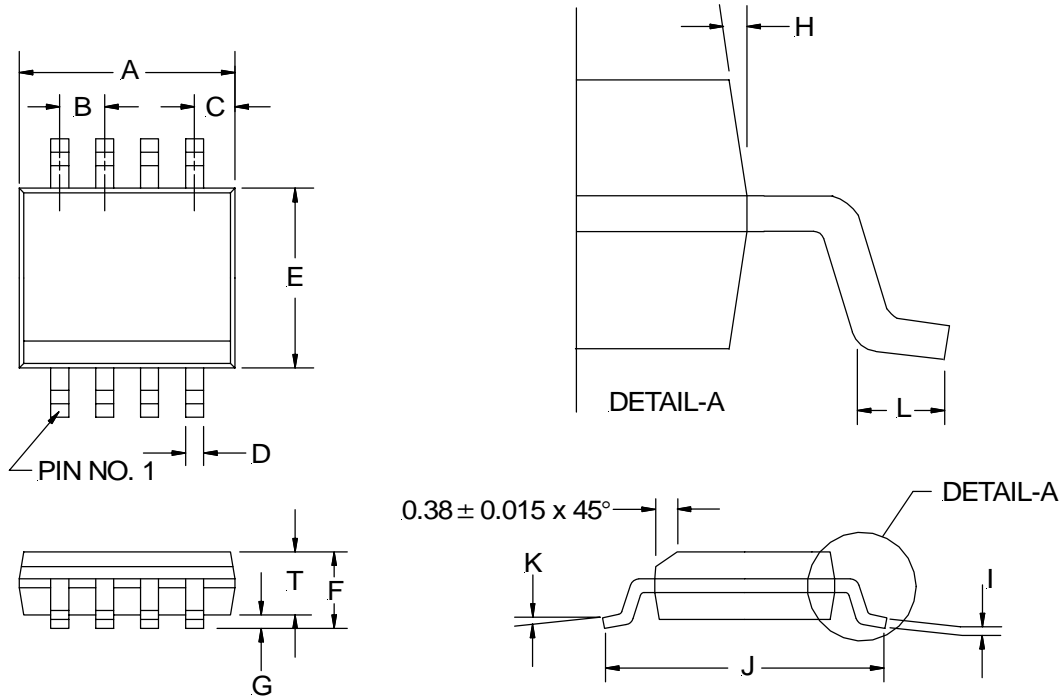
PARAMETER	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Reference Voltage						
Fb Voltage	V_{FB}	IRU3037 IRU3037A	1.225 0.784	1.250 0.800	1.275 0.816	V
Fb Voltage Line Regulation	L_{REG}	$5 < V_{CC} < 12$		0.2	0.35	%
UVLO						
UVLO Threshold - Vcc	$UVLO_{VCC}$	Supply Ramping Up	4.0	4.2	4.4	V
UVLO Hysteresis - Vcc				0.25		V
UVLO Threshold - Vc	$UVLO_{Vc}$	Supply Ramping Up	3.1	3.3	3.5	V
UVLO Hysteresis - Vc				0.2		V
UVLO Threshold - Fb	$UVLO_{Fb}$	Fb Ramping Down (IRU3037) (IRU3037A)	0.4 0.3	0.6 0.4	0.8 0.5	V
UVLO Hysteresis - Fb				0.1		V
Supply Current						
Vcc Dynamic Supply Current	$Dyn I_{CC}$	Freq=200KHz, $C_L=1500pF$	2	5	8	mA
Vc Dynamic Supply Current	$Dyn I_C$	Freq=200KHz, $C_L=1500pF$	2	7	10	mA
Vcc Static Supply Current	I_{CCQ}	SS=0V	1	3.3	6	mA
Vc Static Supply Current	I_{CQ}	SS=0V	0.5	1	4.5	mA
Soft-Start Section						
Charge Current	SS_{IB}	SS=0V	-10	-20	-30	μA

PARAMETER	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Error Amp						
Fb Voltage Input Bias Current	I _{FB1}	SS=3V, Fb=1V		-0.1		μA
Fb Voltage Input Bias Current	I _{FB2}	SS=0V, Fb=1V		-64		μA
Transconductance	g _m		410	600	830	μmho
Oscillator						
Frequency	Freq	IRU3037 IRU3037A	180 345	200 400	220 440	KHz
Ramp-Amplitude Voltage	V _{RAMP}		1.225	1.25	1.275	V
Output Drivers						
Rise Time	T _r	C _L =1500pF		50	100	ns
Fall Time	T _f	C _L =1500pF		50	100	ns
Dead Band Time	T _{DB}		50	150	250	ns
Max Duty Cycle	T _{ON}	Fb=1V, Freq=200KHz	85	90	95	%
Min Duty Cycle	T _{OFF}	Fb=1.5V	0	0		%

PIN DESCRIPTIONS

PIN#	PIN SYMBOL	PIN DESCRIPTION
1	Fb	This pin is connected directly to the output of the switching regulator via resistor divider to provide feedback to the Error amplifier.
2	Vcc	This pin provides biasing for the internal blocks of the IC as well as power for the low side driver. A minimum of 1μF, high frequency capacitor must be connected from this pin to ground to provide peak drive current capability.
3	LDrv	Output driver for the synchronous power MOSFET.
4	Gnd	This pin serves as the ground pin and must be connected directly to the ground plane. A high frequency capacitor (0.1 to 1μF) must be connected from V5 and V12 pins to this pin for noise free operation.
5	HDrv	Output driver for the high side power MOSFET. Connect a diode, such as BAT54 or 1N4148, from this pin to ground for the application when the inductor current goes negative (Source/ Sink), soft-start at no load and for the fast load transient from full load to no load.
6	Vc	This pin is connected to a voltage that must be at least 4V higher than the bus voltage of the switcher (assuming 5V threshold MOSFET) and powers the high side output driver. A minimum of 1μF, high frequency capacitor must be connected from this pin to ground to provide peak drive current capability.
7	Comp	Compensation pin of the error amplifier. An external resistor and capacitor network is typically connected from this pin to ground to provide loop compensation.
8	SS / \overline{SD}	This pin provides soft-start for the switching regulator. An internal current source charges an external capacitor that is connected from this pin to ground which ramps up the output of the switching regulator, preventing it from overshooting as well as limiting the input current. The converter can be shutdown by pulling this pin below 0.5V.

(S) SOIC Package
8-Pin Surface Mount, Narrow Body



8-PIN		
SYMBOL	MIN	MAX
A	4.80	4.98
B	1.27 BSC	
C	0.53 REF	
D	0.36	0.46
E	3.81	3.99
F	1.52	1.72
G	0.10	0.25
H	7° BSC	
I	0.19	0.25
J	5.80	6.20
K	0°	8°
L	0.41	1.27
T	1.37	1.57

NOTE: ALL MEASUREMENTS ARE IN MILLIMETERS.