

Sup/IRBuck™

HIGHLY INTEGRATED 14A

WIDE-INPUT VOLTAGE, SYNCHRONOUS BUCK REGULATOR

Features

- Wide Input Voltage Range 2.5V to 21V
- Wide Output Voltage Range 0.6V to 12V
- Continuous 14A Load Capability
- 300kHz High Frequency Operation
- Programmable Over-Current Protection
- Programmable PGood Output
- Hiccup Current Limit
- Precision Reference Voltage (0.6V)
- Programmable Soft-Start
- Pre-Bias Start-up
- Thermal Protection
- Thermally Enhanced Package
- Small Size 5mmx6mm QFN
- Pb-Free (RoHS Compliant)

Applications

- Distributed Point-of-Loads
- Server and Workstations
- Embedded Systems
- Storage Systems
- DDR Applications
- Graphics Cards
- Game Consoles
- Computing Peripheral Voltage Regulators

Description

The IR3820A **Sup/IRBuck™** is an easy-to-use, fully integrated and highly efficient DC/DC regulator. The onboard switching controller and MOSFETs make the IR3820A a space-efficient solution, providing accurate power delivery for low output voltage applications.

The IR3820A operates from a single 4.5V to 14V input supply and generates an output voltage adjustable from 0.6V to $0.8 \times V_{in}$ at loads up to 14A.

A versatile regulator offering programmability of startup time, power good threshold and current limit, the IR3820A's fixed 300kHz switching frequency allows the use of small external components.

The IR3820A also features important protection functions, such as Pre-Bias startup, hiccup current limit and thermal shutdown to provide the required system level security in the event of fault conditions.

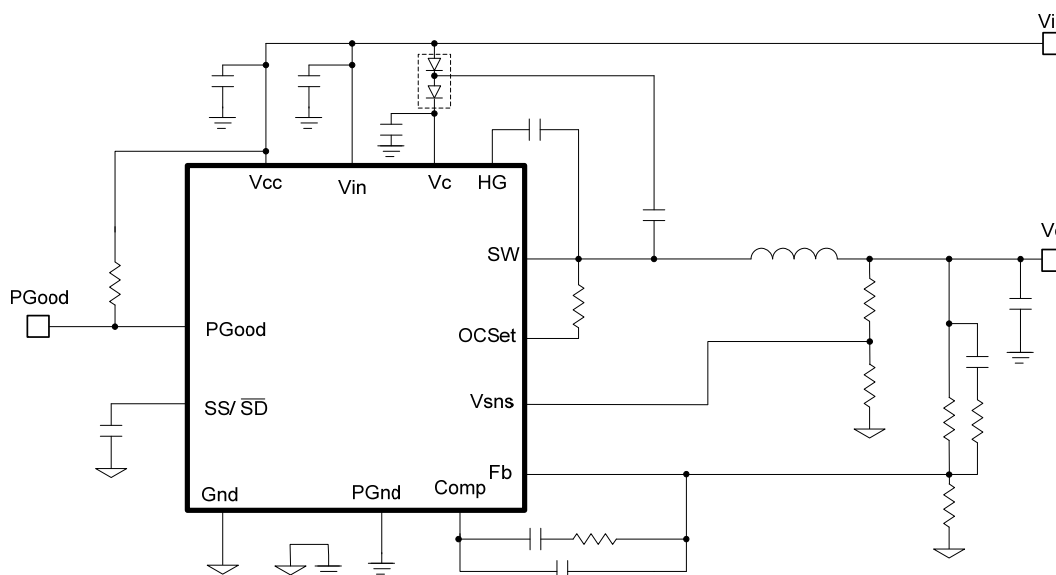


Fig. 1. Typical application diagram

ABSOLUTE MAXIMUM RATINGS

(Voltages referenced to GND)

- V_{IN} Supply Voltage ----- -0.3V to 24V
- V_{CC} Supply Voltage ----- -0.3V to 16V
- V_C Supply Voltage ----- -0.3V to 30V
- SW ----- -0.3V to 30V
- PGood ----- -0.3V to 16V
- Fb,COMP,SS,Vsns ----- -0.3V to 3.5V
- OCSet ----- 10mA
- AGnd to PGnd ----- -0.3V to +0.3V
- Storage Temperature Range ----- -65°C To 150°C
- Operating Junction Temperature Range ----- -40°C To 150°C
- ESD Classification ----- JEDEC, JESD22-A114
- Moisture Sensitivity Level ----- JEDEC Level 3 @ 260°C

Caution: Stresses beyond those listed under “Absolute Maximum Rating” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to “Absolute Maximum Rating” conditions for extended periods may affect device reliability.

PACKAGE INFORMATION

5mm x 6mm POWER QFN

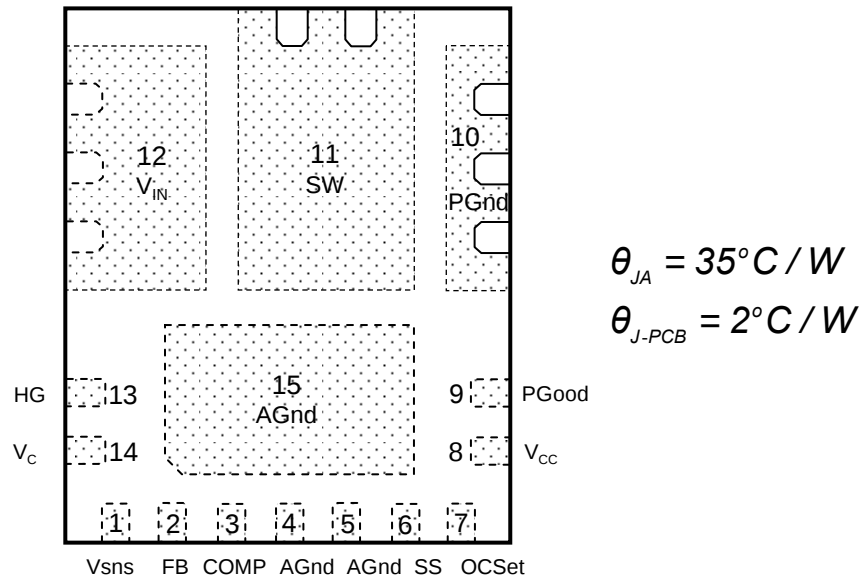


Fig. 2: Package outline (Top view)

ORDERING INFORMATION

PACKAGE DESIGNATOR	PACKAGE DESCRIPTION	PIN COUNT	PARTS PER REEL
M	IR3820AMTRPbF	15	4000
M	IR3820AMTR1PbF	15	750

Recommended Operating Conditions

Symbol	Definition	Min	Max	Units
V_{in}	Input Voltage	2.5	21	V
V_{cc}	Supply Voltage	4.5	14	
V_c	Supply Voltage	$V_{in} + 5V$	28	
V_o	Output Voltage	0.6	12	
I_o <i>Note1</i>	Output Current	0	14	A
T_j	Junction Temperature	-40	125	$^{\circ}C$

Electrical Specifications

Unless otherwise specified, these specification apply over $V_{in}=V_{cc}=V_c=12V$, $0^{\circ}C < T_j(I_c) < 105^{\circ}C$.
Typical values are specified at $T_a = 25^{\circ}C$.

Parameter	Symbol	Test Condition	Min	TYP	MAX	Units
Power Loss						
Power Loss	P _{loss}	V _{CC} =V _{in} =12V, V _c =24V, V _o =1.8V, I _o =14A, L=1.0uH, <i>Note3</i>		3.7		W
MOSFET R _{ds(on)}						
Top Switch	R _{ds(on)_Top}	I _D =13A, T _j (MOSFET)=25°C		6.9	8.7	mΩ
Bottom Switch	R _{ds(on)_Bot}	I _D =13A, T _j (MOSFET)=25°C		6.9	8.7	
Reference Voltage						
Feedback Voltage	V _{FB}			0.6		V
Accuracy		0°C<T _j <105°C	-1.35		+1.35	%
		-40°C<T _j <105°C, <i>Note2</i>	-1.5		+1.5	%
Supply Current						
V _{CC} Supply Current (Static)	I _{CC(Static)}	SS=0V, No Switching		10	13	mA
V _C Supply Current (Static)	I _{C(Static)}	SS=0V, No Switching		4.5	7	
V _{CC} Supply Current (Dynamic)	I _{CC(Dynamic)}	SS=3V, V _c =24V, V _{cc} =V _{in} =12V. V _o =1.8V, I _o =0A		15	22	
V _C Supply Current (Dynamic)	I _{C(Dynamic)}	SS=3V, V _c =24V, V _{cc} =V _{in} =12V. V _o =1.8V, I _o =0A		15	22	
Under Voltage Lockout						
V _{CC} -Start-Threshold	V _{CC_UVLO(R)}	Supply ramping up	4.0		4.4	V
V _{CC} -Stop-Threshold	V _{CC_UVLO(F)}	Supply ramping down	3.7		4.1	
V _{CC} -Hysteresis		Supply ramping up and down	0.15	0.25	0.3	
V _C -Start-Threshold	V _{C_UVLO(R)}	Supply ramping up	3.1		3.5	
V _C -Stop-Threshold	V _{C_UVLO(F)}	Supply ramping down	2.85		3.25	
V _C -Hysteresis		Supply ramping up and down	0.15	0.2	0.25	

Parameter	SYM	Test Condition	Min	TYP	MAX	Units
Oscillator						
Frequency	F_S		270	300	330	kHz
Ramp Amplitude	V_{ramp}	Note3		1.25		V
Min Pulse Width	$D_{min(ctr)}$	Note3		80		ns
Max Duty Cycle	D_{max}	Fb=0V	80			%
Error Amplifier						
Input Bias Current	I_{FB1}	SS=3V		-0.1	-0.5	μA
Input Bias Current	I_{FB2}	SS=0V	20	35	50	
Source/Sink Current	I(source/Sink)		50	70	90	
Transconductance	gm		1000	1300	1600	μmho
Soft Start/SD						
Soft Start Current	I_{SS}	SS=0V	15	20	28	μA
Shutdown Output Threshold	SD				0.25	V
Power Good						
Vsns Low Trip Point	Vsns(trip)	Vsns Ramping Down	0.35	0.38	0.41	V
Hysteresis	PGood(Hys)		15	27.5	40	mV
PGood Output Low Voltage	PG(voltage)	$I_{PGood}=4mA$		0.25	0.5	V
Input Bias Current	I_{sns}		0	0.3	1	μA
Over Current Protection						
OCSET Current	I_{OCSET}		15	20	26	μA
Hiccup Current	I_{Hiccup}	Note3		3		
Hiccup Duty Cycle	Hiccup(duty)	I_{Hiccup} / I_{SS} , Note3		15		%
Thermal Shutdown						
Thermal Shutdown Threshold		Note3		140		$^{\circ}C$
Thermal Shutdown Hysteresis		Note3		20		

Note1: Continuous output current determined by input and output voltage setting and the thermal environment.

Note2: Cold temperature performance is guaranteed via correlation using statistical quality control. Not tested in production.

Note3: Guaranteed by Design but not tested in production.

