Step Down Switching Regulator

multicomp PRO

RoHS Compliant

Description

This is a step down monolithic power switching regulator capable to deliver up to 1A at output voltages from 1.2V to 35V.
The device uses an internal P-Channel D-MOS transistor (with a typical Rdson of 250m) as switching element to minimize the size of the external components.
An internal oscillator fixes the switching frequency at 250KHz.
Having a minimum input voltage of 4.4V only, it is particularly suitable for 5V bus, available in all computer related applications.
Pulse by pulse current limit with the internal frequency modulation offers an effective constant current short circuit protection.

Applications

- Consumer: STB, DVD, TV, VCR, car radio, LCD monitors
- Networking: XDSL, modems, DC-DC modules
- Computer: printers, audio/graphic cards, optical storage, hard disk drive
- Industrial: changers, car battery, DC-DC converters

Features

- Up to 1A output current
- Operating input voltage from 4.4V to 36V
- 3.3V / (±2%) reference voltage
- Output voltage adjustable from 1.2V to 35V
- Low dropout operation: 100% duty cycle
- 250KHz Internally fixed frequency
- Voltage feedforward
- Zero load current operation
- Internal current limiting
- Inhibit for zero current consumption
- Synchronization
- Protection against feedback disconnection
- Thermal shutdown

Absolute Maximum Ratings

Table 2. Absolute maximum ratings

Parameter	Symbol	Value	Unit
Input voltage	V_8	40	V
Output DC voltage Output peak voltage at t = 0.1 s	V_1	-1 to 40 -5 to 40	
Maximum output current	I_1	int. limit.	
Analog pins	V_4, V_5	4	V
INH	V_3	-0.3V to V_{CC}	
SYNC	V_2	-0.3 to 4	V
Power dissipation at TA≤60°C	P_{TOT}	0.75	W
Operating junction temperature range	T_J	-40 to 150	°C
Storage temperature range	T_{STG}	-55 to 150	

Thermal Data

Symbol	Parameter	SOP-8	Unit
R_{thJA}	Maximum thermal resistance junction-ambient	120 (1)	C/W

1. Package mounted on board

Electrical characteristics (T_J = 25°C, V_{CC} = 12V, unless otherwise specified)

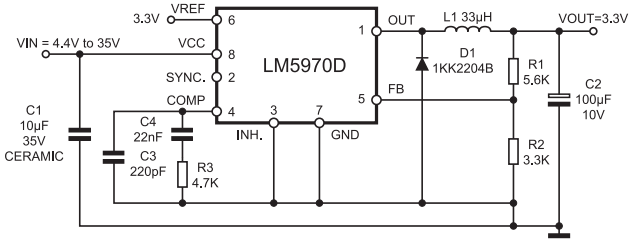
Parameter Name	Test condition		Symbol	Min	Typ	Max	Unit
Operating input voltage range	V_o = 1.235V; I_o = 2A	(1)	V_{CC}	4.4		36	V
Mosfet on Resistance		(1)	$R_{DS(on)}$		0.25	0.5	Ω
Maximum limiting current	V_{CC} = 4.4V to 36V		I_l	1.5	1.87	2.25	A
Switching frequency		(1)	f_s	212	250	280	KHz
				225		275	
Duty cycle				0		100	%
Dynamic characteristics (see test circuit).							
Voltage feedback	4.4V < V_{CC} < 36V, 20mA < I_O < 2A		V_5	1.22	1.235	1.25	V
		(1)		1.198	1.235	1.272	
Efficiency	V_O = 5V, V_{CC} = 12V		h		90		%
DC characteristics							
Total operating quiescent current		(1)	I_{qop}		3	5	mA
Quiescent current	Duty cycle = 0; V_{FB} = 1.5V		I_q			2.5	
Total stand-by quiescent current	V_{inh} > 2.2V	(1)	I_{qst-by}		50	100	µA
	V_{CC} = 36V; V_{inh} > 2.2V				80	150	
Inhibit							
INH threshold voltage	Device ON					0.8	V
	Device OFF			2.2			
Error amplfier							
High level output voltage	V_{FB} = 1V		V_{OH}	3.5			V
Low level output voltage	V_{FB} = 1.5V		V_{OL}			0.4	
Source output current	V_{COMP} = 1.9V; V_{FB} = 1V		$I_{o\ source}$	200	300		µA
Sink output current	V_{COMP} = 1.9V; V_{FB} = 1.5V		$I_{o\ sink}$	1	1.5		mA
Source bias current			I_b		2.5	4	µA
DC open loop gain	R_L = ∞			50	65		dB
Transconductance	I_{comp} = -0.1mA to 0.1mA V_{COMP} = 1.9V		gm		2.3	mS	
Sync function							
High input voltage	V_{CC} = 4.4V to 36V		V_{REF}	2.5			V
Low input voltage	V_{CC} = 4.4V to 36V					0.74	

Parameter Name	Test condition		Symbol	Min	Typ	Max	Unit
Slave sink current	V_{sync} = 0.74V (2) V_{sync} = 2.33V			0.11 0.21		0.25 0.45	mA
Master output amplitude	I_{source} = 3mA			2.75	3		V
Output pulse width	no load, V_{sync} = 1.65V			0.2	0.35		µs
Reference section							
Reference voltage				3.234	3.3	3.366	V
	I_{REF} = 0 to 5mA V_{CC} = 4.4V to 36V	(1)		3.2	3.3	3.399	
Line regulation	I_{REF} = 0mA V_{CC} = 4.4V to 36V				5	10	mV
Load regulation	I_{REF} = 0 to 5mA				8	15	
Short circuit current				10	18	30	mA

1. Specification Referred to TJ from -40 to 125°C. Specification over the -40 to +125 TJ Temperature range are assured by design, characterization and statistical correlation.
2. Guaranteed by design.

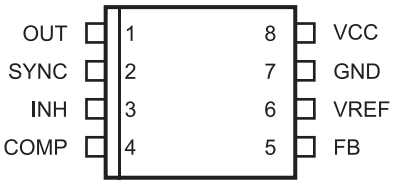
Test application circuit

Figure 1. Test application circuit



Pin connection

Figure 2. Pin connection (top view)



Dimensions : Millimetres

Pin Description

Table 1. Pin description

N°	Type	Description
1	OUT	Regulator output.
2	SYNC	Master/slave synchronization.
3	INH	A logical signal (active high) disables the device. If INH not used the pin must be grounded. When it is open an internal pull-up disable the device.
4	COMP	E/A output for frequency compensation.
5	FB	Feedback input. Connecting directly to this pin results in an output voltage of 1.23V. An external resistive divider is required for higher output voltages.
6	VREF	3.3V V_{REF}. No cap is requested for stability.
7	GND	Ground.
8	VCC	Unregulated DC input voltage.

Typical characteristics

Figure 3. Junction temperature vs output current

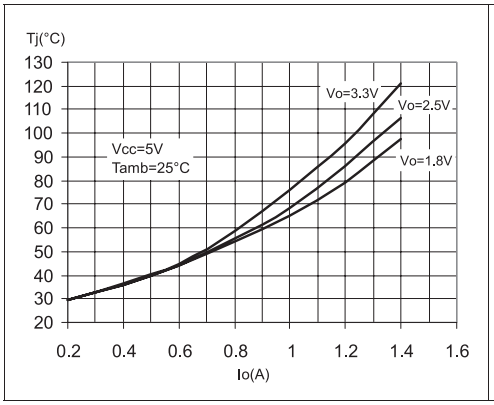


Figure 4. Load regulator

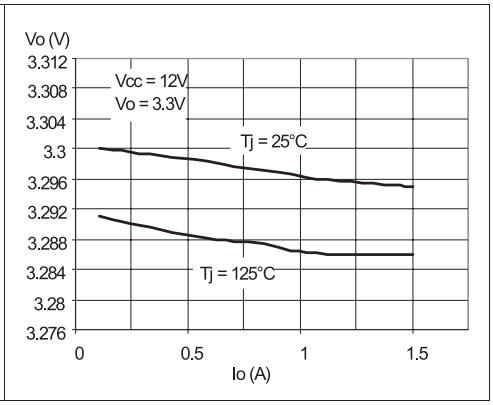


Figure 5. Junction temperature vs output current

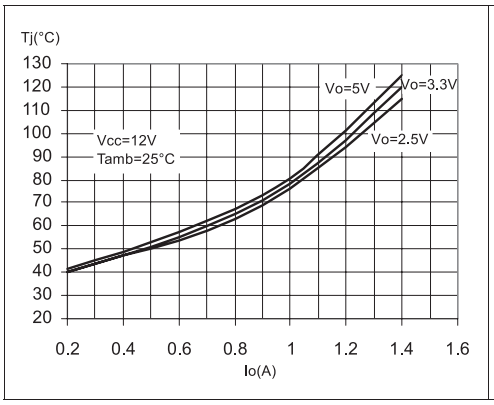


Figure 6. Line regulator

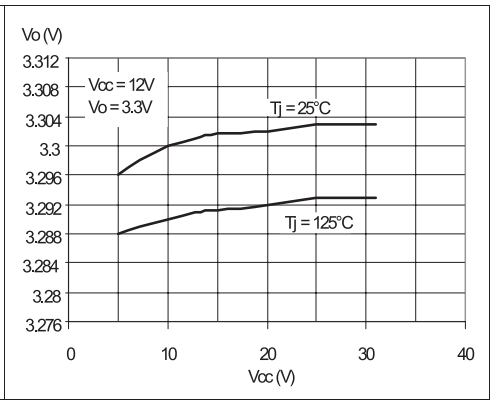


Figure 7. Junction temperature vs output current

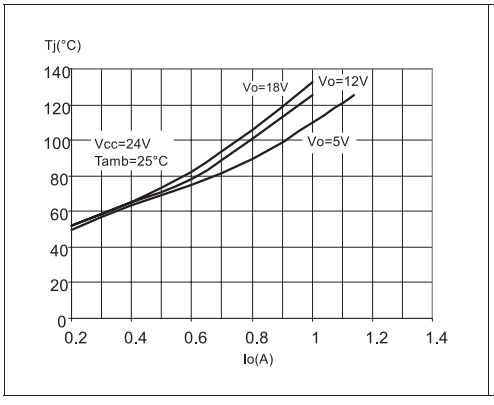


Figure 8. Output voltage vs junction temperature

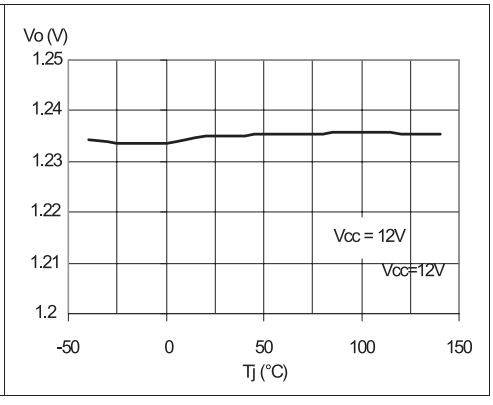


Figure 9. Quiescent current vs junction temperature

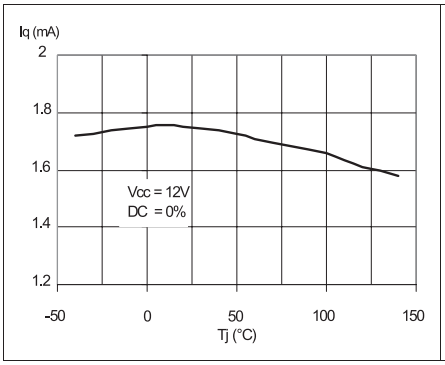


Figure 10. Switching frequency vs junction temperature

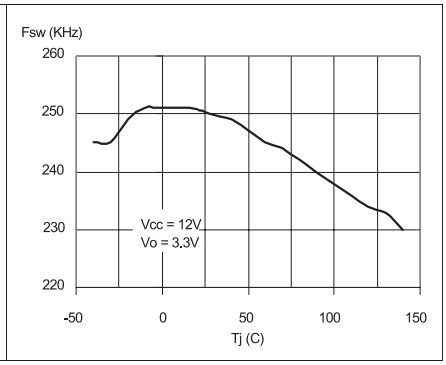


Figure 11. Shutdown current vs junction temperature

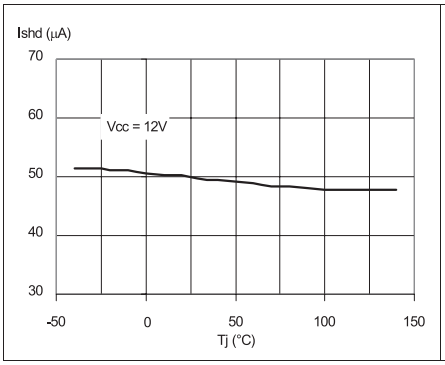


Figure 12. Efficiency vs output current

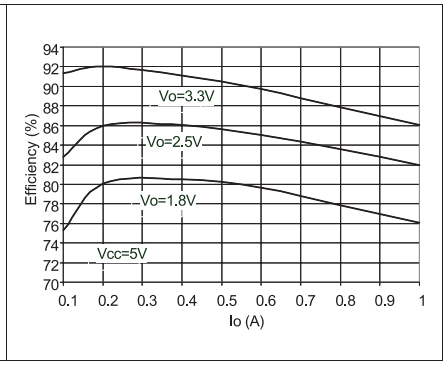
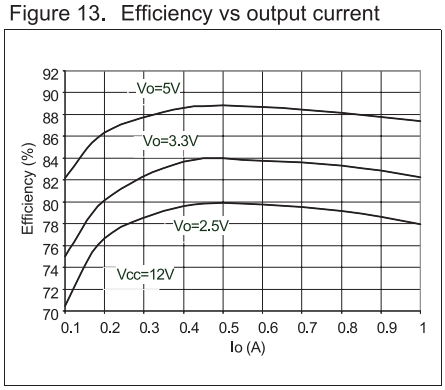


Figure 13. Efficiency vs output current



Part Number Table

Description	Part Number
Negative Voltage Regulator 1.25V-37V, 1.5A, TO-220F	LM337ATF