

DESCRIPTION

The LXM1600/1600A-xx series of DC/DC converters are Voltage Regulator Modules (VRM) which are specifically designed to meet or exceed the Pentium Pro VRM electrical specification as well as its mechanical outline. The LXM1600-xx is guaranteed to deliver a minimum current of 11.2A while the LXM1600A-xx is capable of 12.4A for higher speed processor applications. These converters maintain a total tolerance of $\pm 5\%$ maximum, which includes load and line regulation, temperature stability, initial accuracy, load transient and ripple and noise. One of the main features of these converters is their ability to program the output voltage from 2 to 3.5V using a 4-bit word from

the processors, providing automatic voltage adjustment for each individual processor. Other features include high efficiency, short-circuit protection, over-voltage protection, under-voltage detection, soft start and logic level output enable functions.

The LXM1600/1600A-05 powers the processor using the 5V supply as the input power and 12V for the control bias. The LXM1600/1600A-12 powers the processor using only the 12V supply and does not need a separate voltage for the control bias (see Block Diagram below). The LXM1600A-12 is primarily used for multiple processor applications, such as quad processor servers, where 5V supplies may not have the needed current capability.

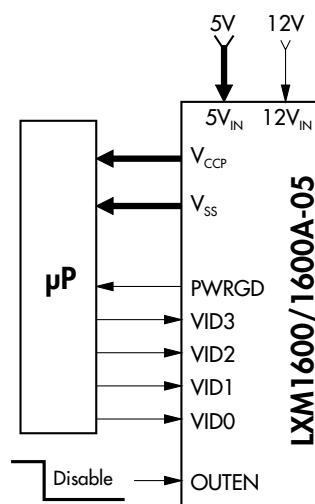
KEY FEATURES

- **GUARANTEED > 12.4A (LXM1600A-xx)**
- **GUARANTEED > 11.2A (LXM1600-xx)**
- TOTAL OUTPUT TOLERANCE OF LESS THAN $\pm 5\%$
Includes: Line & load regulation, temperature stability, initial accuracy, load transient and ripple & noise.
- ADJUSTABLE OUTPUT VOLTAGE USING A FOUR-BIT WORD (See Table 1)
- OVER-VOLTAGE DETECTION CROWBARS THE OUTPUT VOLTAGE IN THE EVENT OF PASS TRANSISTOR FAILURE - 100% PROCESSOR PROTECTION
- HIGH EFFICIENCY — 85% (TYP.)
- POWER GOOD SIGNAL INDICATES LOW OUTPUT VOLTAGE
- SOFT START ELIMINATES TURN ON OVERSHOOT
- SHORT-CIRCUIT PROTECTION
- OUTPUT ENABLE /SHUTDOWN

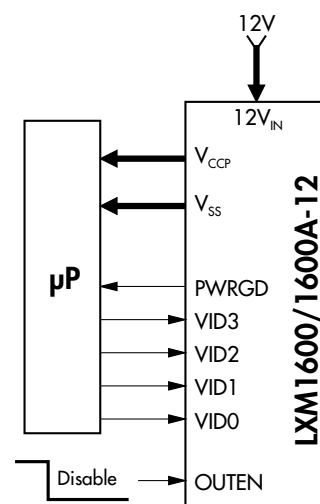
MODULE PHOTO



BLOCK DIAGRAM



LXM1600/1600A-05
IN A 5V SUPPLY APPLICATION



LXM1600/1600A-12
IN A 12V SUPPLY APPLICATION

MODULE ORDER INFORMATION

Part #	Input	I _{MAX}
LXM1600-05	5V	11.2A
LXM1600A-05	5V	12.4A
LXM1600-12	12V	11.2A
LXM1600A-12	12V	12.4A

FOR FURTHER INFORMATION CALL (714) 898-8121

LXM1600/1600A-xx

PENTIUM® PRO VRM MODULE

PRELIMINARY SPECIFICATION

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	LXM1600/1600A-xx			Units
			Min.	Typ.	Max.	
Input Voltage	V_{IN}		4.75	5	5.25	V
			11.4	12	12.6	V
Total Output Voltage Tolerance	V_O		2.945	3.1	3.255	V
			3.135	3.3	3.465	V
Includes: Initial Accuracy		$I_O = 0.3A, T_A = 25^\circ C$		± 0.6		%
Load Regulation		$I_O = 0.3A$ to 11.2A		15		mV
		$I_O = 0.3A$ to 12.4A		15		mV
Line Regulation		$0.95V_{IN}$ to $1.05V_{IN}$		1		mV
Temp. Stability		10 to $60^\circ C$		16		mV
Load Transient		$I_O = 0.3A$ to 11.2A, $V_{IN} = 5V$		90		mV
		$I_O = 0.3A$ to 12.4A, $V_{IN} = 5V$		95		mV
Output Ripple & Noise		$I_O = 5A$		12		mV
Output Current	I_O	$V_O = 3.1V$	11.2	11.8		A
		$V_O = 3.1V$	12.4	12.6		A
					0	A
Power Good Threshold	V_{THPG}			$0.93V_{SET}$		V
Power Good Output LO Resistance	R_{LOPG}	OUTEN = LO		5		Ω
Output Enable	OUTEN					
LO Level Input Voltage	V_{OL}	$I_{OL} = 1mA$			0.8	V
HI Level Input Voltage	V_{OH}	$I_{OH} = 1mA$	2			V
Turn-on Response	T_R	0 to 99% of V_O after V_{IN} reaches 90%			10	ms
Efficiency	Eff	$I_O = 11A$		85		%
		$I_O = 11A$		80		%
Over-Voltage Threshold	V_{OV}	$V_O = 3.1V$		3.66		V
		$V_O = 3.3V$		3.85		V
Average Short-Circuit Current	I_{SC}	$V_O = 0V$		2		A
Ambient Temperature	T_A		0		60	$^\circ C$
Required Air Flow		$I_O = 11.2A$	100			LFM
		$I_O = 12.4A$	200			LFM

Table 1

D_3	D_2	D_1	D_0	$V_{SET} (V)$
1	1	1	1	2
1	1	1	0	2.1
1	1	0	1	2.2
1	1	0	0	2.3
1	0	1	1	2.4
1	0	1	0	2.5
1	0	0	1	2.6
1	0	0	0	2.7
0	1	1	1	2.8
0	1	1	0	2.9
0	1	0	1	3.0
0	1	0	0	3.1
0	0	1	1	3.2
0	0	1	0	3.3
0	0	0	1	3.4
0	0	0	0	3.5

- Note: 0 $\equiv$ Processor pin connected to ground.
1 $\equiv$ Processor pin Open or pulled High externally by system design to detect a socket with no processor.

PRELIMINARY SPECIFICATION

CONNECTOR PIN-OUTS AND DESCRIPTIONS

Pin #	Ref. Desig.	Description
A1	5V _{IN}	5V Input Power (not needed for LXM1600/1600A-12)
A2	5V _{IN}	5V Input Power (not needed for LXM1600/1600A-12)
A3	5V _{IN}	5V Input Power (not needed for LXM1600/1600A-12)
A4	12V _{IN}	12V Input Power
A5	Reserved	This pin is reserved for future applications
A6	Reserved	This pin is reserved for future applications
A7	VID0	Bit 0 of the 4-bit input (see Table 1)
A8	VID2	Bit 2 of the 4-bit input (see Table 1)
A9	UP#	This pin is not connected internally
A10	V _{CP}	Output voltage to microprocessor
A11	V _{SS}	Output voltage return
A12	V _{CP}	Output voltage to microprocessor
A13	V _{SS}	Output voltage return
A14	V _{CP}	Output voltage to microprocessor
A15	V _{SS}	Output voltage return
A16	V _{CP}	Output voltage to microprocessor
A17	V _{SS}	Output voltage return
A18	V _{CP}	Output voltage to microprocessor
A19	V _{SS}	Output voltage return
A20	V _{CP}	Output voltage to microprocessor

Pin #	Ref. Desig.	Description
B1	5V _{IN}	5V Input Power (not needed for LXM1600/1600A-12)
B2	5V _{IN}	5V Input Power (not needed for LXM1600/1600A-12)
B3	5V _{IN}	5V Input Power (not needed for LXM1600/1600A-12)
B4	12V _{IN}	12V Input Power
B5	Reserved	This pin is reserved for future applications
B6	OUTEN	A TTL input that disables output when it switches to LO state
B7	VID1	Bit 1 of the 4-bit input (see Table 1)
B8	VID3	Bit 3 of the 4-bit input (see Table 1)
B9	PWRGD	An open collector output that switches LO when output is below the specified range
B10	V _{SS}	Output voltage return
B11	V _{CP}	Output voltage to microprocessor
B12	V _{SS}	Output voltage return
B13	V _{CP}	Output voltage to microprocessor
B14	V _{SS}	Output voltage return
B15	V _{CP}	Output voltage to microprocessor
B16	V _{SS}	Output voltage return
B17	V _{CP}	Output voltage to microprocessor
B18	V _{SS}	Output voltage return
B19	V _{CP}	Output voltage to microprocessor
B20	V _{SS}	Output voltage return

MODULE DIMENSIONS

