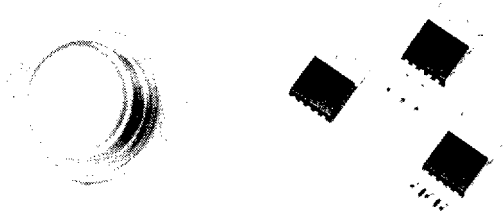
3 AMP DC-TO-DC MICROCONVERTER

LSH-6335
LSH-6435



FEATURES

- Military temperature range
- Complete DC-to-DC converter
- 70% minimum efficiency
- 80kHz switching frequency
- Programmable output voltage from 5 to 31 Volts
- Preset output voltage of 5.05 Volts ±1.5%
- Current limit and thermal shutdown
- Inhibit/enable control pin

DESCRIPTION

The LSH-6335/LSH-6435 switching regulator is a micro-hybrid circuit designed for use in step-down applications requiring accurate output voltages over combined variations of line, load and temperature. This unique product greatly simplifies switching power supply design. The LSH-6335/LSH-6435 microconverter includes a switching regulator, catch diode and compensation network within a TO-220 style package. Just add a choke and two capacitors to obtain an efficient DC-to-DC converter for 5 Volts at 3 Amps. To increase the output voltage, simply add a programming resistor. The current limit and thermal shutdown features of the LSH-6335/ LSH-6435 fully protect the device against overstress conditions.

In order to accommodate various mounting and operating temperature requirements, the LSH-6335 and LSH-6435 are available in 4 package options. The LSH-6335 is offered in 3 TO-220 style lead formations: straight in-line, staggered vertical mount and staggered horizontal mount. A full military temperature range hermetic TO-3 together with inhibit/enable control pin is also available in the LSH-6435.

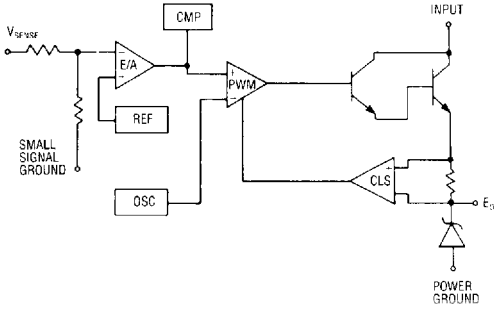
ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MAXIMUM	UNITS
Input Voltage LSH-6335 LSH-6435	V_{IN}	35 40	Volts
Power Dissipation	P_D	Internally Limited	Watts
Thermal Resistance Junction to Case	θ_{JC}	7	°C/W
Operating Junction Temperature Range TO-220 TO-3	T_J	 – 25 to 125 – 55 to 150	°C
Storage Temperature Range TO-3 TO-220	T_{STG}	 – 65 to 150 – 25 to 125	°C
Lead Temperature (Soldering) 10 Sec. for TO-220 60 Sec. for TO-3	T_{LEAD}	 260 300	°C

DEVICE SELECTION GUIDE

DEVICE	V_{IN} MAX	V_{OUT} MAX	LEADS
LSH-6335P	35	27	Straight in-line
LSH-6335PV	35	27	Vertical staggered
LSH-6335PH	35	27	Horizontal staggered
LSH-6435P	40	31	Straight in-line
LSH-6435PV	40	31	Vertical staggered
LSH-6435PH	40	31	Horizontal staggered
LSH-6435	40	31	TO-3
LSH-6435M	40	31	TO-3 Mil screened

BLOCK DIAGRAM



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ELECTRICAL CHARACTERISTICS

Input test conditions are as follows: V_{IN} = 24VDC, V_O = 5VDC, I_O = 3A, T_J = 25°C, unless otherwise specified.

Parameter	Symbol	Test Conditions			Test Limits			Units
		V_{IN}	I_O	T_J[5]	Minimum	Typical	Maximum	
Output Voltage[1]	V_O	12V to $V_{IN(MAX)}$	5mA 0.3A to 3A	Over Temp	4.97 4.80	5.05	5.13 5.30	Volts
Line Regulation[1]	$REG_{(LINE)}$	12V to $V_{IN(MAX)}$				90		mV
Load Regulation[1]	$REG_{(LOAD)}$		0.3A to 3A			45		mV
System Efficiency	η			Over Temp	70	75		%
Switching Frequency	f_{SX}		50mA		60	80	100	kHz
Quiescent Current	I_Q	$V_{IN(MAX)}$	0A			18	30	mA
Peak Current Limit Knee	I_{CL}			Over Temp	3.3			Amps
Short Circuit Current Limit	I_{SC}					7.5		Amps
Output Noise and Ripple[4] LSH-6335 LSH-6435	V_N	 30V + $5V_{pk-pk}$ 35V + $5V_{pk-pk}$				50		mV_{pk-pk}
Turn On Overshoot			0.3A to 3A			0		mV
Unit Step Load Change			5mA to 3A 3A to 0.05A			0 250		mV mV_{pk}
Programming Resistance[3]		12V to $V_{IN(MAX)}$		Over Temp		0.2		Volts/kΩ

(1)Low duty cycle, pulse testing with Kelvin connections required.
(2)10mS duration.
(3)V_O programming above 5.05V to 27V.
(4)120 Hz input ripple.
(5)Over temperature – 25°C to 125°C for TO-220; – 55°C to 150°C for TO-3.

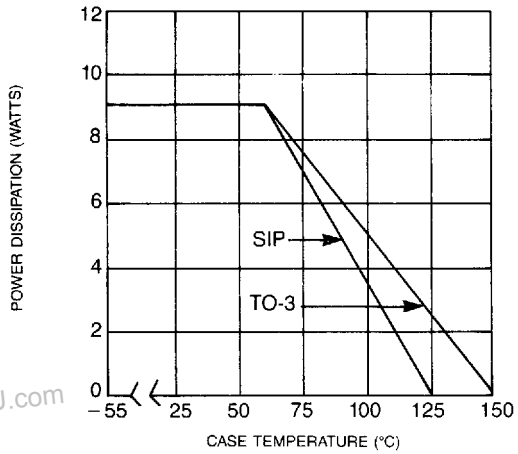
MILITARY SCREENING

100% screened in accordance with MIL-STD-883, Method 5004 Class B

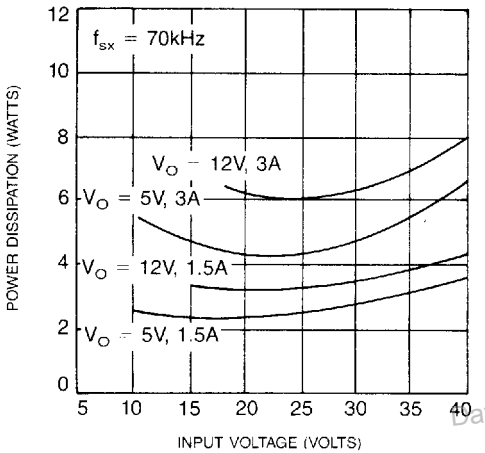
Screen	MIL-STD-883 Test Method
Internal Visual	2010
Temperature Cycling	1010
Constant Acceleration	2010
Hermeticity	1014
Electricals	Per Specification
Burn-In	1015
External Visual	2009

OPERATIONAL DATA

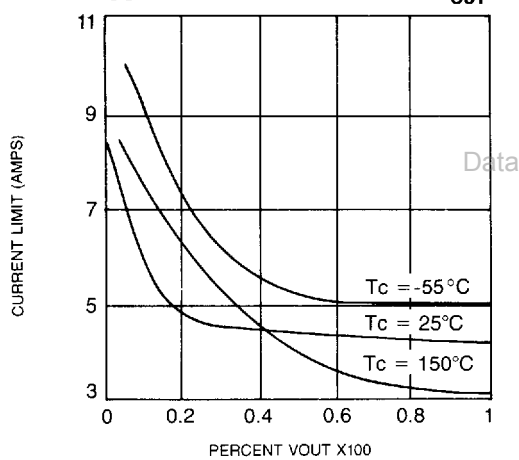
POWER DERATING



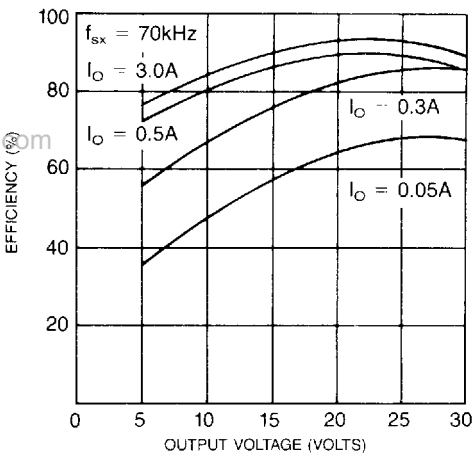
POWER DISSIPATION VS INPUT VOLTAGE



CURRENT LIMIT VS. PERCENT V_{OUT}



EFFICIENCY VS OUTPUT VOLTAGE



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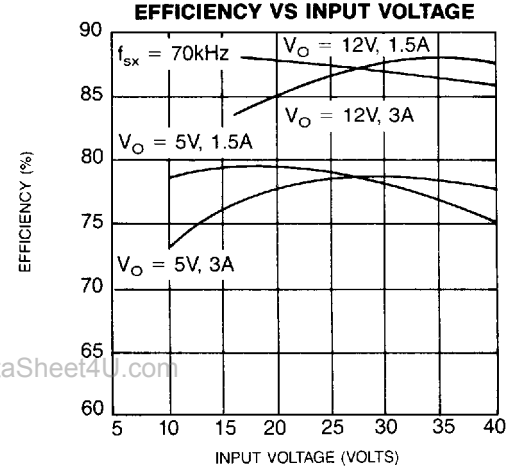
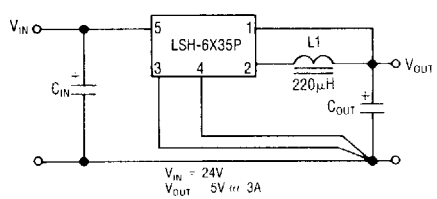


TYPICAL APPLICATION

DC-TO-DC STEP-DOWN CONVERTER[1,2]



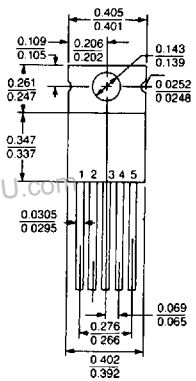
[1] C_{IN} = 330µF; C_{OUT} = 1000µF
[2] For output voltages above 5V, add programming resistor between Pin 1 and V_{OUT}.

3 AMP DC-TO-DC MICROCONVERTER

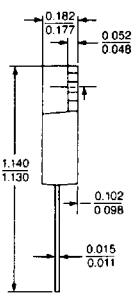
DEVICE OUTLINE

LSH-6X35P

(Front View)

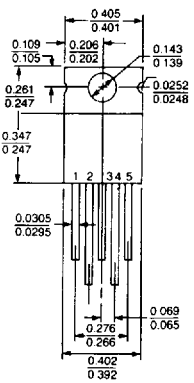


(Side View)

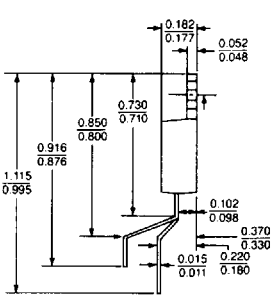


LSH-6X35PV

(Front View)

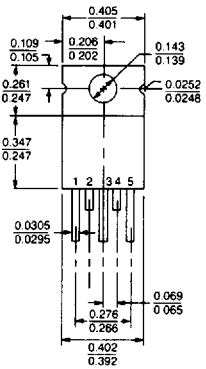


(Side View)

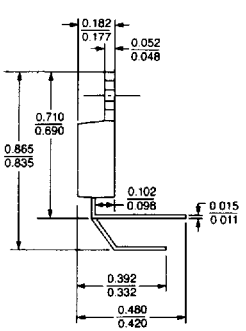


LSH-6X35PH

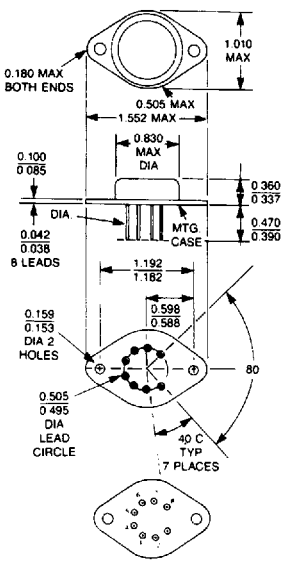
(Front View)



(Side View)



LSH-6435



1 — V_{SENSE}
2 — E_O
3 — Small Signal Ground
4 — Power Ground
5 — Input
Tab is Small Signal Ground

1 — CT
2 — Small Signal Ground
3 — CNT
4 — N/C
5 — V_{SENSE}
6 — EO
7 — Power Ground
8 — Input
Case is Small Signal Ground

NOTE: All dimensions are in inches.