INTEGRATED CIRCUITS
UNITRODE

8 AMP SWITCHING REGULATORS

LAS 6380 SERIES

T-58-11-31

FEATURES

- DC to 100 kHz operation
- Adjustable output voltage
- Cycle-by-cycle current limit
- Internal thermal shutdown
- Inhibit/enable control pin

DESCRIPTION

The LAS 6380 Series are monolithic integrated circuits designed for fixed frequency, pulse width modulated, switching converter applications such as step-down, step-up, flyback, forward, Cŭk and voltage inverting DC-to-DC converters and motor controls. The LAS 6380 Series includes a temperature compensated voltage reference, sawtooth oscillator with over-current frequency shift, linear trailing edge pulse width modulator with double pulse suppression logic, transconductance error amplifier, and an 8 amp Darlington output transistor with internal current limit protection.

The LAS 6380 & 6380P1 can be used in step-down or step-up applications. The LAS 6381 & LAS 6381P1 are for step-down applications where current limit adjustment is necessary. The LAS 6380 Series is available in TO-3 steel packages for true hermetic seal and board insertable plastic SIP packages.

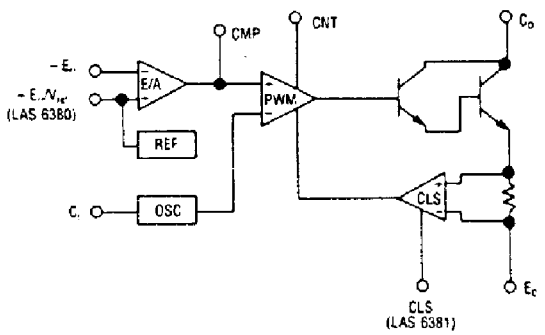
ABSOLUTE MAXIMUM RATINGS

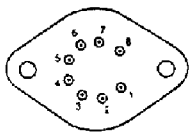
PARAMETER	SYMBOL	MAXIMUM	UNITS
Control Circuit Voltage	V_{CC}	35	Volts
Output Collector Voltage	C_O	35	Volts
Power Dissipation	P_D	Internally Limited	Watts
Thermal Resistance Junction to Case LAS 6380&6381 LAS 6380P1&6381P1	θ_{JC}	 1.5 0.8	°C/W
Operating Junction and Storage Temperature Range	T_J T_{STG}	- 25 to 125	°C
Lead Temperature (Soldering) 60 sec for TO-3 10 sec for SIP	T_{LEAD}	 300 260	°C

DEVICE SELECTION GUIDE

DEVICE	CURRENT LIMIT	PACKAGE
LAS 6380	Fixed	TO-3
LAS 6381	Adjustable	TO-3
LAS 6380P1	Fixed	Plastic SIP
LAS 6381P1	Adjustable	Plastic SIP

BLOCK DIAGRAM





Bottom View

LAS6380

1 – C_O
2 – V_{CC}
3 – C_t
4 – CNT
5 – V_{REF}
6 – $E_{rr}(-)$
7 – CMP
8 – E_O
Case is Ground

LAS6381

1 – C_O/V_{CC}
2 – C_t
3 – CNT
4 – V_{REF}
5 – $E_{rr}(-)$
6 – CMP
7 – CLS
8 – E_O
Case is Ground

LAS6380P1

1 – C_O
2 – V_{CC}
3 – C_t
4 – CNT
5 – GND
6 – V_{REF}
7 – $E_{rr}(-)$
8 – CMP
9 – E_O
Tab is Ground

LAS6381P1

1 – C_O/V_{CC}
2 – C_t
3 – CNT
4 – V_{REF}
5 – GND
6 – $E_{rr}(-)$
7 – CMP
8 – CLS
9 – E_O
Tab is Ground

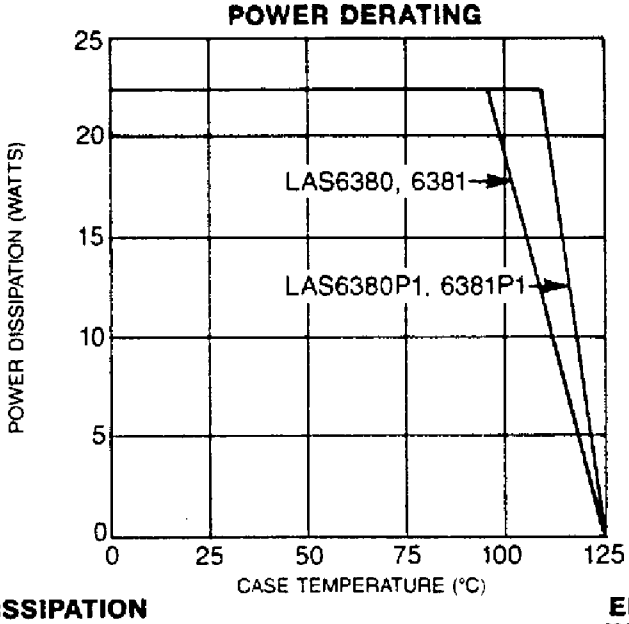
ELECTRICAL CHARACTERISTICS

Test conditions are as follows: V_{CC} = 24V, V_O = 5V, I_O = 8A, C_t = 0.0056μF, T_J = 25°C, unless otherwise specified.

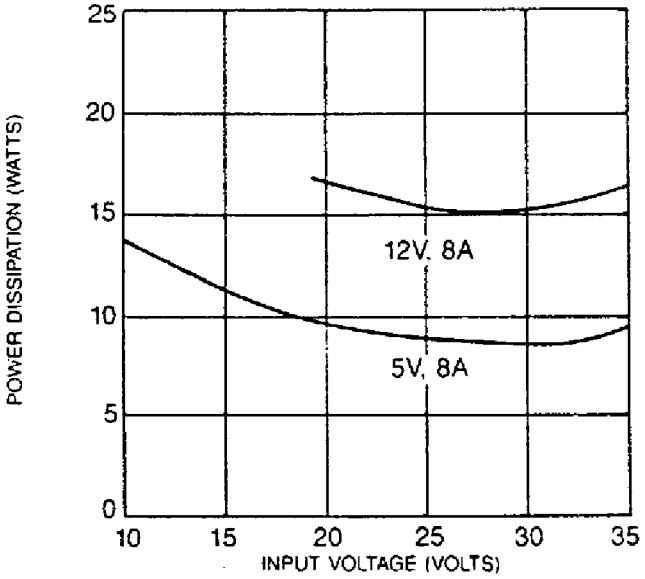
Parameter	Symbol	Test Conditions			Test Limits			Units
		V_{CC}	I_O	T_J	Minimum	Typical	Maximum	
REFERENCE SECTION								
Reference Voltage	V_{REF}				2.137	2.25	2.363	Volts
Line Regulation	$REG_{(LINE)}$	12V to 30V				0.015	0.04	%/V
Temperature Coefficient	T_C			0 to 125°C		0.01	0.02	%/°C
OSCILLATOR SECTION								
Initial Frequency Accuracy					−33	± 10	+33	%
Line Regulation of Frequency	$REG_{(LINE)}$	12V to 30V				0.1	0.15	%/V
Frequency Temperature Coefficient	T_C			0 to 125°C		0.05		%/°C
Sawtooth Duty Cycle	d.c.					85		%
ERROR AMPLIFIER SECTION								
Input Offset Voltage						± 5		mV
Transconductance						2.7		mA/V
Output Sink/Source Current						0.26		mA
Input Common Mode Range					1.5		3.0	Volts
Open Loop Voltage Gain					50	60		dB
OUTPUT SECTION								
Peak Switching Current Limit	I_{CL}				9	11	13	Amps
Output Saturation Voltage	V_O (sat)	$C_O = V_{CC}$ $C_O = V_{CC}$ E_O = GND E_C = GND	4A 8A 4A 8A			1.6 2.1 0.9 1.4	 2.5 1.8	Volts Volts Volts Volts
Efficiency	η				70	75		%
Current Rise Time	t_R	Inductive Load				50	100	nS
Current Fall Time	t_F	Inductive Load				700	900	nS
CONTROL PIN								
Output Inhibit					0.64	0.75	1.06	Volts
Quiescent Current	I_O	V_O = 0V				18	30	mA

OPERATIONAL DATA

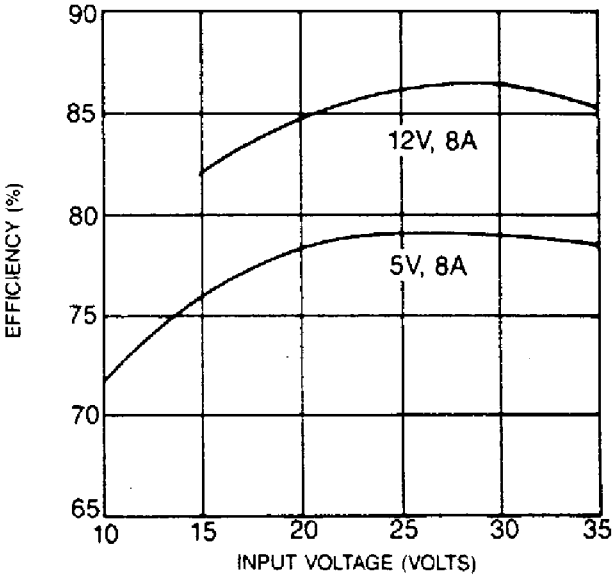
POWER DERATING



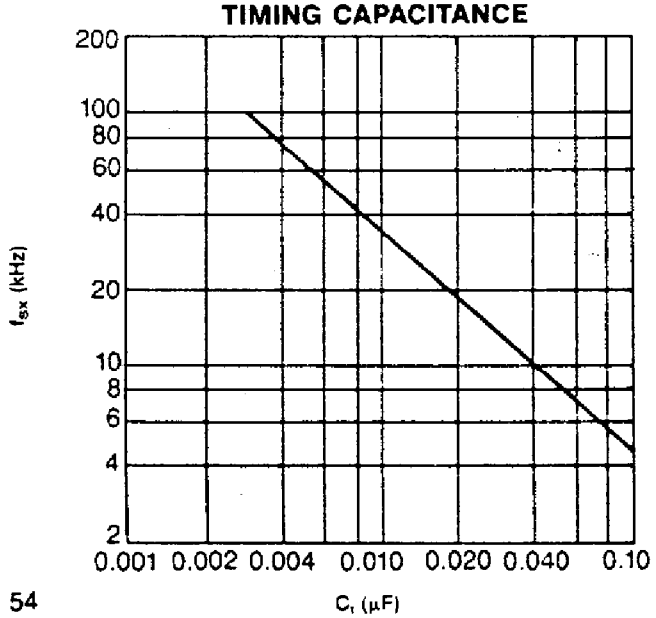
POWER DISSIPATION VS INPUT VOLTAGE



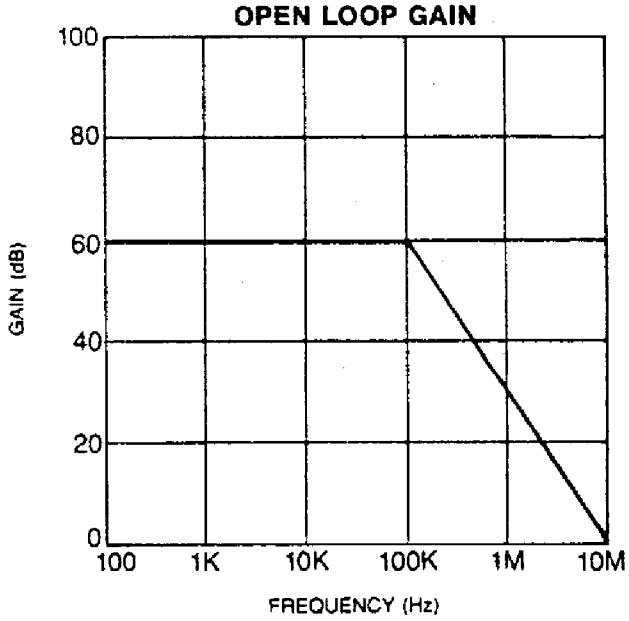
EFFICIENCY VS INPUT VOLTAGE



FREQUENCY VS TIMING CAPACITANCE

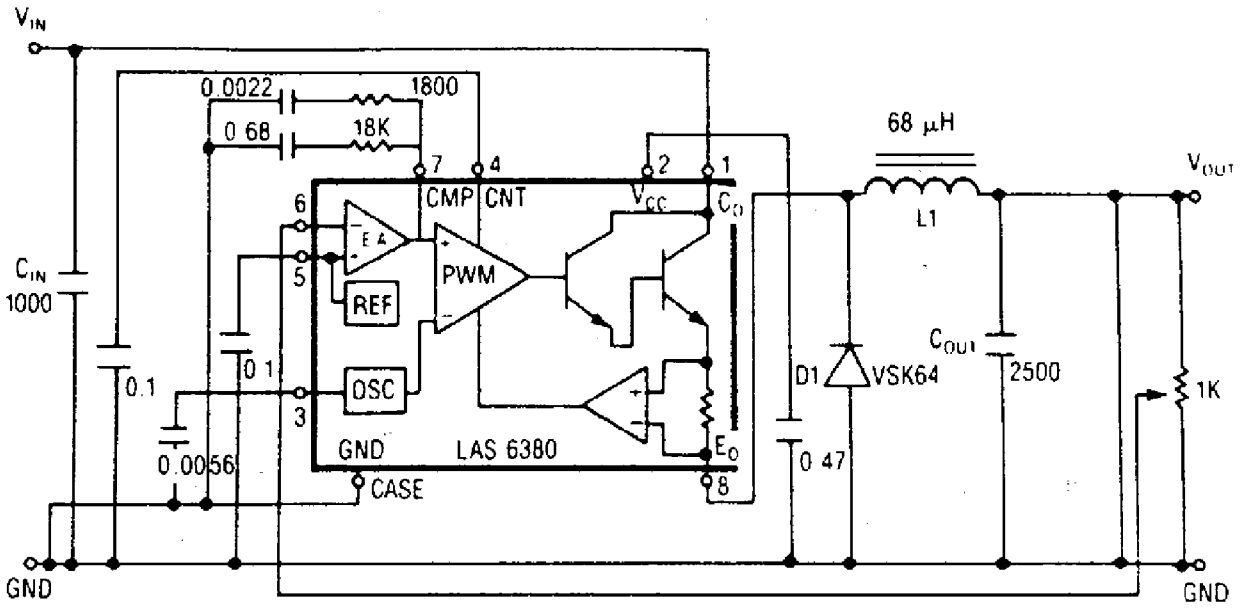


ERROR AMPLIFIER OPEN LOOP GAIN



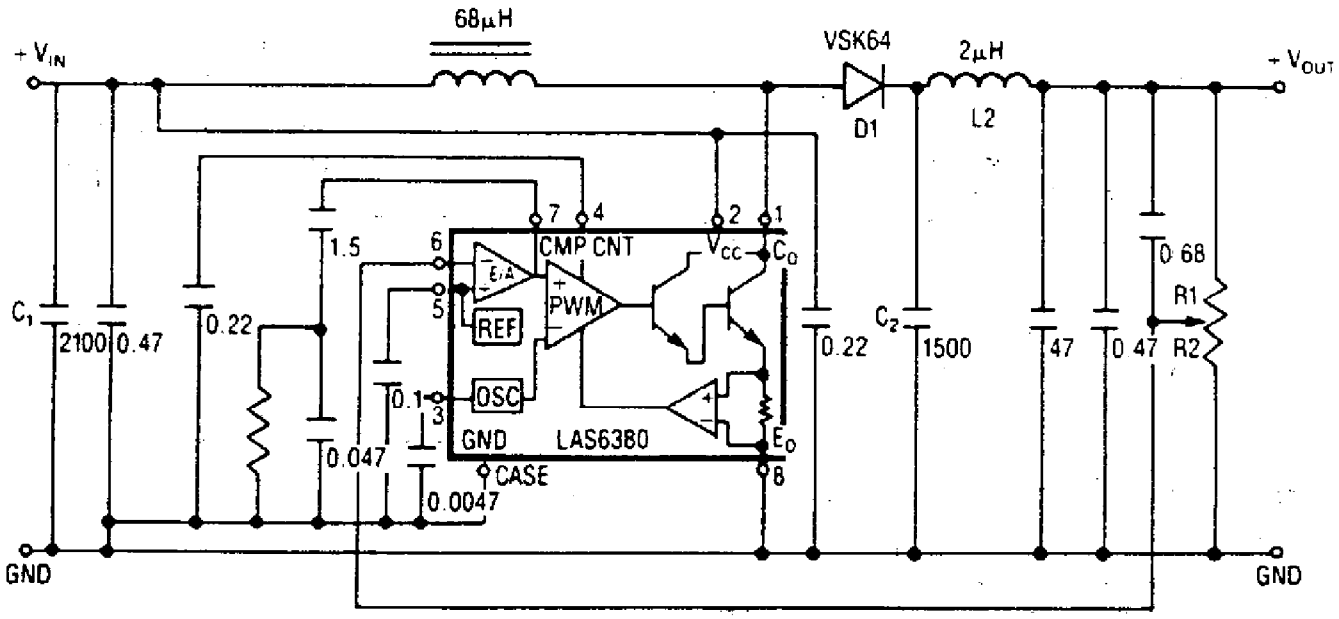
TYPICAL APPLICATIONS

DC-TO-DC STEP-DOWN CONVERTER



V_{IN} = 24V
V_{OUT} = 5V @ 8A

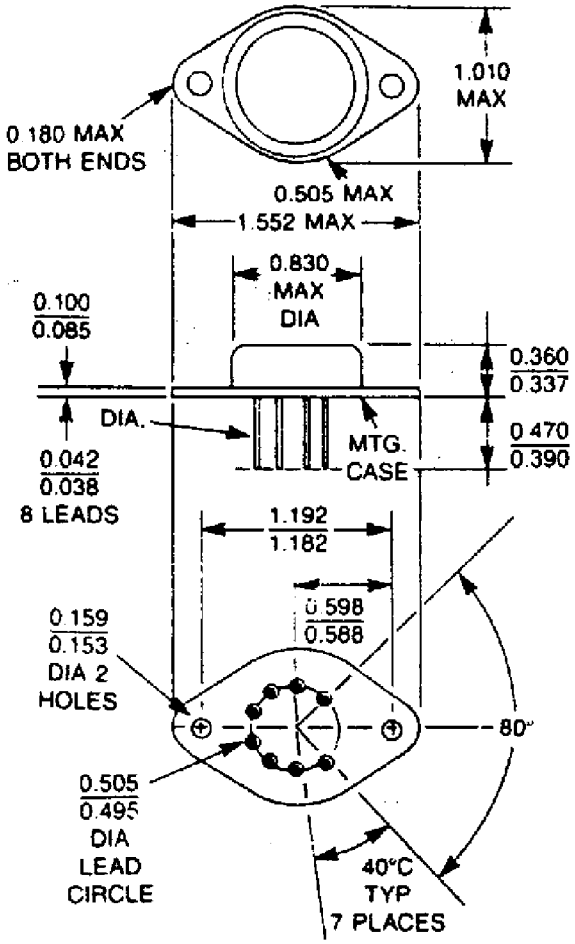
DC-TO-DC STEP-UP CONVERTER



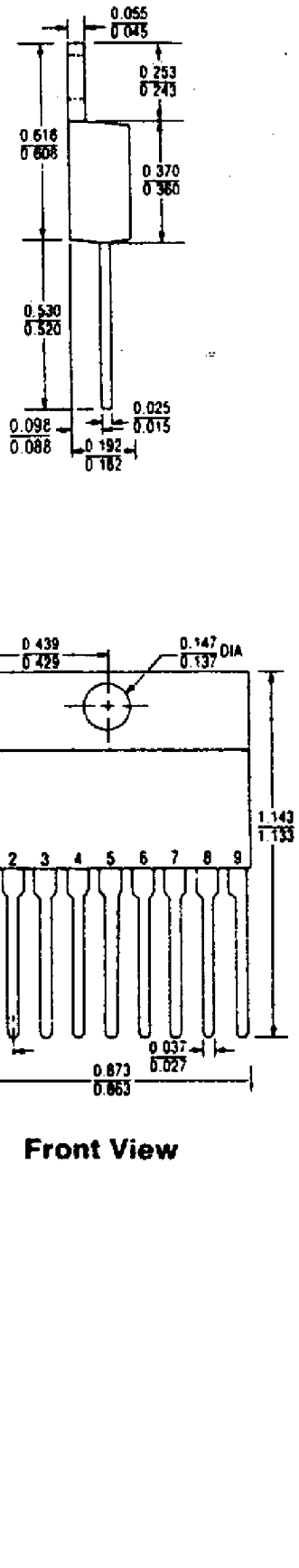
V_{IN} = 12V
V_{OUT} = 24V @ 2.5A

DEVICE OUTLINE

LAS6380, 6381



LAS6380P1, 6381P1



Front View

NOTE: All dimensions are in inches.