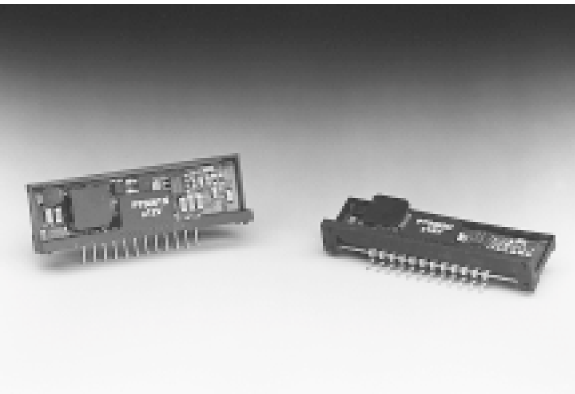
PT5060 Series

9-W +5V-Input Dual-Output Integrated Switching Regulator

SLTS027B

(Revised 12/19/2001)



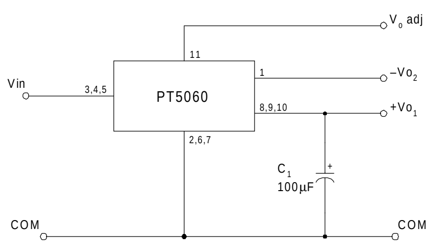
Features

- Single Device: +5V Input
- Complimentary Dual Output: ±12V, ±15V
- Wide Input Voltage Range
- 85% Efficiency
- Adjustable Output Voltage
- Laser-trimmed

Description

The PT5060 series of dual-output Integrated Switching Regulators (ISRs) provide a complimentary ±12V or ±15V from a single +5V input. Applications include systems that require power for analog interface circuitry, such as D/A and A/D converters, and Op Amps. The output voltage can be adjusted with an external resistor. These ISRs are made available in a 12-pin single in-line pin (SIP) package. Note that these modules are are not short-circuit protected.

Standard Application



C_1 = Required 100µF electrolytic

Pin-Out Information

Pin	Function
1	$-Vo_2$
2	GND
3	V_{in}
4	V_{in}
5	V_{in}
6	GND
7	GND
8	$+Vo_1$
9	$+Vo_1$
10	$+Vo_1$
11	V_o Adj
12	Do Not Connect

Ordering Information

PT5061☐ = ±12 Volts
PT5062☐ = ±15 Volts

PT Series Suffix (PT1234 x)

Case/Pin Configuration	Order Suffix	Package Code *
Vertical	N	(ECD)
Horizontal	A	(ECA)
SMD	C	(ECC)
Vertical, Side Tabs	R	(ECE)
Horizontal, Side Tabs	G	(ECG)
SMD, Side Tabs	B	(ECK)

** Previously known as package style 300.*

(Reference the applicable package code drawing for the dimensions and PC board layout)

Specifications (Unless otherwise stated, T_a =25°C, V_{in} =+5V, I_o =$I_o$max, C_1 =100µF)

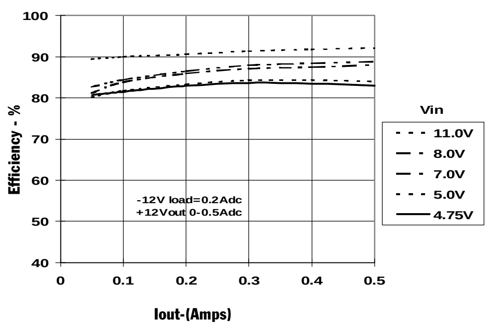
Characteristics	Symbol	Conditions		PT5060 SERIES Min	Typ	Max	Units
Output Current	I_o	Over V_{in} range	Vo_1 = +12V Vo_2 = −12V	0.05 0.05 (1)	— —	0.50 0.25	A
			Vo_1 = +15V Vo_2 = −15V	0.05 0.05 (1)	— —	0.40 0.20	A
Current Limit	I_{lim}			—	150 (2)	—	%$I_o$max
Inrush Current	I_{ir} t_{ir}	On start up		— —	5.5 (3) 2	— —	A mSec
Input Voltage Range	V_{in}	Over I_o range		4.75	—	$+V_o$ −1	V
Output Voltage Tolerance	ΔV_o	Over V_{in} and I_o ranges T_a= 0°C to SOA limit (3)	$+Vo_1$ $-Vo_2$	— —	±1.5 ±5	±3.0 ±10	%V_o
Line Regulation	Reg_{line}	Over V_{in} range		—	±0.5	±1.0	%V_o
Load Regulation	Reg_{load}	0.1 ≤ I_o ≤ $I_o$max		—	±0.5	±1.0	%V_o
V_o Ripple (pk-pk)	V_n	20MHz bandwidth	$+Vo_1$ $-Vo_2$	— —	±1.5 ±2	±3 ±3	%V_o
Transient Response	t_{tr} V_{os}	25% load change V_o over/undershoot		— —	100 3	— 5	µSec %V_o
Efficiency	η	I_o=0.2A each output		—	85	—	%
Switching Frequency	f_s	Over V_{in} and I_o ranges		—	650	—	kHz
Operating Temperature Range	T_a	—		0	—	+85 (4)	°C
Storage Temperature	T_s			−40	—	+125	°C
Mechanical Shock		Per Mil-STD-883D, Method 2002.3, 1 msec, Half Sine, mounted to a fixture	—	500	—	G's	
Mechanical Vibration		Per Mil-STD-883D, Method 2007.2 20-2000 Hz, Soldered in a PC board	—	15	—	G's	
Weight				—	6.5	—	grams

Notes: *(1) Do not operate thes negative output rail of these ISRs below the minimum load.*
(2) ISRs based on a boost topology are not short-circuit protected.
(3) The inrush current stated is above the normal input current for the associated output load.
(4) See Safe Operating Area curves or consult the factory for the appropriate derating.

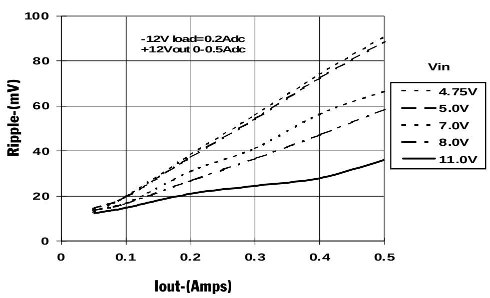
Typical Characteristics

PT5061 +/- 12VDC (See Note A)

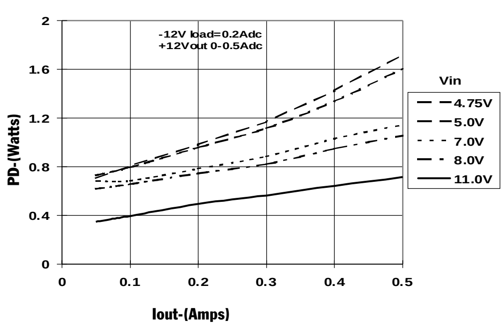
Efficiency vs Output Current



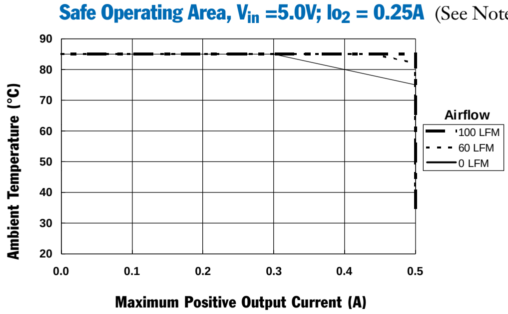
Ripple Voltage vs Output Current



Power Dissipation vs Output Current

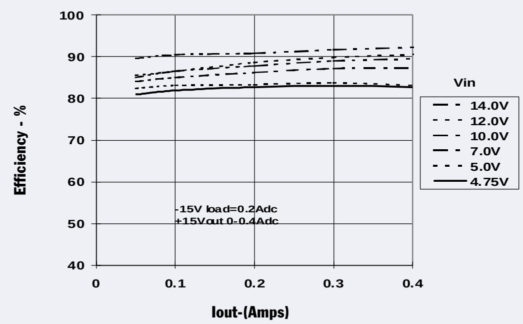


Safe Operating Area, V_{in} =5.0V; Io_2 = 0.25A (See Note B)

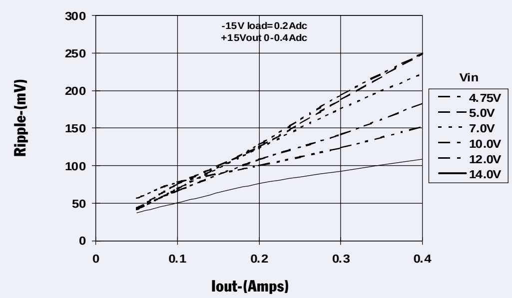


PT5062 +/- 15V (See Note A)

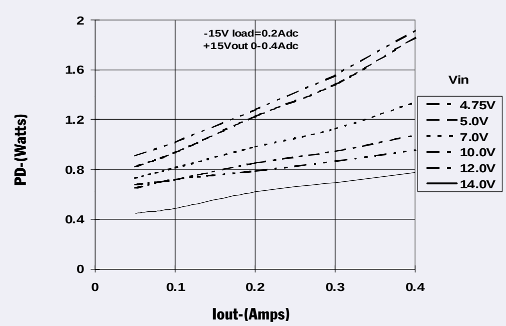
Efficiency vs Output Current



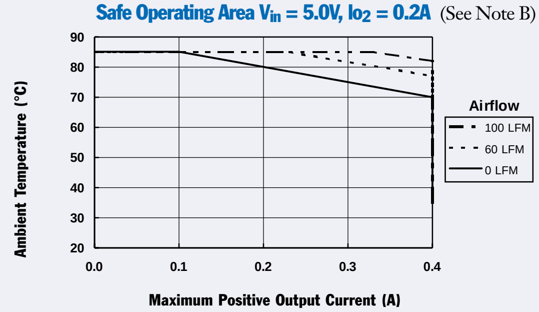
Ripple Voltage vs Output Current



Power Dissipation vs Output Current



Safe Operating Area V_{in} = 5.0V, Io_2 = 0.2A (See Note B)



Note A: *Characteristic data has been developed from actual products tested at 25°C. This data is considered typical data for the Converter.*
Note B: *Thermal derating graphs are developed in free-air convection cooling, which corresponds to approximately 40–60LFM of airflow.*

Adjusting the Output Voltage of the PT5060 Dual-Output Boost Converter Series

The dual output voltage of the PT5060 series modules can be adjusted higher or lower than the factory pre-set voltage with the addition of a single external resistor. Table 1 gives the applicable adjustment range for each model in the series as V_a (min) and V_a (max).

Adjust Up: An increase in the output voltage is obtained by adding a resistor R_2, between pin 11 (V_o adj) and pins 2, 6, or 7 (GND).

Adjust Down: Add a resistor (R_1), between pin 11 (V_o adj) and pins 8, 9 or 10 (Vo_1).

Refer to Figure 1 and Table 2 for both the placement and value of the required resistor, either (R_1) or R_2 as appropriate.

Notes:

1. Both the positive and negative voltage outputs from the ISR are adjusted simultaneously.
2. Use only a single 1% resistor in either the (R_1) or R_2 location. Place the resistor as close to the ISR as possible.
3. Never connect capacitors from V_o adj to either GND or V_o. Any capacitance added to the V_o adjust pin will affect the stability of the ISR.
4. An increase in the output voltage must be accompanied by a corresponding reduction in the specified maximum current at each output. For Vo_1 and $-Vo_2$, the revised maximum output current must be reduced to the equivalent of 6 watts and 3 watts respectively. i.e.

$$Io_1\text{ (max)} = \frac{6}{V_a}\ \text{Adc}$$

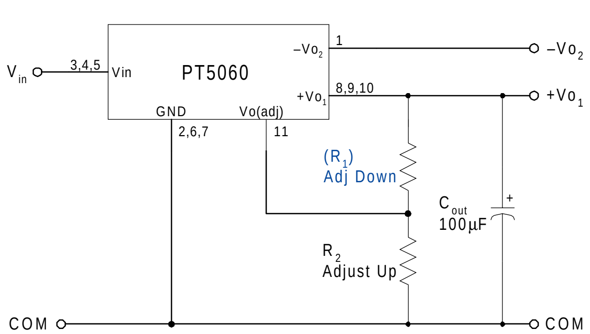
and

$$Io_2\text{ (max)} = \frac{3}{V_a}\ \text{Adc,}$$

where V_a is the adjusted output voltage.

5. Adjustments to the output voltage will also limit the maximum input voltage that can be applied to the ISR. The maximum input voltage that may be applied is limited to $(V_o - 1)$Vdc or 14Vdc, whichever is less.

Figure 1



The values of (R_1) [adjust down], and R_2 [adjust up], can also be calculated using the following formulas.

$$(R_1) = \frac{3.65\,(V_a - 2.5)}{(V_o - V_a)} - 0.1 \quad k\Omega$$

$$R_2 = \frac{9.125}{V_a - V_o} - 0.1 \quad k\Omega$$

Where: V_o = Original output voltage
V_a = Adjusted output voltage

Table 1

PT5060 ADJUSTMENT AND FORMULA PARAMETERS

Series Pt #	PT5061	PT5062
V_o (nom)	±12.0V	±15.0V
V_a (min)	± 7.5V	± 7.5V
V_a (max)	±14.0V	±20.0V

Table 2

PT5060 ADJUSTMENT RESISTOR VALUES

Series Pt #	PT5061	PT5062
Current	0.5/0.25Adc	0.4/0.2Adc
V_o(nom)	±12.0Vdc	±15.0Vdc
V_a(req'd)		
7.0		
7.5	(4.0)kΩ	(2.3)kΩ
8.0	(4.9)kΩ	(2.8)kΩ
8.5	(6.2)kΩ	(3.3)kΩ
9.0	(7.8)kΩ	(3.9)kΩ
9.5	(10.1)kΩ	(4.6)kΩ
10.0	(13.6)kΩ	(5.4)kΩ
10.5	(19.4)kΩ	(6.4)kΩ
11.0	(30.9)kΩ	(7.7)kΩ
11.5	(65.6)kΩ	(9.3)kΩ
12.0		(11.5)kΩ
12.5	18.2kΩ	(14.5)kΩ
13.0	9.0kΩ	(19.1)kΩ
13.5	6.0kΩ	(26.7)kΩ
14.0	4.5kΩ	(41.9)kΩ
14.5		(87.5)kΩ
15.0		
15.5		18.2kΩ
16.0		9.0kΩ
16.5		6.0kΩ
17.0		4.5kΩ
17.5		3.6kΩ
18.0		2.9kΩ
18.5		2.5kΩ
19.0		2.2kΩ
19.5		1.9kΩ
20.0		1.7kΩ

R_1 = (Blue) R_2 = Black

IMPORTANT NOTICE

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265