

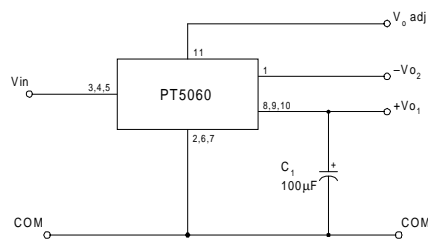
Features

- Single Device: +5V Input
- Complimentary Dual Output: $\pm 12V$, $\pm 15V$
- 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 $\pm 12V$ or $\pm 15V$ 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 not short-circuit protected.

Standard Application



C_1 = Required 100µF electrolytic

Pin-Out Information

Pin	Function
1	$-V_{O2}$
2	GND
3	V_{in}
4	V_{in}
5	V_{in}
6	GND
7	GND
8	$+V_{O1}$
9	$+V_{O1}$
10	$+V_{O1}$
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.

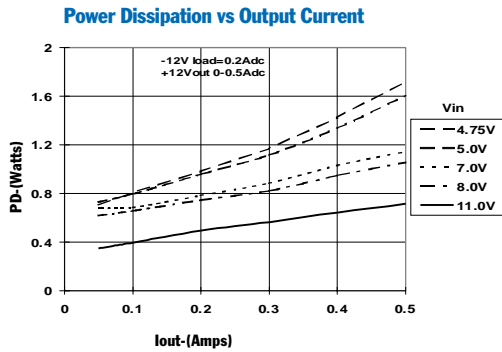
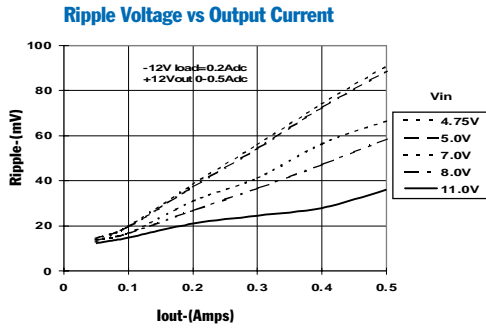
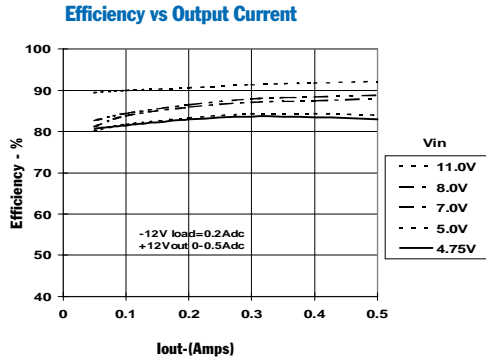
(Reference the applicable package code drawing for the dimensions and PC board layout)

Specifications (Unless otherwise stated, $T_a = 25^\circ C$, $V_{in} = +5V$, $I_o = I_{o,max}$, $C_1 = 100\mu F$)

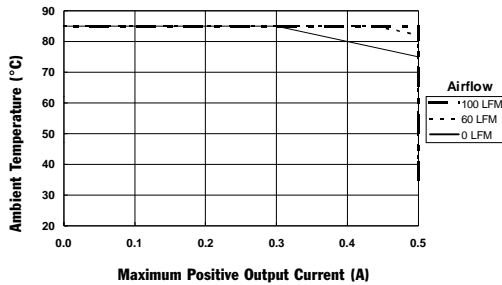
Characteristics	Symbol	Conditions	PT5060 SERIES			Units	
			Min	Typ	Max		
Output Current	I_o	Over V_{in} range	$V_{O1} = +12V$ $V_{O2} = -12V$	0.05 0.05 (1)	— —	0.50 0.25	A
Current Limit	I_{lim}			—	150 (2)	—	$\%I_{o,max}$
Inrush Current	I_{ir}	On start up		—	5.5 (3)	—	A
	t_{tr}			—	2	—	mSec
Input Voltage 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 $T_a = 0^\circ C$ to SOA limit (3)	$+V_{O1}$ $-V_{O2}$	— —	± 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}	$0.1 \leq I_o \leq I_{o,max}$		—	± 0.5	± 1.0	$\%V_o$
V_o Ripple (pk-pk)	V_n	20MHz bandwidth	$+V_{O1}$ $-V_{O2}$	— —	± 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)	$^\circ C$
Storage Temperature	T_s	—		-40	—	$+125$	$^\circ C$
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 the 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.

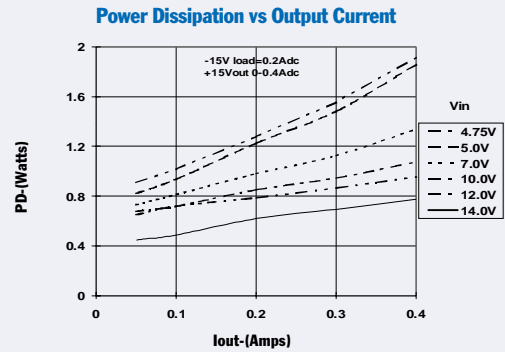
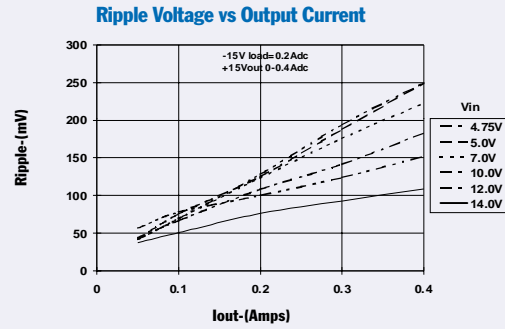
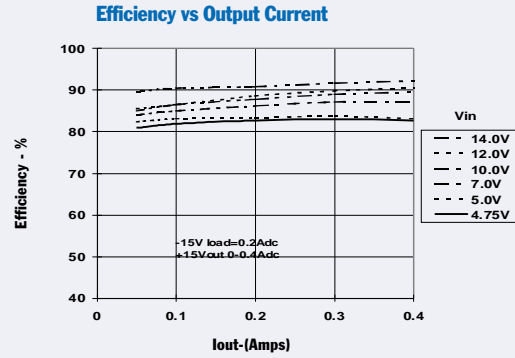
PT5061 +/- 12VDC (See Note A)



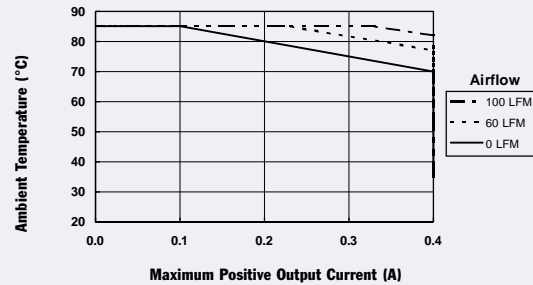
Safe Operating Area, $V_{in} = 5.0V$; $I_{o2} = 0.25A$ (See Note B)



PT5062 +/- 15V (See Note A)



Safe Operating Area $V_{in} = 5.0V$, $I_{o2} = 0.2A$ (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 40-60 LFM 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 (V_{o1}).

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:

- Both the positive and negative voltage outputs from the ISR are adjusted simultaneously.
- 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.
- Never connect capacitors from V_o adj to either GND or V_{o1} . Any capacitance added to the V_o adjust pin will affect the stability of the ISR.
- An increase in the output voltage must be accompanied by a corresponding reduction in the specified maximum current at each output. For V_{o1} and $-V_{o2}$, the revised maximum output current must be reduced to the equivalent of 6 watts and 3 watts respectively. i.e.

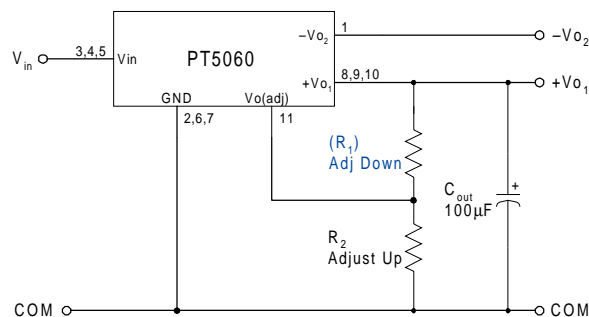
$$I_{o1}(\text{max}) = \frac{6}{V_a} \text{ A dc}$$

$$\text{and } I_{o2}(\text{max}) = \frac{3}{V_a} \text{ A dc,}$$

where V_a is the adjusted output voltage.

- 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 $(V_o - 1)\text{Vdc}$ 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.

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

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

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)	$\pm 12.0\text{V}$	$\pm 15.0\text{V}$
V_a (min)	$\pm 7.5\text{V}$	$\pm 7.5\text{V}$
V_a (max)	$\pm 14.0\text{V}$	$\pm 20.0\text{V}$

Table 2

PT5060 ADJUSTMENT RESISTOR VALUES		
Series Pt #	PT5061	PT5062
Current	0.5/0.25A dc	0.4/0.2A dc
V_o (nom)	$\pm 12.0\text{Vdc}$	$\pm 15.0\text{Vdc}$
V_a (req'd)		
7.0		
7.5	(4.0)k Ω	(2.3)k Ω
8.0	(4.9)k Ω	(2.8)k Ω
8.5	(6.2)k Ω	(3.3)k Ω
9.0	(7.8)k Ω	(3.9)k Ω
9.5	(10.1)k Ω	(4.6)k Ω
10.0	(13.6)k Ω	(5.4)k Ω
10.5	(19.4)k Ω	(6.4)k Ω
11.0	(30.9)k Ω	(7.7)k Ω
11.5	(65.6)k Ω	(9.3)k Ω
12.0		(11.5)k Ω
12.5	18.2k Ω	(14.5)k Ω
13.0	9.0k Ω	(19.1)k Ω
13.5	6.0k Ω	(26.7)k Ω
14.0	4.5k Ω	(41.9)k Ω
14.5		(87.5)k Ω
15.0		
15.5		18.2k Ω
16.0		9.0k Ω
16.5		6.0k Ω
17.0		4.5k Ω
17.5		3.6k Ω
18.0		2.9k Ω
18.5		2.5k Ω
19.0		2.2k Ω
19.5		1.9k Ω
20.0		1.7k Ω

R_1 = (Blue) R_2 = Black

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
PT5061A	ACTIVE	SIP MOD ULE	ECA	12	12	TBD	Call TI	Level-1-215C-UNLIM
PT5061C	ACTIVE	SIP MOD ULE	ECC	12	12	TBD	Call TI	Level-1-215C-UNLIM
PT5061G	ACTIVE	SIP MOD ULE	ECG	12	12	TBD	Call TI	Level-1-215C-UNLIM
PT5061N	ACTIVE	SIP MOD ULE	ECD	12	12	TBD	Call TI	Level-1-215C-UNLIM
PT5061R	ACTIVE	SIP MOD ULE	ECE	12	12	TBD	Call TI	Level-1-215C-UNLIM
PT5062A	ACTIVE	SIP MOD ULE	ECA	12	12	TBD	Call TI	Level-1-215C-UNLIM
PT5062C	ACTIVE	SIP MOD ULE	ECC	12	12	TBD	Call TI	Level-1-215C-UNLIM
PT5062CT	ACTIVE	SIP MOD ULE	ECC	12	200	TBD	Call TI	Level-1-215C-UNLIM
PT5062G	ACTIVE	SIP MOD ULE	ECG	12	12	TBD	Call TI	Level-1-215C-UNLIM
PT5062N	ACTIVE	SIP MOD ULE	ECD	12	12	TBD	Call TI	Level-1-215C-UNLIM
PT5062R	ACTIVE	SIP MOD ULE	ECE	12	12	TBD	Call TI	Level-1-215C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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