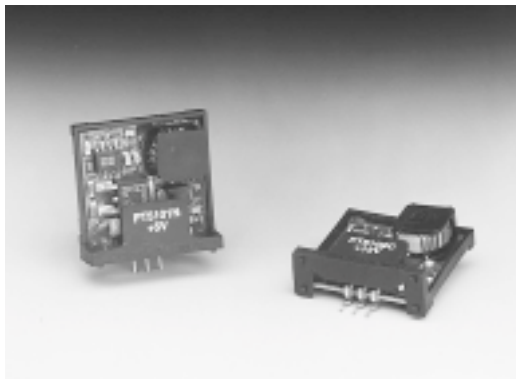




# THE DATASHEET OF PT5105A



### Features

- 90%+ Efficiency
- Internal Short-Circuit Protection
- Pin-Compatible with 3-Terminal Linear Regulators
- Laser-Trimmed Output Voltage
- Over-Temperature Protection
- Small Footprint
- Wide Input Range
- 5-Pin Mount Option (Suffixes L & M)

### Description

The PT5100 modules are a series of economical, easy-to-use 1-A positive step-down, Integrated Switching Regulators (ISRs). These ISRs are compatible with most TO-220 style linear regulators, and when employed as a linear replacement, provide significant benefits in both efficiency and power dissipation. They are recommended for use in a wide variety of on-board power regulation applications. These include computer, data storage, industrial controls, and battery powered equipment. Modules are laser-trimmed for optimal output voltage accuracy, and exhibit excellent line and load regulation. The PT5100 also features output current limiting and thermal shutdown protection.

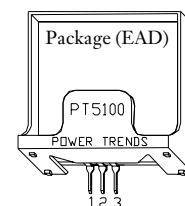
### Ordering Information

|                 |               |
|-----------------|---------------|
| <b>PT5101</b> □ | = +5.0 Volts  |
| <b>PT5102</b> □ | = +12.0 Volts |
| <b>PT5103</b> □ | = +3.3 Volts  |
| <b>PT5105</b> □ | = +6.5 Volts  |
| <b>PT5107</b> □ | = +15.0 Volts |
| <b>PT5109</b> □ | = +5.6 Volts  |
| <b>PT5110</b> □ | = +9.0 Volts  |
| <b>PT5111</b> □ | = +10.0 Volts |
| <b>PT5112</b> □ | = +8.0 Volts  |

### PT Series Suffix (PT1234x)

| Case/Pin Configuration | Order Suffix | Package Code |
|------------------------|--------------|--------------|
| Vertical               | <b>N</b>     | (EAD)        |
| Horizontal             | <b>A</b>     | (EAA)        |
| SMD                    | <b>C</b>     | (EAC)        |
| Horizontal, 2-pin Tab  | <b>M</b>     | (EAM)        |
| SMD, 2-Pin Tab         | <b>L</b>     | (EAL)        |

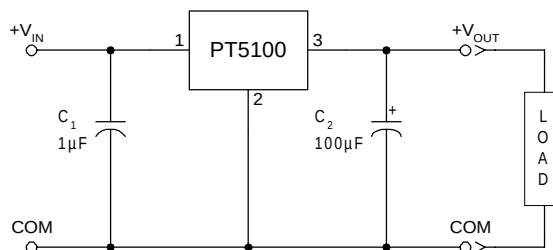
(Reference the applicable package code drawing for the dimensions and PC board layout)



### Pin-Out Information

| Pin | Function         |
|-----|------------------|
| 1   | V <sub>in</sub>  |
| 2   | GND              |
| 3   | V <sub>out</sub> |

### Standard Application



C<sub>1</sub> = Optional 1µF ceramic capacitor  
C<sub>2</sub> = Required 100µF electrolytic

**Specifications** (Unless otherwise stated,  $T_a = 25^\circ\text{C}$ ,  $V_{in} = V_{inmin}$ ,  $C_{out} = 100\mu\text{F}$ , and  $I_o = I_{o\max}$ )

| Characteristic                 | Symbol                     | Conditions                                                                                                   | PT5100 SERIES         |                            |                       | Units                     |
|--------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------|-----------------------|---------------------------|
|                                |                            |                                                                                                              | Min                   | Typ                        | Max                   |                           |
| Output Current                 | $I_o$                      | Over $V_{in}$ range                                                                                          | 0.1 <sup>(1)</sup>    | —                          | 1.0                   | A                         |
| Input Voltage Range            | $V_{in}$                   | Over $I_o$ Range<br>$V_o = 3.3\text{V}$<br>$V_o = 5.0\text{V}$<br>$V_o > 5.0\text{V}$                        | 9<br>9<br>$V_o + 4$   | —<br>—<br>—                | 26<br>38<br>38        | VDC                       |
| Set Point Voltage Tolerance    | $V_o \text{ tol}$          |                                                                                                              | —                     | $\pm 1$                    | $\pm 2$               | % $V_o$                   |
| Temperature Variation          | $\text{Reg}_{\text{temp}}$ | $0^\circ \leq T_a \leq +60^\circ\text{C}$ , $I_o = I_{o\min}$                                                | —                     | $\pm 0.5$                  | —                     | % $V_o$                   |
| Line Regulation                | $\text{Reg}_{\text{line}}$ | Over $V_{in}$ range                                                                                          | —                     | $\pm 5$                    | $\pm 10$              | mV                        |
| Load Regulation                | $\text{Reg}_{\text{load}}$ | Over $I_o$ range                                                                                             | —                     | $\pm 5$                    | $\pm 10$              | mV                        |
| Total Output Voltage Variation | $\Delta V_{o\text{tot}}$   | Includes set-point, line, load,<br>$0^\circ \leq T_a \leq +60^\circ\text{C}$                                 | —                     | $\pm 1.5$                  | $\pm 3$               | % $V_o$                   |
| Efficiency                     | $\eta$                     | $V_o = 15\text{V}$<br>$V_o = 12\text{V}$<br>$V_o = 10\text{V}$<br>$V_o = 5.0\text{V}$<br>$V_o = 3.3\text{V}$ | —<br>—<br>—<br>—<br>— | 95<br>94<br>92<br>90<br>82 | —<br>—<br>—<br>—<br>— | %                         |
| $V_o$ Ripple (pk-pk)           | $V_r$                      | 20MHz bandwidth                                                                                              | —                     | 2                          | —                     | % $V_o$                   |
| Transient Response             | $t_{tr}$                   | 1A/ $\mu\text{s}$ load step, 50% to 100% $I_{o\max}$                                                         | —                     | 100                        | 200                   | $\mu\text{s}$             |
|                                | $\Delta V_{tr}$            | $V_o$ over/undershoot                                                                                        | —                     | $\pm 5.0$                  | —                     | % $V_o$                   |
| Current Limit                  | $I_{lim}$                  | $\Delta V_o = -1\%$                                                                                          | 1.2                   | 2.6                        | —                     | A                         |
| Switching Frequency            | $f_s$                      | Over $V_{in}$ range<br>$V_o \geq 5.0\text{V}$<br>$V_o \leq 3.3\text{V}$                                      | 500<br>575            | 650<br>725                 | 800<br>875            | kHz                       |
| External Output Capacitance    | $C_{out}$                  |                                                                                                              | 100                   | —                          | —                     | $\mu\text{F}$             |
| Operating Temperature Range    | $T_a$                      | Over $V_{in}$ range                                                                                          | $-40$ <sup>(2)</sup>  | —                          | $+85$ <sup>(3)</sup>  | $^\circ\text{C}$          |
| Thermal Resistance             | $\theta_{ja}$              | Free-air convection (40-60LFM)<br>$V_o = 3.3\text{V}$<br>$V_o = 5.0\text{V}$<br>$V_o \geq 12\text{V}$        | —<br>—<br>—           | 45<br>50<br>60             | —<br>—<br>—           | $^\circ\text{C}/\text{W}$ |
| Storage Temperature            | $T_s$                      | —                                                                                                            | $-40$                 | —                          | $+125$                | $^\circ\text{C}$          |
| Reliability                    | MTBF                       | Per Bellcore TR-332<br>50% stress, $T_a = 40^\circ\text{C}$ , ground benign                                  | 11.3                  | —                          | —                     | $10^6$ Hrs                |
| Mechanical Shock               | —                          | Per Mil-Std-883D, method 2002.3,<br>1mS, half-sine, mounted to a fixture                                     | —                     | 500                        | —                     | G's                       |
| Mechanical Vibration           | —                          | Per Mil-Std-883D, Method 2007.2<br>20-2000Hz, soldered in PC board                                           | —                     | 5 <sup>(4)</sup>           | —                     | G's                       |
| Weight                         | —                          | Suffixes N, A, & C<br>Suffixes L & M                                                                         | —<br>—                | 4.5<br>6.5                 | —<br>—                | grams                     |
| Flammability                   | —                          | Materials meet UL 94V-0                                                                                      | —                     | —                          | —                     |                           |

**Notes:** (1) The ISR will operate at no load with reduced specifications.(2) For operation below  $0^\circ\text{C}$ , use a tantalum type capacitor for  $C_2$ .

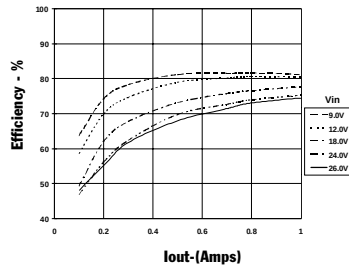
(3) See Thermal Derating curves.

(4) The tab pins on the 5-pin mount package types (suffixes L &amp; M) must be soldered. For more information see the applicable package outline drawing.

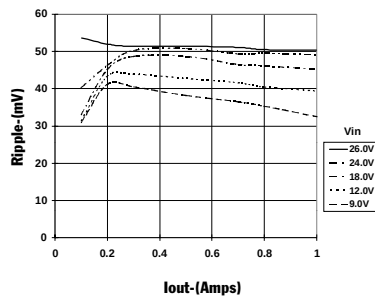
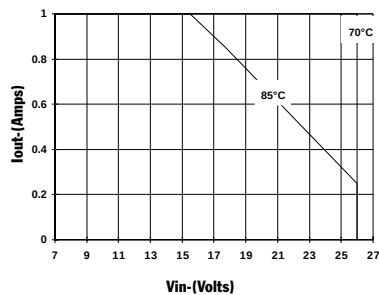
1-A Positive Step-down  
Integrated Switching Regulator

PT5103, 3.3 VDC (See Note A)

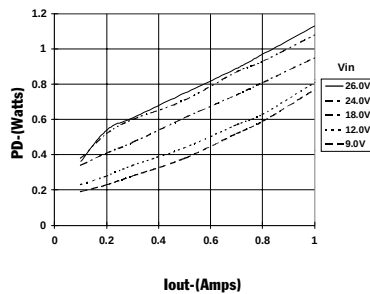
Efficiency vs Output Current



Ripple vs Output Current

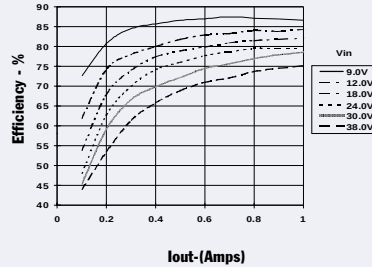
Thermal Derating ( $T_A$ ) (See Note B)

Power Dissipation vs Output Current

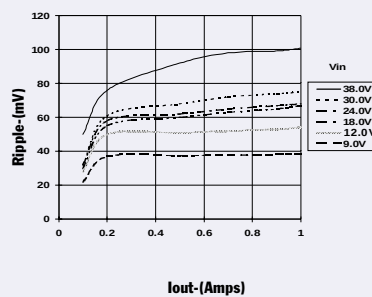
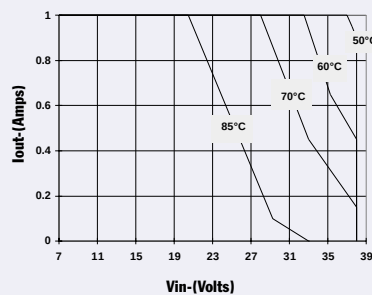


PT5101, 5.0 VDC (See Note A)

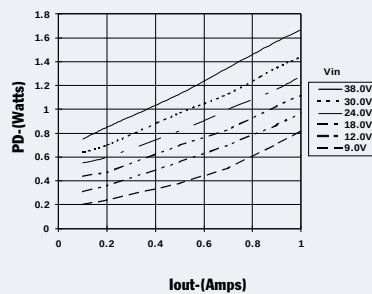
Efficiency vs Output Current



Ripple vs Output Current

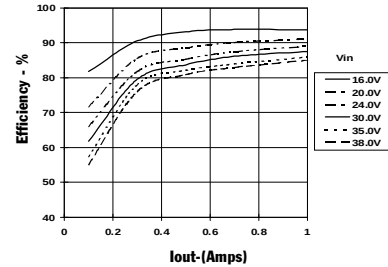
Thermal Derating ( $T_A$ ) (See Note B)

Power Dissipation vs Output Current

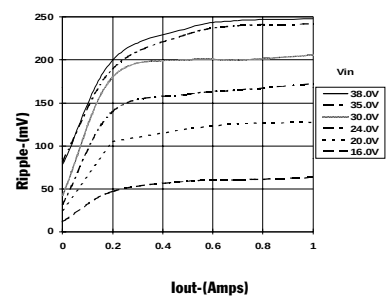
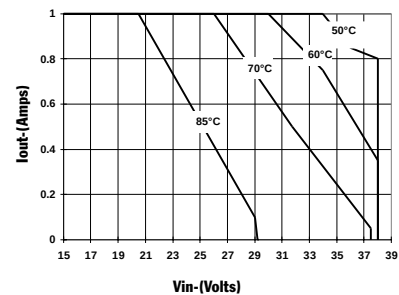


PT5102, 12.0 VDC (See Note A)

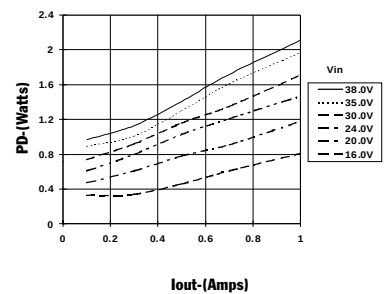
Efficiency vs Output Current



Ripple vs Output Current

Thermal Derating ( $T_A$ ) (See Note B)

Power Dissipation vs Output Current



**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.

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