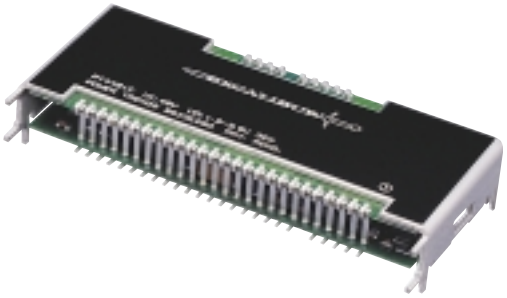
PT4452—24V

100-W 30-A Programmable Isolated DC/DC Converter

EXCALIBUR

SLTS144A

(Revised 5/28/2002)



Features

- 18V to 36V Input Voltage Range
- Programmable Output Voltage Range: 1.3V to 3.5V
- -40° to +100°C Operating Temp
- 1500 VDC Isolation
- 89% Efficiency
- Remote On/Off
- Differential Remote Sense
- 60A Output with PT4495
- Over-Current Protection *(Shutdown with Auto-Reset)*
- Over-Temperature Protection
- Over-Voltage Protection
- Space-Saving Package
- Solderable Copper Case
- Safety Approvals:
  UL 60950
  CSA 22.2 950
  VDE EN60950 Pending

Description

The PT4452 Excalibur™ DC/DC converter module combines state-of-the-art power conversion technology with un-paralleled flexibility. Incorporating high efficiency and ultra-fast transient response, these modules provide up to 30A of output current over the programmable voltage range of 1.3V to 3.5V. This represents a full 100W output at 3.3V.

The modules include a number of inbuilt features to facilitate system integration. These include output over-current shutdown (with auto reset), over-temperature protection, and an inhibit on/off control. A differential remote sense is also provided to compensate for voltage drop between the converter and load.

For additional output current, one PT4452 may be operated with up to two PT4495 compatible booster modules. Each PT4495 adds an additional 30A of output current capability.

Ordering Information

PT4452❑ = 1.3 to 3.5 Volts
PT4495❑ = 30-A Booster

PT Series Suffix (PT1234x)

Case/Pin Configuration	Order Suffix	Package Code
Vertical	**N**	(EKD)
Horizontal	**A**	(EKA)
SMD	**C**	(EKC)

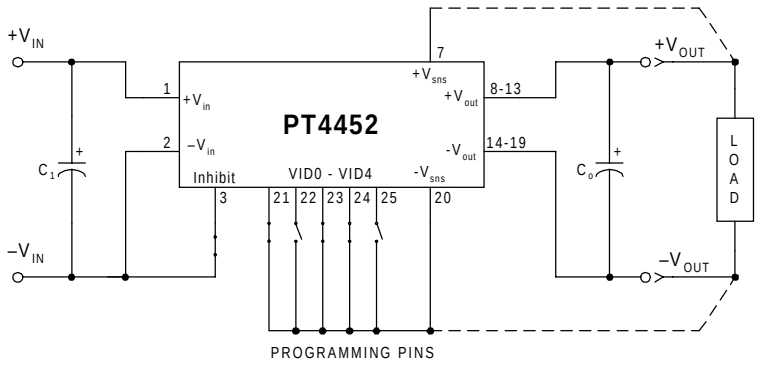
(Reference the applicable package code drawing for the dimensions and PC board layout)

Pin-Out Information

Pin	Function	Pin	Function
1	$+V_{in}$	14	$-V_{out}$
2	$-V_{in}$	15	$-V_{out}$
3	Inhibit	16	$-V_{out}$
4	V_r †	17	$-V_{out}$
5	V_a †	18	$-V_{out}$
6	No Connect	19	$-V_{out}$
7	(+)Remote Sense	20	(–)Remote Sense
8	$+V_{out}$	21	VID0
9	$+V_{out}$	22	VID1
10	$+V_{out}$	23	VID2
11	$+V_{out}$	24	VID3
12	$+V_{out}$	25	VID4
13	$+V_{out}$	26	DRV †

† *Pins 4, 5, & 26 are used for booster applications. For stand-alone operation, leave open circuit.*

Standard Application



- C_o = Optional 330µF electrolytic capacitor
- C_1 = Optional 33µF, 100V electrolytic capacitor
- C_2 = Optional 1µF, 100V ceramic capacitor
- Programming pins, VID0–VID4, are shown configured for Vo =3.3V
- For normal operation, pin 3 (Inhibit) must be connected to –Vin.

Programming Information

VID3	VID2	VID1	VID0	VID4=1 Vout	VID4=0 Vout
1	1	1	1	2.0V	1.30V
1	1	1	0	2.1V	1.35V
1	1	0	1	2.2V	1.40V
1	1	0	0	2.3V	1.45V
1	0	1	1	2.4V	1.50V
1	0	1	0	2.5V	1.55V
1	0	0	1	2.6V	1.60V
1	0	0	0	2.7V	1.65V
0	1	1	1	2.8V	1.70V
0	1	1	0	2.9V	1.75V
0	1	0	1	3.0V	1.80V
0	1	0	0	3.1V	1.85V
0	0	1	1	3.2V	1.90V
0	0	1	0	3.3V	1.95V
0	0	0	1	3.4V	2.00V
0	0	0	0	3.5V	2.05V

Logic 0 = Connect to (–)Remote Sense, pin 20
Logic 1 = Open circuit (no pull-up resistors)

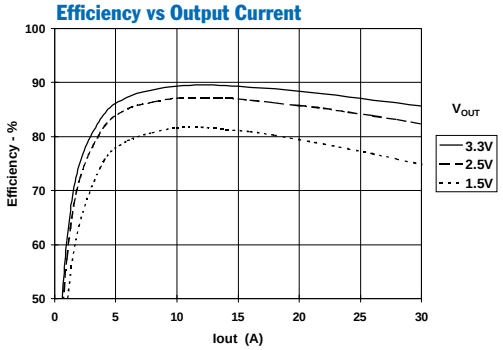
Specifications (Unless otherwise stated, T_a =25°C, V_{in} =24V, V_o =3.3V, C_o =0µF, and I_o =$I_o$max)

Characteristic	Symbol	Conditions		PT4452 Min	PT4452 Typ	PT4452 Max	Units
Output Current	I_o	Over V_{in} range		0	—	30	A
Input Voltage Range	V_{in}	Over I_o Range		18	24	36	VDC
Set Point Voltage Tolerance	V_o tol			—	±1	±1.5	%V_o
Temperature Variation	Reg_{temp}	–40° ≤T_c≤ +100°C, I_o =0		—	±0.5	—	%V_o
Line Regulation	Reg_{line}	Over V_{in} range		—	±0.1	±1	%V_o
Load Regulation	Reg_{load}	Over I_o range		—	±0.2	±1	%V_o
Total Output Voltage Variation	ΔV_otot	Includes set-point, line, load, –40° ≤T_c≤ +100°C		—	±2	±3	%V_o
Efficiency	η	I_o =15A	V_o =3.3V V_o =2.5V V_o =1.5V	— — —	89 87 81	— — —	%
V_o Ripple (pk-pk)	V_r	20MHz bandwidth	V_o >2.0V V_o ≤2.0V	— —	55 45	75 55	mV_{pp}
Transient Response	t_{tr} ΔV_{tr}	0.1A/µs load step, 50% to 75% $I_o$max V_o over/undershoot		— —	N/A 1	— —	µs %V_o
		1A/µs load step, 50% to 100% $I_o$max V_o over/undershoot		— —	75 ±5	— —	µs %V_o
Current Limit Threshold	I_{lim} thld	V_{in} =18V, shutdown with auto-restart		—	35	—	A
Current Share Tolerance	I_{shr} tol	with PT4495 booster		—	±10	—	%
Over-Voltage Protection	OVP	Shutdown and latch off		—	125	—	%V_o
Switching Frequency	f_s	Over V_{in} range		270	300	350	kHz
Under-Voltage Lockout	UVLO			—	17	—	V
Inhibit (Pin 3) Input High Voltage Input Low Voltage Input Low Current	 V_{IH} V_{IL} I_{IL}	Referenced to –V_{in} (pin 2)		 2.5 –0.5 —	 — — –0.2	 Open (1) +0.8 —	 V mA
Standby Input Current	I_{in} standby	pins 3 & 2 connected		—	4	10	mA
Internal Input Capacitance	C_{in}			—	3	—	µF
External Output Capacitance	C_{out}	Between +V_o and –V_o		0	—	10,000	µF
Isolation Voltage Capacitance Resistance		Input–output/input–case Input to output Input to output		1500 — 10	— 1100 —	— — —	V pF MΩ
Operating Temperature Range	T_c	Case temperature, over V_{in} range		-40	—	+115 (2)	°C
Over-Temperature Shutdown	OTP	Case temperature, auto reset		—	120	—	°C
Storage Temperature	T_s	—		-40	—	+125	°C
Reliability	MTBF	Per Bellcore TR-332 50% stress, T_a =40°C, ground benign		1.4	—	—	10^6 Hrs
Mechanical Shock	—	Per Mil-Std-883D, method 2002.3, 1mS, half-sine, mounted to a fixture		—	500	—	G's
Mechanical Vibration	—	Mil-Std-883D, Method 2007.2 20-2000Hz, pcb mounted	Horizontal	—	20 (3)	—	G's
Weight	—	—		—	90	—	grams
Flammability	—	Materials meet UL 94V-0					

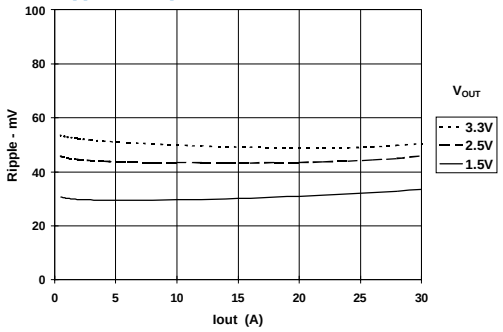
Notes: *(1) The Inhibit (pin 3) has an internal pull-up, which if left open circuit allows the converter to operate when input power is applied. The open-circuit is limited to 6.5V. Refer to the application notes for interface considerations.*
(2) See Safe Operating Area curves or contact the factory for the appropriate derating.
(3) The case pins on through-hole pin configuration (suffix A) must be soldered. For more information see the applicable package outline drawing.

PT4452 Performance Characteristics (See Note A)

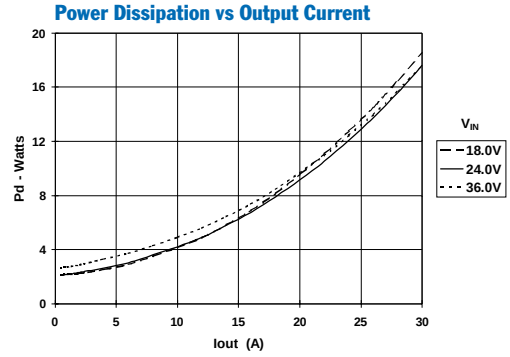
Efficiency vs Output Current



Ripple vs Output Current

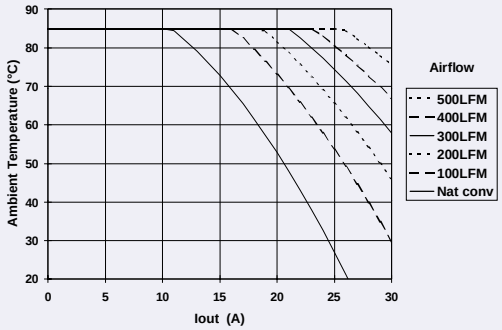


Power Dissipation vs Output Current



Safe Operating Area, V_{in} =24V (See Note B)

Stand Alone, No Heatsink



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: *SOA curves represent the conditions at which internal components are at or below the manufacturer's maximum operating temperatures*

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