

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)

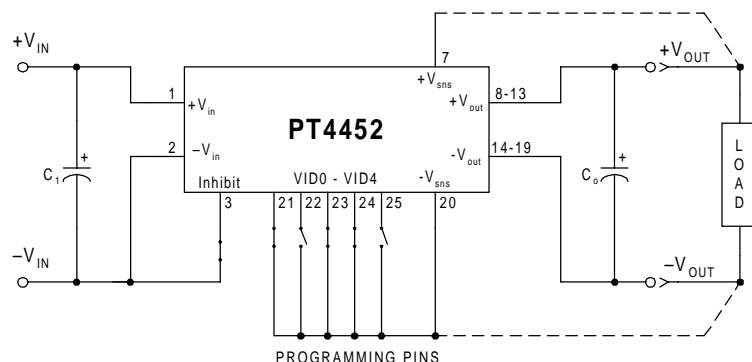
(Reference the applicable package code drawing for the dimensions and PC board layout)

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 _f †	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



- C₀ = Optional 330μF electrolytic capacitor
- C₁ = Optional 33μF, 100V electrolytic capacitor
- C₂ = Optional 1μF, 100V ceramic capacitor
- Programming pins, VID0–VID4, are shown configured for V_O = 3.3V
- For normal operation, pin 3 (Inhibit) must be connected to -V_{in}.

Programming Information

VID3	VID2	VID1	VID0	VID4=1 V _{out}	VID4=0 V _{out}
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_omax)

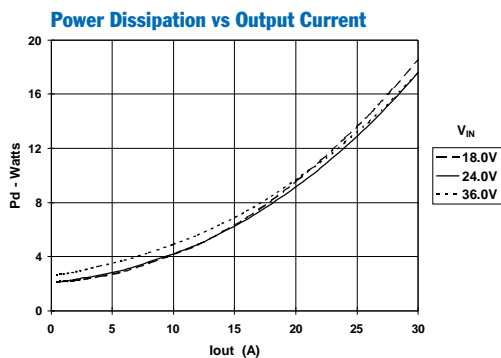
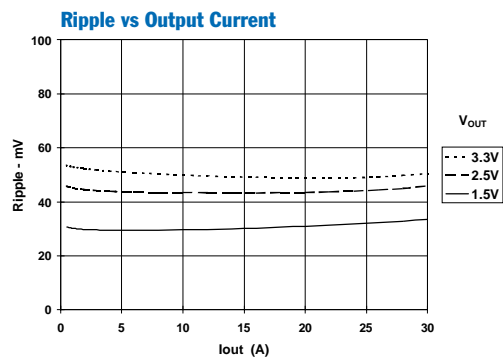
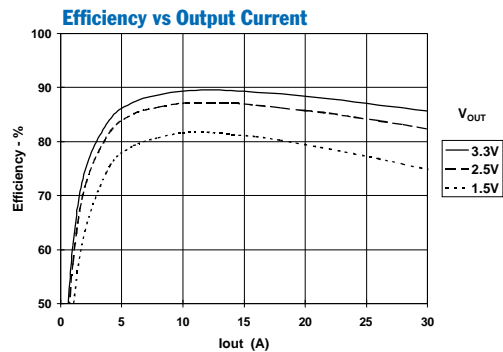
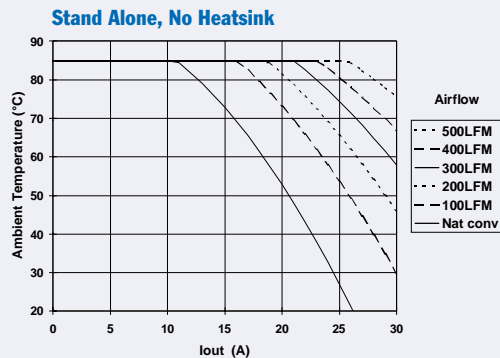
Characteristic	Symbol	Conditions	PT4452			Units
			Min	Typ	Max	
Output Current	I _o	Over V _{in} range	0	—	30	A
Input Voltage Range	V _{in}	Over I _o Range	18	24	36	VDC
Set Point Voltage Tolerance	V _o tol		—	±1	±1.5	%V _o
Temperature Variation	Reg _{temp}	–40° ≤ T _c ≤ +100°C, I _o = 0	—	±0.5	—	%V _o
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 _o tot	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}	0.1A/µs load step, 50% to 75% I _o max	—	N/A	—	µs
	ΔV _{tr}	V _o over/undershoot	—	1	—	%V _o
		1A/µs load step, 50% to 100% I _o max	—	75	—	µs
		V _o over/undershoot	—	±5	—	%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)		Referenced to –V _{in} (pin 2)				
Input High Voltage	V _{IH}		2.5	—	Open (1)	V
Input Low Voltage	V _{IL}		–0.5	—	+0.8	
Input Low Current	I _{IL}		—	–0.2	—	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		Input–output/input–case	1500	—	—	V
		Input to output	—	1100	—	pF
Capacitance		Input to output	10	—	—	MΩ
Resistance						
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	—	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)

Safe Operating Area, $V_{in} = 24V$ (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: SOA curves represent the conditions at which internal components are at or below the manufacturer's maximum operating temperatures

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265