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28V/100W, Dual Output, DC/DC Converters with Integral EMI Filter

Preliminary Information

ADDC27012DA/ADDC27015DA

FEATURES

270Vdc input, ± 12 Vdc @ 8.33A, 100W output
(ADDC27012DA)

270Vdc input, ± 15 Vdc @ 6.68A, 100W output
(ADDC27015DA)

Integral EMI filter designed to meet MIL-STD-461D

Low weight: 80 grams

NAVMAT derated

Many protection and system features

APPLICATIONS

Commercial and Military Airborne Electronics

Missile Electronics

Space-Based Antennae and Vehicles

Mobile/Portable Ground Equipment

GENERAL DESCRIPTION

The ADDC27012DA and ADDC27015DA hybrid military DC/DC converters with integral EMI filter offer the highest power density of any DC/DC power converters with their features and in their power range available today. The converters with integral EMI filter are a fixed frequency, 1 MHz, square wave switching DC/DC power supply. They are not variable frequency resonant converters. In addition to many protection features, these converters have system level features which allows them to be used as a component in larger systems as well as a stand-alone power supply. The units are designed for high reliability and high performance applications where saving space and/or weight are critical.

The ADDC27012DA and ADDC27015DA are available in a hermetically sealed, molybdenum based hybrid package and are easily heatsink mountable. For MIL-STD-883 devices, contact factory for availability.

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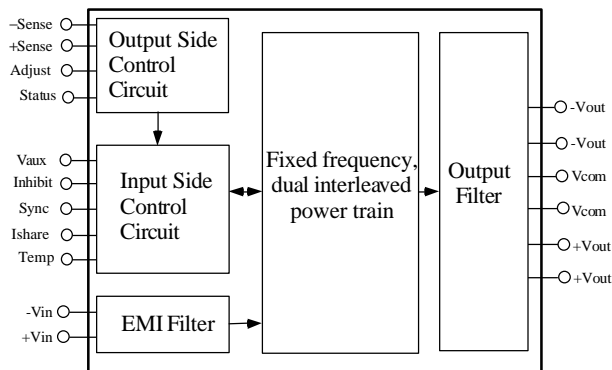
Central

Atlantic

714/641-9391

214/231-5094

215/643-7790



ADDC02812DA/ADDC02815DA
FUNCTIONAL BLOCK DIAGRAM

PRODUCT HIGHLIGHTS

- 1) 60W/cubic inch power density with an integral EMI filter designed to meet all applicable requirements in MIL-STD-461D when installed in a typical system setup.
- 2) Light weight: 80 grams.
- 3) Operational and survivable over a wide range of input conditions: 160-400Vdc; survives low line and high .
- 4) High reliability; NAVMAT derated.
- 5) Protection features include:
 - output overvoltage protection
 - output short circuit current protection
 - thermal monitor/shutdown
 - input overvoltage shutdown
 - input transient protection
- 6) System level features include:
 - current sharing for parallel operation
 - inhibit control
 - output status signal
 - synchronization for multiple units
 - input referenced auxiliary voltage

ADDC27012DA/ADDC27015DA SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS¹

Inhibit, Input Voltage.....450Vdc, -0.5Vdc
 Sync.....8Vdc, -0.5Vdc
 Ishare.....6Vdc, -0.5Vdc
 Temp.....12Vdc, -0.3Vdc
 Common-Mode Voltage, Input to Output.....500Vdc

Lead Soldering Temp (10 sec)+300°C
 Storage Temperature-65°C to +150°C
 Maximum Junction Temperature.....+150°C
 Maximum Case Operating Temperature..... +125°C

ELECTRICAL CHARACTERISTICS (T_c=25°C, V_{in}=270Vdc unless otherwise noted; full temperature range is -55°C to +90°C; all temperatures are case and T_c is the temperature measured at the center of the package bottom.)

Parameter	Case Temp	Test Level	Conditions	ADDC27012DA			ADDC27015DA			Units
				Min	Typ	Max	Min	Typ	Max	
INPUT CHARACTERISTICS										
Steady State Operating Input Voltage Range ³ (+12V)	Full	VI	I _o =±0.42A to ±4.17A	180	270	350				Volts
Steady State Operating Input Voltage Range ³ (+15V)	Full	VI	I _o =±0.34A to ±3.34A				180	270	350	
Abnormal Operating Input Voltage Range (per MIL-STD-704D) ³ (+12V)	Full	VI	I _o =±0.42A to ±3.33A	160		400				Volts
Abnormal Operating Input Voltage Range (per MIL-STD-704D) ³ (+15V)	Full	VI	I _o =±0.34A to ±3.34A				160		400	Volts
Input Voltage Shutdown (+12V)	+25°C	I		401	419					Vdc
Input Voltage Shutdown (+15V)	+25°C	I					401	419		Vdc
Disabled Input Current (+12V)	+25°C	VI			300					µA
Disabled Input Current (+15V)	+25°C	VI					300			µA
OUTPUT CHARACTERISTICS^{4,5,6}										
Regulated Output Voltage (+12V)	+25°C	I	I _o =±0.42A to ±4.17A, V _{in} =180 to 350Vdc	+11.88	+12.00	+12.12				Vdc
	Full	VI	I _o =±0.42A to ±4.17A, V _{in} =180 to 350Vdc I _o =±0.42A to ±4.17A, V _{in} =160 to 400Vdc	+11.76		+12.24				Vdc
	Full	VI	I _o =±0.42A to ±4.17A, V _{in} =180 to 350Vdc I _o =±0.42A to ±4.17A, V _{in} =160 to 400Vdc	+11.76		+12.24				Vdc
Regulated Output Voltage (+15V)	+25°C	I	I _o =±0.34A to ±3.34A, V _{in} =180 to 350Vdc I _o =±0.34A to ±3.34A, V _{in} =160 to 400Vdc				+14.85	+15.00	+15.15	Vdc
	Full	I	I _o =±0.34A to ±3.34A, V _{in} =180 to 350Vdc I _o =±0.34A to ±3.34A, V _{in} =160 to 400Vdc				+14.70		+15.30	Vdc
	Full	VI	I _o =±0.34A to ±3.34A, V _{in} =180 to 350Vdc I _o =±0.34A to ±3.34A, V _{in} =160 to 400Vdc				+14.70		+15.30	Vdc
Non-Regulated Output Voltage (-12V)	+25°C	I	I _o =±0.42A to ±4.17A, V _{in} =180 to 350Vdc I _o =±0.42A to ±4.17A, V _{in} =180 to 350Vdc	-11.76	-12.00	-12.24				Vdc
	Full	VI	I _o =±0.42A to ±4.17A, V _{in} =180 to 350Vdc I _o =±0.42A to ±4.17A, V _{in} =160 to 400Vdc	-11.64		-12.36				Vdc
	Full	VI	I _o =±0.42A to ±4.17A, V _{in} =180 to 350Vdc I _o =±0.42A to ±4.17A, V _{in} =160 to 400Vdc	-11.64		-12.36				Vdc
Non-Regulated Output Voltage (-15V)	+25°C	I	I _o =±0.34A to ±3.34A, V _{in} =180 to 350Vdc I _o =±0.34A to ±3.34A, V _{in} =180 to 350Vdc				-14.70	-15.00	-15.30	Vdc
	Full	VI	I _o =±0.34A to ±3.34A, V _{in} =180 to 350Vdc I _o =±0.34A to ±3.34A, V _{in} =160 to 400Vdc				-14.55		-15.45	Vdc
	Full	VI	I _o =±0.34A to ±3.34A, V _{in} =180 to 350Vdc I _o =±0.34A to ±3.34A, V _{in} =160 to 400Vdc				-14.40		-15.60	Vdc
Line Regulation (+12V)	+25°C	VI	I _o =±4.17A, V _{in} =180 to 350Vdc		1.8	8				mV
Line Regulation (+15V)	+25°C	VI	I _o =±3.34A, V _{in} =180 to 350Vdc				5	10		mV
Load Regulation (+12V)	+25°C	VI	V _{in} =270Vdc, I _o =+0.42A to +4.17A		4	12				mV
Load Regulation (+15V)	+25°C	VI	V _{in} =270Vdc, I _o =+0.34A to +3.34A				6	14		mV
Output Ripple/Noise (each output) ⁷ (+12V)	+25°C	I	I _o =±4.17A, 5 kHz - 10 MHz BW			45				mVp-p
Output Ripple/Noise (each output) ⁷ (+15V)	+25°C	I	I _o =±3.34A, 5 kHz - 10 MHz BW					45		mVp-p
Total Output Current (I _o) +12V	Full	VI	V _o =±12Vdc, V _{in} =180 to 350Vdc	0.833		8.33				A
Total Output Current (I _o) +15V	Full	VI	V _o =±15Vdc, V _{in} =180 to 350Vdc				0.34	3.34		A
Output Overvoltage Protection (+12V)	+25°C	V	I _o =±4.17A, open remote sense connection		120					%V _{nom}
Output Overvoltage Protection (+15V)	+25°C	V	I _o =±3.34A, open remote sense connection				118			%V _{nom}
Output Current Limit (+12V)	+25°C	V	V _o =90% V _{out} nom		130					%I _o max
Output Current Limit (+15V)	+25°C	V	V _o =90% V _{out} nom				130			%I _o max
Output Short Circuit Current	+25°C	I				13		12.5		A
ISOLATION CHARACTERISTICS										
Isolation Voltage	+25°C	I	Input to output or any pin to case at 500Vdc	100			100			MΩ

Parameter	Case Temp	Test Level	Conditions	ADDC02812DA			ADDC02815DA			Units
				Min	Typ	Max	Min	Typ	Max	
DYNAMIC CHARACTERISTICS⁷										
Output voltage deviation due to step change in load (+12V)	+25°C	I	$I_o = \pm 2.08A$ to $\pm 4.17A$ or $\pm 4.17A$ to $\pm 2.08A$.850	1.30				V
Output voltage deviation due to step change in load (+15V)	+25°C	I	$I_o = \pm 1.67A$ to $\pm 3.34A$ or $\pm 3.34A$ to $\pm 1.67A$.850		1.50			V
Response time due to step change in load (+12V)	+25°C	I	$I_o = 10A$ to $20A$ or $20A$ to $10A$, $di/dt = 0.5A/\mu S$, measured to within 2% of final value		150	225				μS
Response time due to step change in load (+15V)	+25°C	I	$I_o = \pm 1.67A$ to $\pm 3.34A$ or $\pm 3.34A$ to $\pm 1.67A$, $di/dt = 0.5A/\mu S$, measured to within 2% of final value				150	225		μS
Soft Start Turn-On Time (+12V)	+25°C	I	$I_o = \pm 4.17A$, from inhibit high to status high		6	15				ms
Soft Start Turn-On Time (+15V)	+25°C	I	$I_o = \pm 3.34A$, from inhibit high to status high				7	20		ms
THERMAL CHARACTERISTICS										
Efficiency (+12V)	+25°C	I	$I_o = \pm 2.5A$	81	83					%
	Full	VI	$I_o = \pm 2.5A$	80						%
Efficiency (+15V)	+25°C	I	$I_o = \pm 4.17A$	81	83					%
	Full	VI	$I_o = \pm 4.17A$	80						%
Hottest Junction Temperature ⁸ (+12V)	+25°C	I	$I_o = \pm 2.0A$				81	83		%
	Full	VI	$I_o = \pm 2.0A$				80			%
Hottest Junction Temperature ⁸ (+15V)	+25°C	I	$I_o = \pm 3.34A$				81	83		%
	Full	VI	$I_o = \pm 3.34A$				80			%
Hottest Junction Temperature ⁸ (+12V)	+90°C	V	$I_o = \pm 4.17A$		110					°C
Hottest Junction Temperature ⁸ (+15V)	+90°C	V	$I_o = \pm 3.34A$					110		°C
CONTROL CHARACTERISTICS										
Clock frequency (+12V)	Full	VI	$I_o = \pm 0.42A$	0.85		1.00				MHz
Clock frequency (+15V)	Full	VI	$I_o = \pm 0.34A$				0.85		1.00	MHz
Adjust (pin 3) Vadj (+12V)	+25°C	I		4.7	4.8	4.9				V
Adjust (pin 3) Vadj (+15V)	+25°C	I					5.9	6.0	6.1	V
Status (pin 4)										
Voh	+25°C	I	$I_{oh} = 400\mu A$	2.4	4.0		2.4	4.0		V
Vol	+25°C	I	$I_{ol} = 1\text{ mA}$		0.15	0.7		0.15	0.7	V
Vaux (pin 5)										
Vo (nom) (+12V)	+25°C	I	$I_{aux} = 5\text{mA}$, load current $= \pm 4.17A$	13.25	13.5	13.75				V
Vaux (pin 5)										
Vo (nom) (+15V)	+25°C	I	$I_{aux} = 5\text{mA}$, load current $= \pm 4.334A$				13.65	13.9	14.5	V
Inhibit (pin 6)										
Vil	+25°C	I				0.5			0.5	V
Iil	+25°C	I	$V_{il} = 0.5V$			1.2			1.2	mA
Vi (open circuit)	+25°C	I				15			15	V
Sync (pin 7) ⁹										
Vih	+25°C	I		4.0			4.0			V
Iih	+25°C	I	$V_{ih} = 7.0V$			160			160	μA
Ishare (pin 8) (+12V)	+25°C	I	load current $= \pm 4.17A$	2.65	2.75	2.85				V
Ishare (pin 8) (+15V)	+25°C	I	load current $= \pm 3.34A$				2.65	2.75	2.85	V
Temp (pin 9)	+25°C	V			3.90			3.90		V

NOTES

¹ Absolute maximum ratings are limiting values, to be applied individually, and beyond which the serviceability of the circuit may be impaired. Functional operability under any of these conditions is not necessarily implied. Exposure of absolute maximum rating conditions for extended periods of time may affect device reliability.

² Military subgroups apply only to military qualified devices.

³ 400Vdc upper limit rated for transient condition of up to 50 msec. 160Vdc lower limit rated for continuous operation during emergency condition. Steady state and abnormal input voltage range require source impedance sufficient to insure input stability at low line.

⁴ Measured at the remote sense points.

⁵ Tests performed at 10W load; unit regulates output voltage to 5W load.

⁶ Output characteristics tested with balanced loads on each output. However, unit operates with unbalanced loads up to 90%/10% split.

⁷ $C_{load} = 0$.

⁸ Refer to section entitled Thermal Characteristics for more information.

⁹ Unit has internal pull-down; refer to section entitled Pin 7 (Sync).

EXPLANATION OF TEST LEVELS

Test Level

I - 100% Production Tested.

II - 100% production tested at +25°C, and sample tested at specified temperatures.

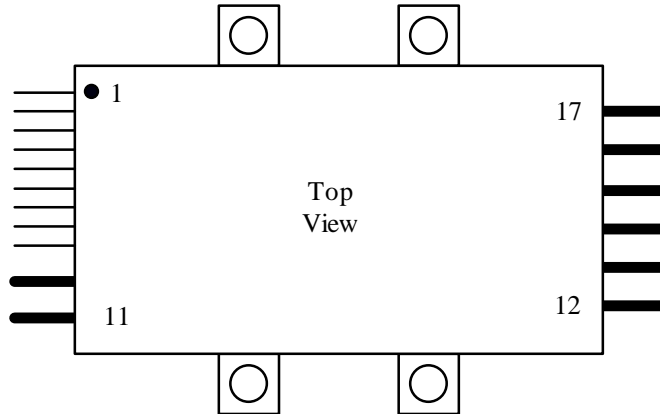
III - Sample Tested Only.

IV - Parameter is guaranteed by design and characterization testing.

V - Parameter is a typical value only.

VI - All devices are 100% production tested at +25°C. 100% production tested at temperature extremes for military temperature devices; guaranteed by design and characterization testing for industrial devices

Pin Configuration



PIN DESCRIPTIONS

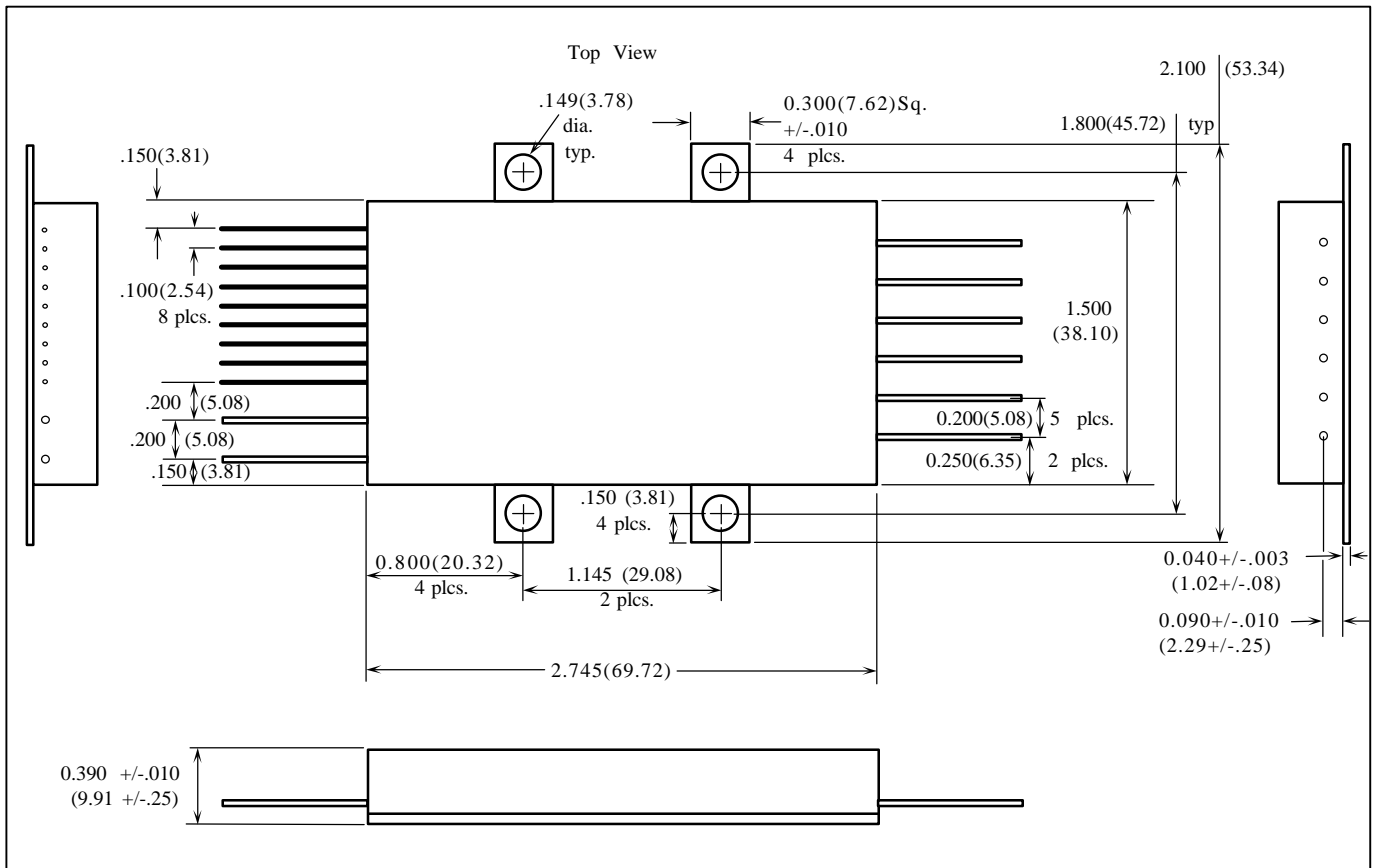
Pin No.	Name	Function
1	- SENSE	Feedback loop connection for remote sensing output voltage. Must always be connected for proper operation.
2	+ SENSE	Feedback loop connection for remote sensing output voltage. Must always be connected for proper operation.
3	ADJUST	Adjusts output voltage setpoint.
4	STATUS	Indicates output voltage is within $\pm 5\%$ of nominal. Active high referenced to -SENSE (pin 1).
5	Vaux	Low level dc auxiliary voltage supply referenced to input return (pin 10).
6	INHIBIT	Power supply disable. Active low and referenced to input return (pin 10).
7	SYNC	Clock synchronization input for multiple units; referenced to input return (pin 10).
8	Ishare	Current share pin which allows paralleled units to share current typically within $\pm 5\%$ at full load; referenced to input return (pin 10).
9	TEMP	Case temperature indicator and temperature shutdown override; referenced to input return (pin 10).
10	- Vin	Input return.
11	+ Vin	+270V nominal input bus.
12	+Vout	+12Vdc output (ADDC27012DA), +15Vdc output (ADDC27015DA)
13	+Vout	+12Vdc output (ADDC27012DA), +15Vdc output (ADDC27015DA)
14	Vcommon	Output return.
15	Vcommon	Output return.
16	-Vout	-12Vdc output (ADDC27012DA), -15Vdc output (ADDC27015DA)
17	-Vout	-12Vdc output (ADDC27012DA), -15Vdc output (ADDC27015DA)

Screening Levels for ADDC27012DA/ADDC27015DA

Screening Steps	Industrial (KV)	Ruggedized Industrial (TV)	MIL-STD-883B/SMD (TV/883B)
Pre-cap visual	100%	MIL-STD-883, TM2017	compliant to MIL-PRF-38534
Temp cycle	N/A	N/A	
Constant acceleration	N/A	N/A	
Fine leak	guaranteed to meet MIL-STD-883, TM1014	guaranteed to meet MIL-STD-883, TM1014	
Gross leak	guaranteed to meet MIL-STD-883, TM1014	guaranteed to meet MIL-STD-883, TM1014	
Burn-in	N/A	MIL-STD-883, TM1015, 96 hrs at 115°C case	
Final electrical test	at 25°C, per spec. table	at 25°C, per spec. table	

Nominal Case Dimensions In Inches

All tolerances $\pm 0.005''$ (± 0.13 mm) unless otherwise specified



Notes

- The final product weight is 85 grams maximum.
- The package base material is made of molybdenum and is nominally 40 mils (1.02 mm) thick. The "runout" is less than 2 mils per inch (0.02 mm per cm).
- The high current pins (10-17) are 40 mil (1.02 mm) diameter; are made of 99.8% copper; and are plated with gold over nickel.
- The signal carrying pins (1-9) are 18 mil (0.46 mm) diameter; are Kovar; and are plated with gold over nickel.
- All pins are a minimum length of 0.740 inches (18.80 mm) when the product is shipped. The pins are typically bent up or down and cut shorter for proper connection into the user's system.
- All pin-to-sidewall spacings are guaranteed for a minimum of 500Vdc breakdown at standard air pressure.

