LAMBDA ADVANCED ANALOG INC.

ATR2800T Series

Hybrid - High Reliability
High Power Triple Output DC/DC Converters

DESCRIPTION

The ATR2800T Series of DC/DC converters provide 30 watts of output power over the full military temperature range with no derating. These devices are pin compatible with the Lambda Advanced Analog ATO series converters but offer twice the maximum output power in a lower profile package. A custom CMOS ASIC pulse width modulator operating at a nominal switching frequency of 550KHz combined with a unique magnetic feedback circuit reduces circuit complexity for enhanced reliability. These converters provide 500 volt input to output isolation and operate in highly efficient single forward mode.

The advanced feedback design and high operating frequency provide an extremely wide bandwidth control loop with high gain and phase margin. This results in fast dynamic line and load response as well as superior audio rejection. The control loop is compensated to provide optimum performance over the full military temperature range and over the 16 to 40 volt input voltage range.

These converters are protected against both continuous output short circuits and output overload. Either load fault condition will result in operating in a low power dissipation foldback mode. The converters will shut down for approximately 15 milliseconds, then attempt to restart. This cycle will continue indefinitely unless the load fault is corrected. Recovery to normal operation is automatic upon removal of the load fault.

Manufactured in a facility fully qualified to MIL-PRF-38534, these converters are available in four screening grades to satisfy a wide range of requirements. The CH grade is fully compliant to the requirements of MIL-PRF-38534 for class H. The HB grade is processed and screened to the class H requirement, but may not necessarily meet all of the other MIL-PRF-38534 requirements, e.g., element evaluation and Periodic Inspections (PI) not required. Both grades are tested to meet the complete group “A” test specification over the full military temperature range without output power deration. Two grades with more limited screening are also available for use in less demanding applications. Variations in electrical, mechanical and screening can be accommodated. Contact Lambda Advanced Analog with specific requirements.

FEATURES

- **30 Watt Output Power**
- **Flexible Output Loading**
- **-55 to +125°C Operation**
- **Pin Compatible With ATO**
- **0.410” Maximum Height**
- **16 to 40 Volt Input Range**
- **500 Volt Input to Output Isolation**
- **High Audio Rejection**
- **MIL-STD-704 Compatible**
- **Load Fault Protection – Short Circuit and Overload**
- **TTL Level Compatible Synchronization**

SPECIFICATIONS

T_{CASE} = -55°C to +125°C, V_{IN} = +28 V ±5% unless otherwise specified

ABSOLUTE MAXIMUM RATINGS[1]	
Input Voltage Range	-0.5 V_{DC} to +50 V_{DC}
Power Dissipation	14W
Lead Temperature	+300°C
Storage Temperature	-65°C to 150°C case

Test	Symbol	Conditions -55°C - Tc - +125°C, V_{IN} = 28 V_{DC} ±5%, C_L=0, unless otherwise specified	ATR2812T Limits Min	ATR2812T Limits Max	ATR2815T Limits Min	ATR2815T Limits Max	Units
STATIC CHARACTERISTICS							
OUTPUT							
Voltage[1]	V_{OUT}	I_{OUT} = 0 (main) +25°C over temperature range	4.95	5.05	4.95	5.05	V_{DC}
			4.90	5.10	4.90	5.10	V_{DC}
		I_{OUT} = 0 (dual)[1] +25°C over temperature range	±11.88	±12.12	±14.85	±15.15	V_{DC}
			±11.76	±12.24	±14.70	±15.30	V_{DC}
Current[1,2,3,4]	I_{OUT}	V_{IN} = 16, 28, and 40 V_{DC} (main)	100.0	4000	100.0	4000	mA
		V_{IN} = 16, 28, and 40 V_{DC} (dual)[1]	0.0	±625	0.0	±500	mA
Ripple Voltage[1,5]	V_{RIP}	V_{IN} = 16, 28, and 40 V_{DC} (dual) BW = 20 Hz to 2 MHz (main)		60		60	mV p-p
		V_{IN} = 16, 28, and 40 V_{DC} BW = 20 Hz to 2 MHz (dual)		40		40	mV p-p
REGULATION							
Line[1,3]	VR_{LINE}	V_{IN} = 16, 28, and 40 V_{DC} P_{OUT} = .5, 10, 20 W (main)		±25		±25	mV
		V_{IN} = 16, 28, and 40 V_{DC} (dual) P_{OUT} = 0, 5, 10 watts (dual)[12]		±60		±75	mV
Load[1,3]	VR_{LOAD}	V_{IN} = 16, 28, and 40 V_{DC} P_{OUT} = .5, 10, 20 W (main)		±50		±50	mV
		V_{IN} = 16, 28, and 40 V_{DC} P_{OUT} = 0, 5, 10 watts (dual)[12]		±60		±75	mV
INPUT							
Current	I_{IN}	I_{OUT} = 0, inhibit (pin 8) tied to input return (pin 10)		15		15	mA
		I_{OUT} = 0, inhibit (pin 8) = open		75		75	mA
Ripple Current[4]	I_{RIP}	I_{OUT} = 4000 mA (main) P_{OUT} = 10 W (dual)[12] BW = 20 Hz to 2 MHz		50		50	mA p-p
EFFICIENCY	E_{FF}	I_{OUT} = 4000 mA (main) +25°C over temperature range	75		75		%
		P_{OUT} = 10 W (dual)[12]	72		72		
ISOLATION	I_{SO}	input to output or any pin to case (except pin 8) at 500 Tc = +25°C	100		100		M Ohms
LOAD FAULT POWER DISSIPATION [3]	P_D	Overload		14		14	W
		Short circuit		9		9	W
SWITCHING FREQUENCY	F_S		500	600	500	600	KHz
SYNC FREQ. RANGE	F_{SYNC}	50% load to/from 100% load no load to/from 50% load	500	700	500	700	KHz
INHIBIT OPEN CIRCUIT VOLTAGE	V_{OI}		9	13	9	13	V
OUTPUT RESPONSE TO Step transient load changes[7]	VO_{TLOAD}	50% load to/from 100% load	-500	+500	-500	+500	mV pk
		no load to/from 50% load	-1000	+1000	-1000	+1000	
RECOVERY TIME STEP Step transient load changes[7,8]	TT_{LOAD}	50 percent load to/from 100 percent load		200		200	µs
		No load to 50 percent load		5		5	ms
		50 percent load to no load		10		10	ms

SPECIFICATIONS

T_{CASE} = -55°C to +125°C, V_{IN} = +28 V ±5% unless otherwise specified

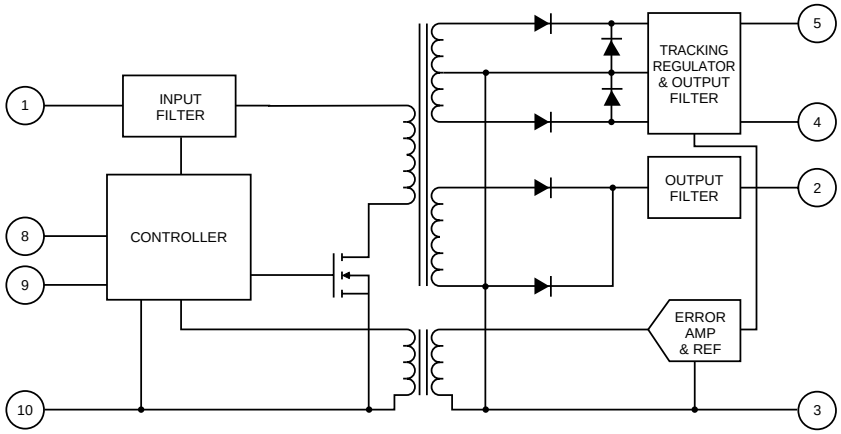
ABSOLUTE MAXIMUM RATINGS		
Input Voltage	-0.5 V to +50 V	
Power Output	Internally limited, 17.5W typical	
Soldering	300°C for 10 seconds	
Temperature Range[6]	Operating	-55°C to 135°C case
		Storage -65°C to +135°C

Test	Symbol	Conditions -55°C - Tc - +125°C, V_{IN} = 28 V_{DC} ±5%, C_L=0, unless otherwise specified	ATR2812T Limits Min	ATR2812T Limits Max	ATR2815T Limits Min	ATR2815T Limits Max	Units
STATIC CHARACTERISTICS							
OUTPUT RESPONSE TO Transient step[9] Line changes[10]	V_{OTLINE}	Input step 16 from/to 40V_{DC} I_{OUT} = 4000 mA (main) P_{OUT} = 10 W (dual)		±1500		±1500	mV pk
RECOVERY TIME[8] Transient step[9] Line changes[10]	TT_{LINE}	Input step 16 form/to 40V_{DC} I_{OUT} = 4000 mA (main) P_{OUT} = 10 W (dual)		10		10	ms
TURN ON OVERSHOOT[1]	$VTON_{OS}$	I_{OUT} = 0 and 4000 mA (main) P_{OUT} = 0, 10 W (dual)		1000		1000	mV pk
TURN ON DELAY[1,11]	TON_D	I_{OUT} = 0 and 4000 mA (main) P_{OUT} = 0, 10 W (dual)		25		25	ms
LOAD FAULT RECOVERY[10]	TR_{LF}			25		25	ms

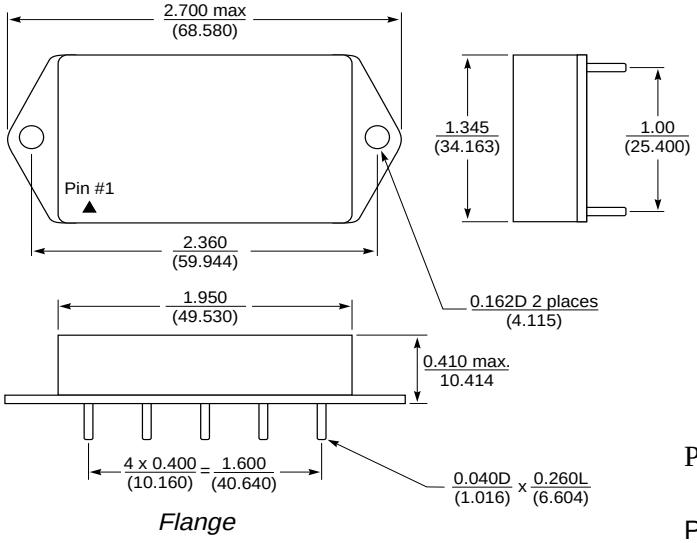
Notes:

1. Tested at each output.
2. Parameter guaranteed by line and load regulation tests.
3. Although operation with no load is permissible, light loading on the main (+5 volt) output may cause the output voltage of the auxiliary outputs (±12 volt or ±15 volt) to drop out of regulation. It is therefore recommended that at least 100 mA or 20 percent of the output power, whichever is greater, be taken from the main (+5 volt) output.
4. Total combined output power - 30 watts.
5. Bandwidth guaranteed by design. Tested for 20 KHz to 2 MHz.
6. An overload is that condition with a load in excess of the rated load but less than that necessary to trigger the overload protection circuit and is the condition of maximum power dissipation.
7. Load step transition time between 2 and 10 microseconds.
8. Recovery time is measured from the initiation of the transient to where V_{OUT} has returned to within ±1 percent of V_{OUT} at 50 percent load.
9. Input step transition time between 2 and 10 microseconds.
10. Parameter shall be tested as part of design characterization and after design or process changes. Thereafter parameters shall be guaranteed to the limits specified in the table.
11. Turn on delay time measurement is for either a step application of power at the input or the removal of a ground signal from the inhibit pin (pin 8) while power is applied to the input.

BLOCK DIAGRAM



MECHANICAL OUTLINE



Flange

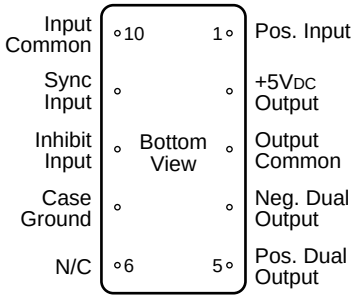
PART NUMBER

ATR 28 xx T x /xx

- Model
- Input Voltage
- Output Voltage
  - 12 – 12VDC
  - 15 – 15VDC
- Triple Output
- Package Option
  - F – Flange
- Temperature Range
  - Omit for -55°C to +85°C
  - ES – -55°C to +125°C
  - HB – -55°C to +125°C
  - CH – class B compliant

PIN DESIGNATION

Pin 1	Positive input	Pin 10	Input return
Pin 2	+5Vdc output	Pin 9	Sync input
Pin 3	Output return	Pin 8	Inhibit input
Pin 4	Neg. Dual Output	Pin 7	Case ground
Pin 5	Pos. Dual Output	Pin 6	Pin N/C



Available Screening Levels and Process Variations for ATR Series

Requirement	MIL-STD-883 method	No Suffix	ES Suffix	HB Suffix	CH Suffix
Temperature Range		-55°C to +85°C	-55°C to +125°C	-55°C to +125°C	-55°C to +125°C
Element Evaluation					MIL-PRF-38534
Internal Visual	2017	◆	✔	✔	✔
Temperature Cycle	1010, Cond C		Cond A	✔	✔
Constant Acceleration	2001, Cond A		500g	5,000g	5,000g
Burn-in	1015		96hrs @125°C	160hrs @125°C	160hrs @125°C
Final Electrical (Group A)	Specification	25°C	25°C	-55, +25, +125°C	-55,+25, +125°C
Seal, Fine & Gross	1014		✔	✔	✔
External Visual	2009	◆	✔	✔	✔

◆ per Commercial Standards

STANDARDIZED MILITARY DRAWING CROSS REFERENCE

Standardized military drawing PIN	Vendor CAGE number	Vendor similar PIN
5962-9315801HXX	52467	ATR2812T/CH
5962-9315801HZX	52467	ATR2812TF/CH
5962-9215901HXX	52467	ATR2815T/CH
5962-9215901HZX	52467	ATR2815TF/CH

NOTES

LAMBDA ADVANCED ANALOG INC.

MIL-PRF-38534 Certified
ISO9001 Registered

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