

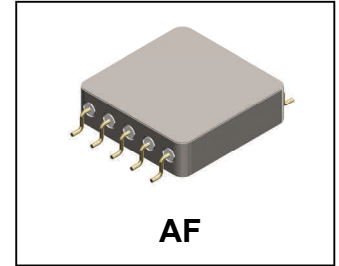
**EMI FILTER
HYBRID-HIGH RELIABILITY**

Description

The AF28461 Series EMI filter is designed to provide full compliance with the input line reflected ripple current requirement specified by MIL-STD-461C and MIL-STD-461F over the extended temperature range while operating in conjunction with the corresponding ARA and ARE Series of DC-DC converters. The filter is offered as part of a family of high reliability conversion products that operate up to 50V input line. Other converters operating with a similar switching frequency could also benefit by use of this device.

The AF28461 filter is hermetically sealed in a seam welded enclosure utilizing axially oriented surface-mountable copper-core pins which minimize resistive losses. The package is fabricated with IR HiRel's rugged ceramic lead-to-package seal assuring long term hermetic seal integrity in harsh environments.

The filter is manufactured in a facility fully qualified to MIL-PRF-38534, and is available in two screening grades. The flight grade is designed with the requirements of MIL-PRF-38534 for class K.

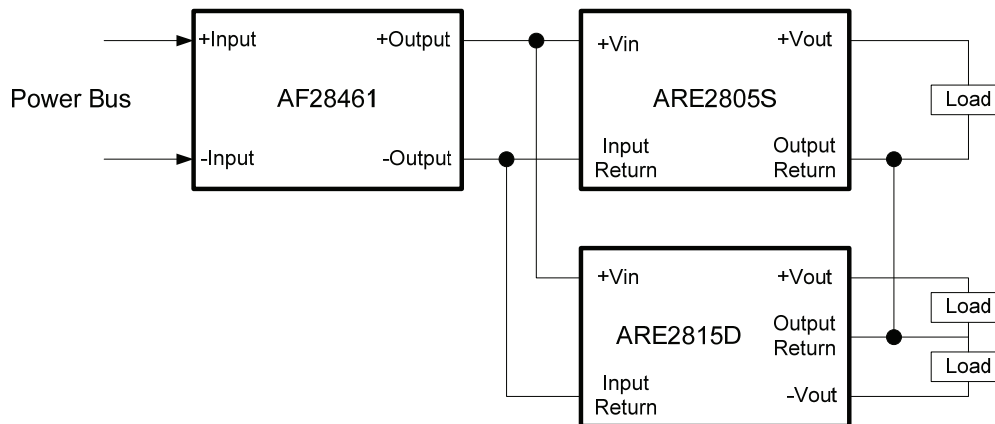


Features

- Up to 1.0 A Output Current
- Attenuation > 60dB @ 500 kHz
- Low Profile Seam Welded Package
- Ceramic Insulated Copper Core Pins
- Operation Over Full Military Temp. Range -55°C to 105°C without Power Derating
- Class K Screened per MIL-STD-38534
- MIL-PRF-38534 Element Evaluated Components
- Enabling ARA and ARE Series DC-DC Converters to meet CE102 Requirements of MIL-STD-461F
- Derated per MIL-STD-1547 and IEEE-INST-002

The EM grade is processed and screened to a lower grade requirement. The filter is designed to meet the derating guidelines of MIL-STD-1547 and IEEE-INST-002.

Typical Connection Diagram



Notes

1. One AF28461 filter is designed to accommodate up to two converters over rated voltage with rated load while not exceeding maximum power limit.
2. To obtain specified EMI performance, it is recommended that conductor length between filter and converter to be kept under 3 inches.
3. Cross section area of each conductor traces (on both input and output side) should be at least 0.05mm².
4. Filter can tolerate up to 20µH total line inductance on the input side.
5. At system integration, attention should be paid to maintain a conducting path with minimal inductance (< 25nH) between case of the filter and case of the converter.

Absolute Maximum Ratings, Note 1

Input Voltage	-50V to +50V, Note 2
Input Current	1.0A
Lead Soldering Temperature	+300°C for 10 seconds
Case Temperature-Operating	-55°C to +125°C
Case Temperature-Storage	-55°C to +135°C
Recommended Case Temperature-Operating	-55°C to +105°C

Specifications $-55^{\circ}\text{C} \leq T_{\text{CASE}} \leq +105^{\circ}\text{C}$, $100 \leq V_{\text{IN}} \leq +100\text{V}$ unless otherwise specified

Parameter	Group A Subgroup	Conditions	Min.	Nom.	Max.	Unit
Input Voltage		Steady State	-50	—	+50	V_{DC}
		Transient, Notes 2, 4	-100	—	+100	
Output Voltage	1, 2, 3	Continuous	$V_{\text{OUT}} = V_{\text{IN}} - I_{\text{IN}} (R_{\text{DC}})$			V_{DC}
Output Current			—	—	1.0	A_{DC}
DC Resistant, Note 3	1	$T_{\text{C}} = 25^{\circ}\text{C}$	—	—	300	$m\Omega$
Power Dissipation		Maximum Current, $T_{\text{C}} = 25^{\circ}\text{C}$	—	—	0.3	W
Noise Reduction	4, 5, 6	$T_{\text{C}} = 25^{\circ}\text{C}$	—	—	—	dB
		1.0 kHz	-1.0	—	+1.0	
		200 kHz - 500 kHz	—	—	-40	
		500 kHz - 10 MHz	—	—	-60	
Isolation	1	Any Pin to Case, Tested @ $500V_{\text{DC}}$	100	—	—	$M\Omega$
Capacitance	1, 2, 3	Measured between any Pin and Case	16	—	24	nF
Device Weight			—	—	23	g

Notes to Specifications

1. Operation above maximum ratings may cause permanent damage to the device. Operation at maximum ratings may degrade performance and affect reliability.
2. Device can tolerate ± 100 Volt transient whose duration is $\leq 100\text{ms}$ when $R_{\text{S}} \geq 0.5\Omega$.
3. DC resistance is the total resistance of the device and includes the sum of the input to output resistance and the *return in* to *return out* resistance paths.
4. Derating guidelines do not apply for any input voltage transient conditions.

Typical EMI Filter Performance Curves

(Case Temperature = 25°C, $V_{IN} = +28V$, Rated Load, unless otherwise specified)

Fig 1. MIL-STD-461C CE03 Two ARE28XXXX Converters without EMI Filter

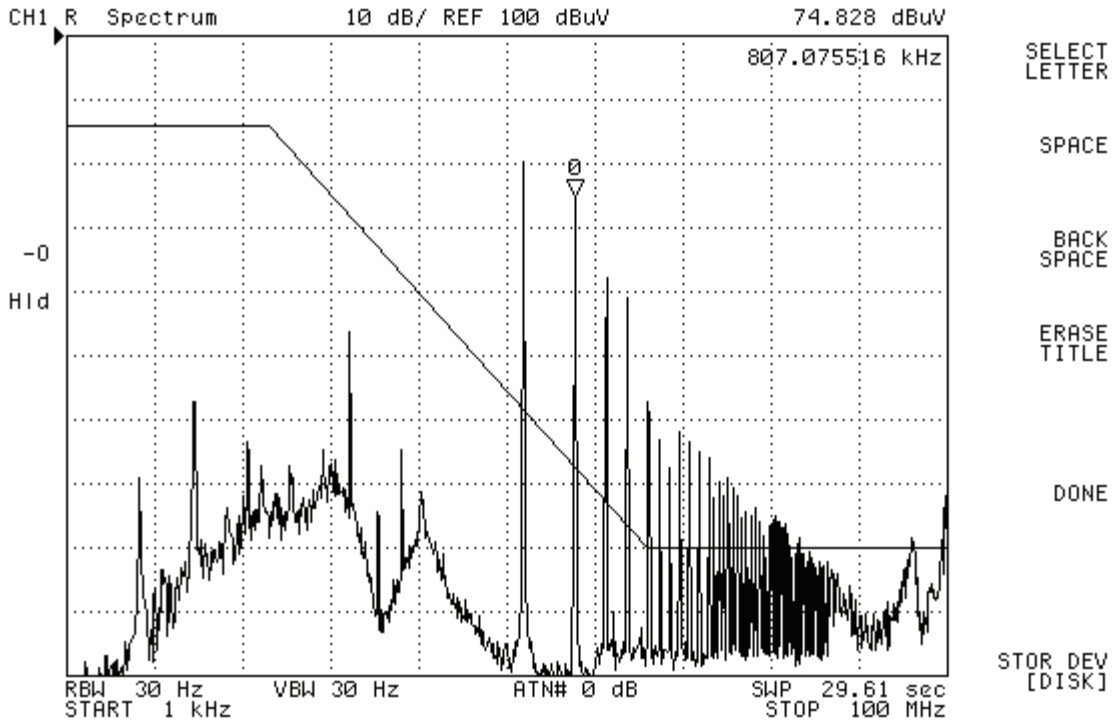


Fig 2. MIL-STD-461C CE03 Two ARE28XXXX Converters with EMI Filter

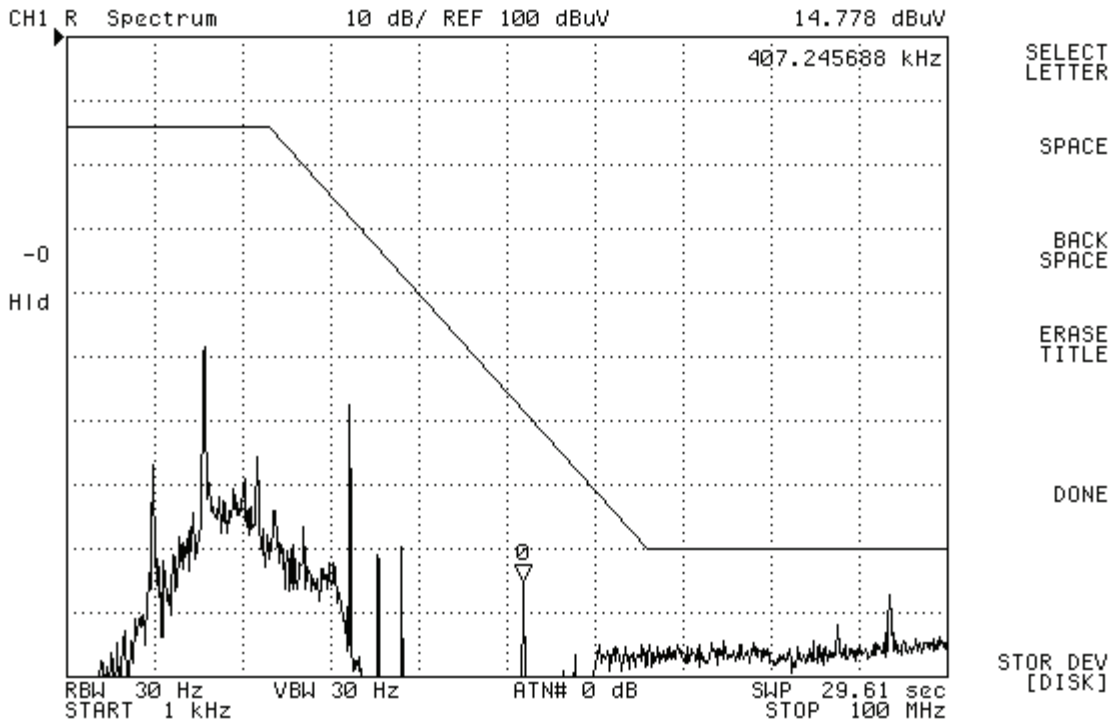


Fig 3. MIL-STD-461F CE102 Two ARE28XXX Converters without EMI Filter

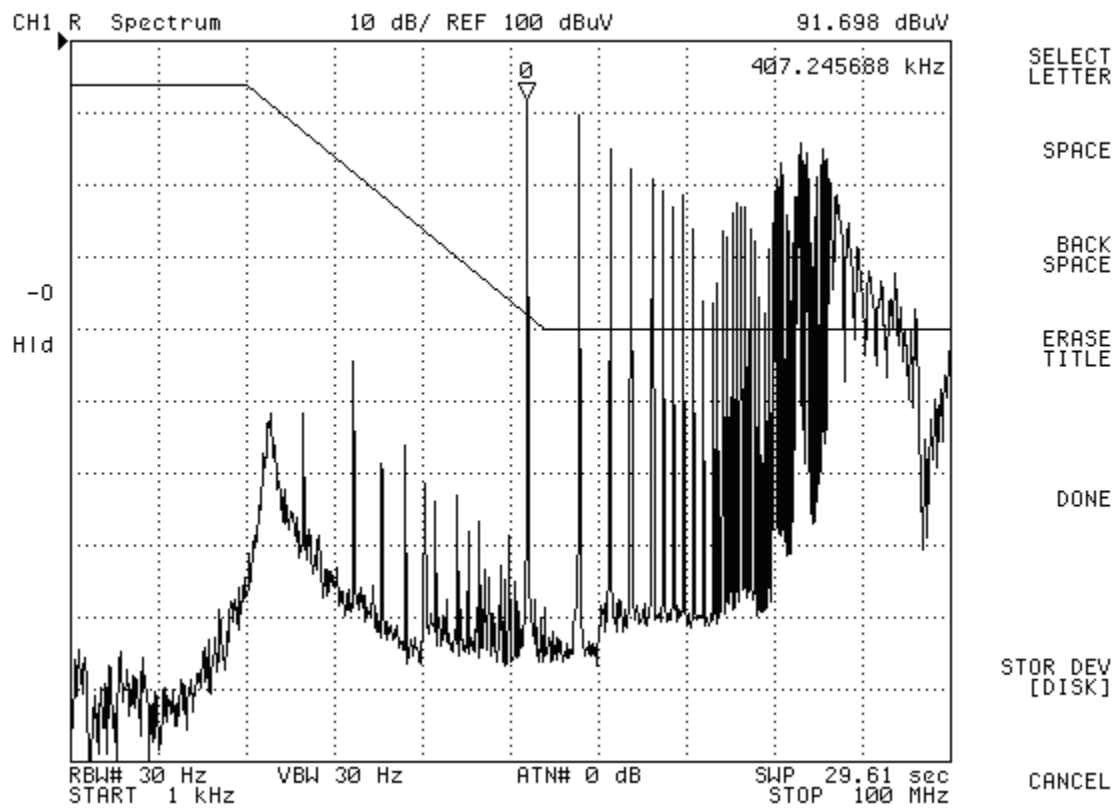
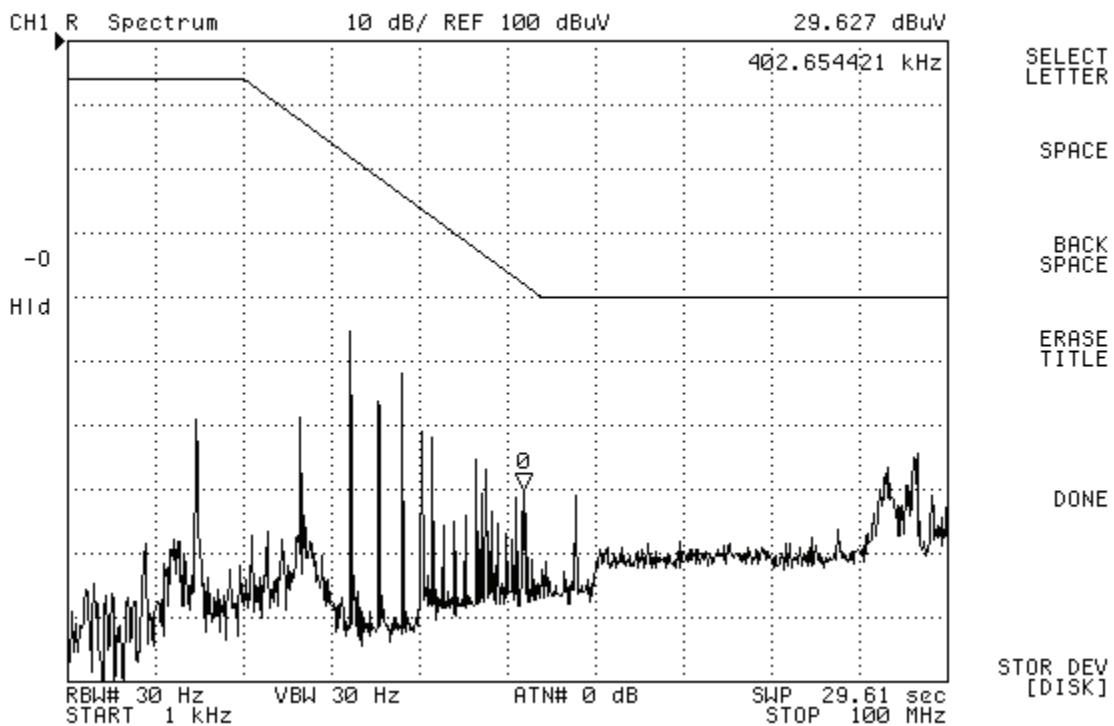


Fig 4. MIL-STD-461F CE102 Two ARE28XXX Converters with EMI Filter



Mechanical Outline

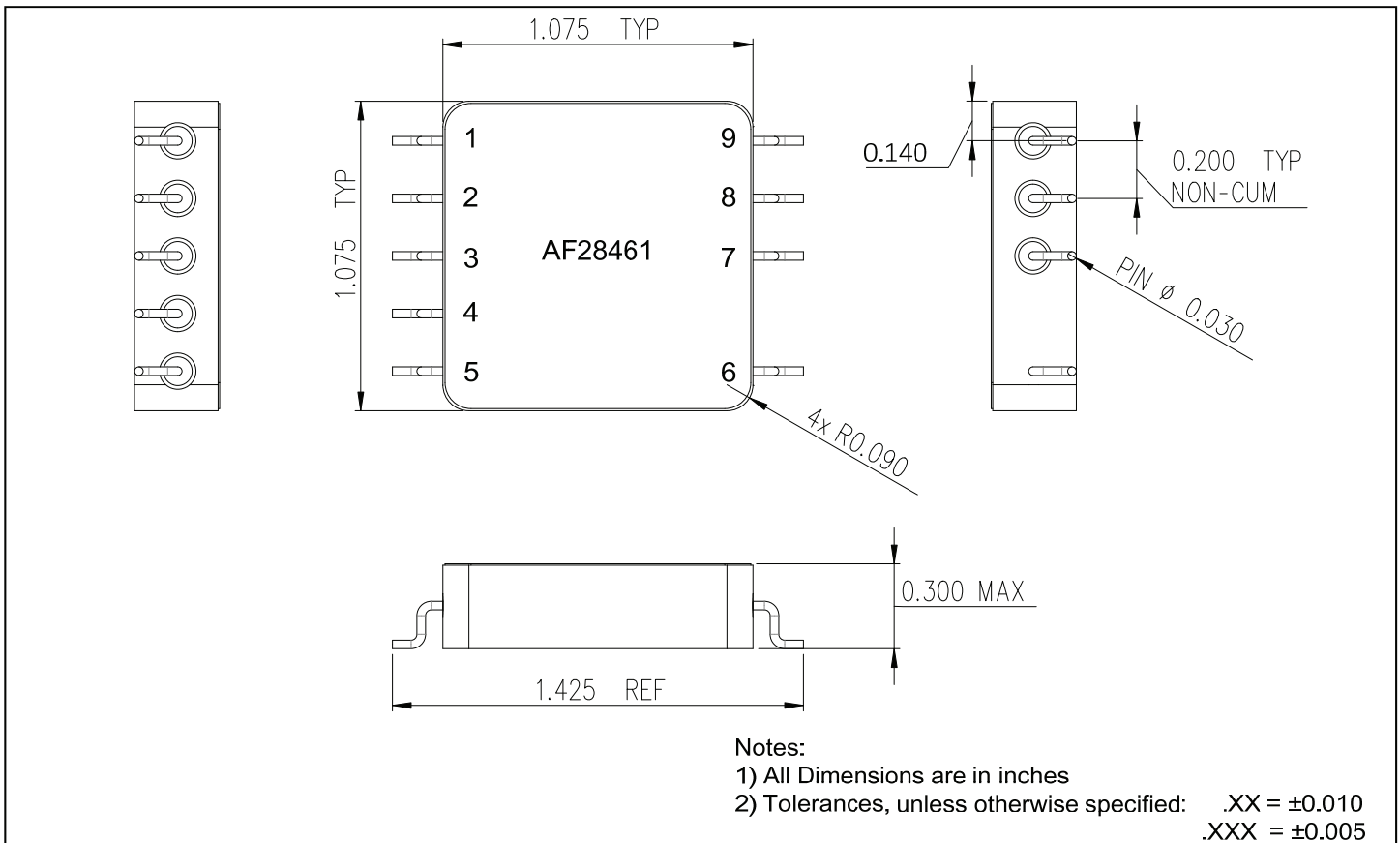
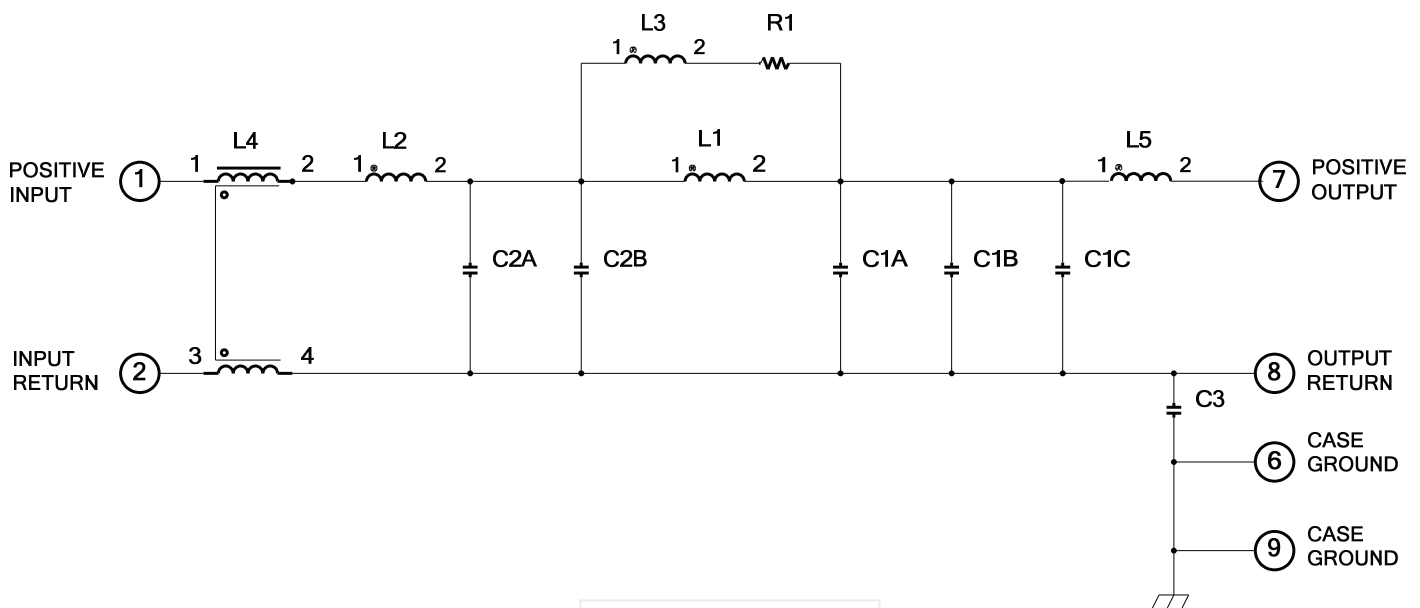


Fig 5. Block Diagram



Pin Designation

Pin #	Designation	Pin #	Designation
1	+ INPUT	6	CASE GROUND
2	INPUT RETURN	7	+ OUTPUT
3	NC	8	OUTPUT RETURN
4	NC	9	CASE GROUND
5	NC		

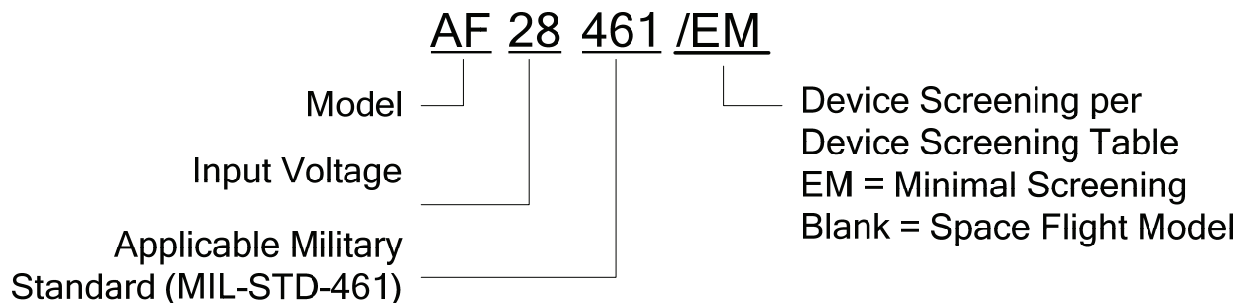
Device Screening

Requirement	MIL-STD-883 Method	Flight No Suffix	/EM Suffix ①
Temperature Range	—	-55°C to +105°C	-55°C to +105°C
Element Evaluation	—	MIL-PRF-38534, Class K	—
Internal Visual	2017	Yes	Yes
Temperature Cycle	1010	Cond C	—
Constant Acceleration	2001	Cond A	—
PIND	2020	Cond A	N/A
Burn-in Interim Electrical @ 160 hrs	1015	320 hrs @ 125°C	48 hrs @ 125°C
Final Electrical (Group A) Read & Record Data	MIL-PRF-38534 & Specification	-55°C, +25°C, +105°C	+25°C
PDA (25°C, interim to final)	—	2%	—
Seal, Fine & Gross	1014	Cond A, C	Cond A, C
Radiographic	2012	Yes	—
External Visual	2009	Yes	Yes

Note:

① Any Engineering Model (EM) build with the “EM” Suffix shall only be form, fit and functional equivalent to its Flight Model (FM) counterpart, and it may not meet the radiation performance. The EM Model shall not be expected comply with MIL-PRF-38534 flight quality/workmanship standards, and configuration control. An EM build may use electrical equivalent commercial grade components. IR HiRel will provide a list of non-compliance items upon request.

Part Numbering



IMPORTANT NOTICE

The information given in this document shall be in no event regarded as guarantee of conditions or characteristic. The data contained herein is a characterization of the component based on internal standards and is intended to demonstrate and provide guidance for typical part performance. It will require further evaluation, qualification and analysis to determine suitability in the application environment to confirm compliance to your system requirements.

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