

AEE (15W) Isolated DC/DC Converter Module

Industry Standard Size, 2" x 1" x 0.44"

9-36V/18-75V Inputs, 3.3V/5V/12V/15V Outputs

The AEE (15W) Isolated DC/DC Converter is Astec's 4:1 wide input voltage family for low power applications. With efficiency up to 84% typical for 5V module, this product is allowed to work at operating temperature range from -40°C to 71°C and a wide input voltage range of 4:1. Single-output models are available for a wide range of applications in telecommunication, transportation equipment, etc.. Housed in small package, 2" x 1" x 0.44", with industry standard pinout, AEE family eases the PCB designs and mechanical designs of customers' end products.



Industry Standard Size
2" x 1" x 0.44"

Special Features

- Wide 4:1 input range
- High efficiency, 84%@5V
- -40°C to 90°C case surface operating temperature
- Input / Output isolation 1.5KVdc
- Low output ripple and noise
- Shielded metal case with size (2"x1"x0.44")
- Industrial standard pinout
- Lead-free soldering pins
- Fixed switching frequency (300KHz)

Environmental Specifications

- Operating temperature: -40°C to +71°C
- Storage temperature: -55°C to +105°C
- MTBF: >700K hours
- ROHS Compliant



Electrical Parameters

Input

Input range	9-36 VDC; 18-75 VDC
Efficiency	84%@ 5V (Typical)

Output

Regulation (Line, Load, Temp)	<1%
Ripple and noise	2% typical (100mV p-p max@ 5V)
Transient Response	6% max deviation with 50% load to full load 300uS (max) recovery
Short Circuit Protection	Indefinite

Safety

Designed to meet EN60950 (up to SELV limit)



Technical Reference Note AEE (15W) Family



AEE (15W) SERIES

THIS SPECIFICATION COVERS THE REQUIREMENTS
FOR AN INDUSTRY STANDARD PACKAGE OF 2"x1"x0.44",
4:1 INPUT RANGE, 15W, SINGLE OUTPUT ISOLATED DC/DC CONVERTER

PART NUMBERS

MODEL NAME / SIS CODE	Nominal Vin / Range of Vin	Vout / Iout
AEE04F18-L	24V / 9-36V	3.3V / 4A
AEE04F36-L	48V / 18-75V	3.3V / 4A
AEE03A18-L	24V / 9-36V	5V / 3A
AEE03A36-L	48V / 18-75V	5V / 3A
AEE01B18-L	24V / 9-36V	12V / 1.25A
AEE01B36-L	48V / 18-75V	12V / 1.25A
AEE01C18-L	24V / 9-36V	15V / 1A
AEE01C36-L	48V / 18-75V	15V / 1A



Technical Reference Note AEE (15W) Family



ELECTRICAL SPECIFICATIONS

Unless otherwise indicated, specifications apply over all operating input voltage and temperature conditions.
Standard test condition on a single unit.

Tambient :	25°C
+Vin :	24V $\pm$ 2% (AEExxxx18-L) 48V $\pm$ 2% (AEExxxx36-L)
-Vin :	return pin for +Vin
+Vout :	connect to load
-Vout :	connect to load (return)

ABSOLUTE MAXIMUM RATINGS

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the IPS. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Device	Symbol	Min	Typ	Max	Unit
a) Input Voltage:						
Continuous:	AEExxx18-L	V_I	0	-	36	Vdc
Transient (100ms)	AEExxx18-L	$V_{I, trans}$	0	-	44	Vdc
Continuous:	AEExxx36-L	V_I	0	-	75	Vdc
Transient (100ms)	AEExxx36-L	$V_{I, trans}$	0	-	88	Vdc
b) Operating Temperature						
Ambient	All	T_a	-40	-	71	°C
Case Surface		T_c	-40	-	100	°C
c) Storage Temperature	All	T_{STG}	-55	-	105	°C
d) Operating Humidity	All	-	-	-	95	%
e) I/O Isolation (Conditions : 0.5mA for 60 sec) Input-Output	All	-	-	-	1500	Vdc
f) Output Power	3.3V	$P_{o, max}$	-	-	13.2	W
	Others	$P_{o, max}$	-	-	15	W



Technical Reference Note AEE (15W) Family



INPUT SPECIFICATIONS

Parameter	Device	Symbol	Min	Typ	Max	Unit
a) Operating Input Voltage	AEExxx18-L	V_I	9	24	36	V_{DC}
	AEExxx36-L	V_I	18	48	75	V_{DC}
b) Maximum Input Current AEExxx18-L ($V_I = 0$ to $V_{I,max}$: $I_o = I_{o,max}$)	3.3V	$I_{I,max}$	-	-	2.9	A
	5V	$I_{I,max}$	-	-	2.9	A
	12V	$I_{I,max}$	-	-	2.5	A
	15V	$I_{I,max}$	-	-	2.5	A
	AEExxx36-L	$I_{I,max}$	-	-	1.5	A
	3.3V	$I_{I,max}$	-	-	1.5	A
	5V	$I_{I,max}$	-	-	1.3	A
	12V	$I_{I,max}$	-	-	1.3	A
c) No Load Input Power ($V_I = V_{I,nom}$)	All	-	-	-	0.5	W
d) External Fuse Ratings	3.3V		-	4	-	A
	AEExxx18-L		-	4	-	A
	5V		-	3	-	A
	12V		-	3	-	A
	15V		-	2	-	A
	AEExxx36-L		-	2	-	A
	3.3V		-	2	-	A
	5V		-	2	-	A
	12V		-	2	-	A
	15V		-	2	-	A

CAUTION: This power module is not internally fused. An input fuse must always be used.



Technical Reference Note AEE (15W) Family



OUTPUT SPECIFICATIONS

Parameter	Device	Symbol	Min	Typ	Max	Unit
a) Output Voltage Setpoint	3.3V	$V_{o,set}$	3.23	3.30	3.37	V_{dc}
($V_I = V_{I,min}$ to $V_{I,max}$; $I_o = I_{o,max}$; $T_A = 25^\circ C$)	5V	$V_{o,set}$	4.90	5.00	5.10	V_{dc}
	12V	$V_{o,set}$	11.76	12.00	12.24	V_{dc}
	15V	$V_{o,set}$	14.70	15.00	15.30	V_{dc}
b) Output Regulation:						
Line ($V_I = V_{I,max}$ to $V_{I,min}$; $I_o = I_{o,max}$)	All	-	-	-	0.5	%
Load ($V_I = V_{I,nom}$; $I_o = I_{o,min}$ to $I_{o,max}$)	All	-	-	-	1.0	%
Temperature ($T_c = -40^\circ C$ to $+90^\circ C$)	All	-	-	-	1.0	% V_o
c) Output Ripple and Noise	3.3V	-	-	-	100	mVp-p
(Across 1 μ F @50V, X7R ceramic capacitor & 10 μ F @25V tantalum capacitor) See Figure 1.	5V	-	-	-	100	mVp-p
Peak-to-Peak (5 Hz to 20 MHz)	12V	-	-	-	120	mVp-p
	15V	-	-	-	120	mVp-p
d) Rated Output Current	3.3V	I_o	400	-	4000	mA
Single Output	5V	I_o	300	-	3000	mA
	12V	I_o	125	-	1250	mA
	15V	I_o	100	-	1000	mA
e) Efficiency						
($V_I = V_{I,nom}$; $I_o = I_{o,max}$; $T_A = 25^\circ C$)	3.3V	-	-	80	-	%
	5V	-	-	84	-	%
	12V	-	-	84	-	%
	15V	-	-	84	-	%
f) Switching Frequency	All	-	270	300	330	KHz



Technical Reference Note AEE (15W) Family



OUTPUT SPECIFICATIONS (Cont.)

Parameter	Device (Series)	Symbol	Min	Typ	Max	Unit
g) Dynamic Response : ($\Delta I_o / \Delta t = 0.08A/\mu s$; $V_I = V_{I,nom}$; $T_A = 25^\circ C$)						
Load Change from $I_o = 50\%$ to 100% of $I_{o,max}$:	3.3V/5V	-	-	-	6	%Vo
Peak Deviation Settling Time (to $V_{o,nom}$)	12V/15V	-	-	-	2	%Vo
	All	-	-	-	300	μSec
Turn-On Time ($I_o = I_{o,max}$; V_o within 1%)	All	-	-	5	10	msec
i) Output Voltage Overshoot ($I_o = I_{o,max}$; $T_A = 25^\circ C$)	All	-	-	1	4	%Vo

FEATURE SPECIFICATIONS

Parameter	Device (Series)	Symbol	Min	Typ	Max	Unit
Undervoltage Lockout Turn-on Point	AEExxx18-L	-	-	8.6	9	V
	AEExxx36-L	-	-	16	18	V
Turn-off Point	AEExxx18-L	-	6.5	7.8	-	V
	AEExxx36-L	-	12.5	14	-	V
Isolation Capacitance	All	-	-	1000	-	PF
Isolation Resistance	All	-	10	-	-	M Ω
Calculated MTBF ($I_o = I_{o,max}$; $T_A = 25^\circ C$)	All	-	700K	-	-	Hours
Weight	All	-	-	-	40	g



Technical Reference Note AEE (15W) Family



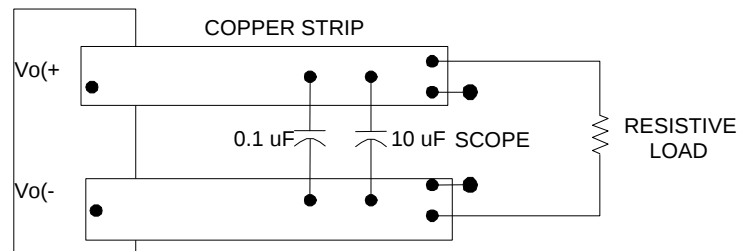
Basic Operation and Features

The AEE converters were designed specifically to address applications where high power density is required. These modules provide 1500V isolation and operate from the input ranges of 9V-36V and 18V-75V with standard features such as short circuit protection.

Output Current Protection

To provide protection in a short circuit condition, the converter is equipped with current limiting circuitry and can endure the fault condition for an unlimited duration. At the point of current-limit inception, the converter goes into "Hiccup Mode", causing the output current to be limited both in peak and duration. The converter operates normally once the output current is brought back into its specified range.

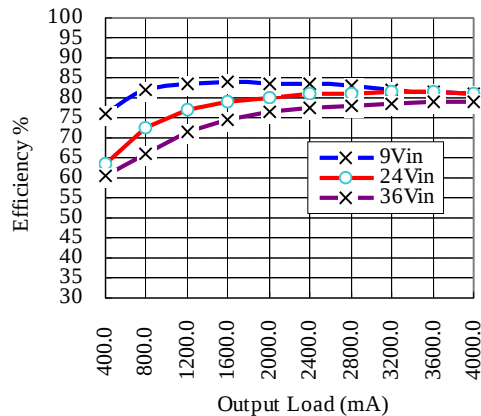
TEST SETUP



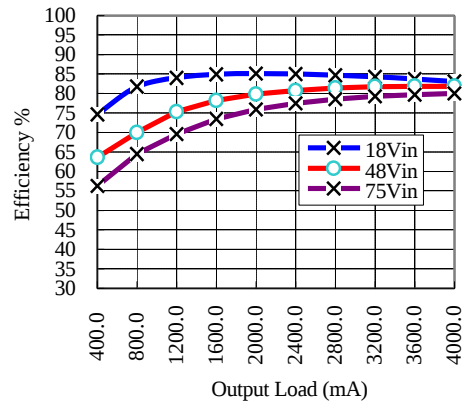
Note: Use a 0.1 μ F @50V X7R ceramic capacitor and a 10 μ F @ 25V tantalum capacitor. Scope measurement should be made using a BNC socket. Position the load between 51 mm and 76 mm (2 in. and 3 in.) from module.

Figure 1 : Peak-to-Peak Output Noise Measurement Test Setup.

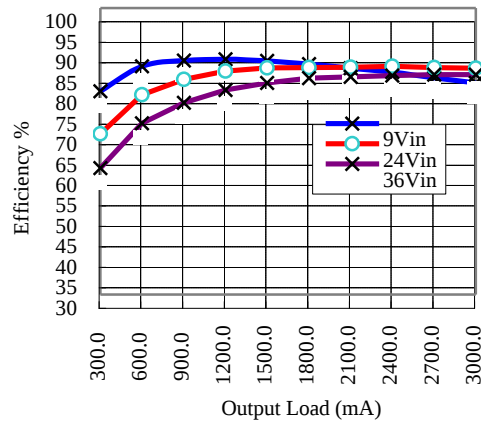
Performance Curves – Efficiency Curve



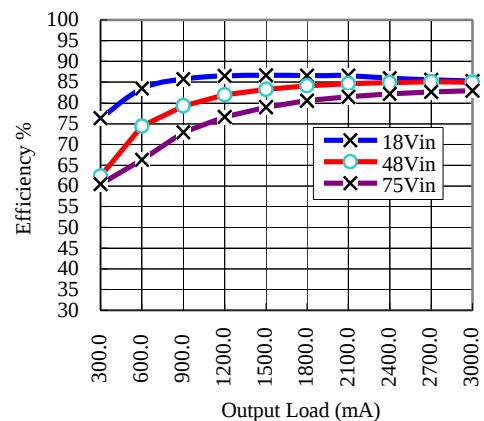
Efficiency vs. Load @ +25° Ambient, AEE04F18-L



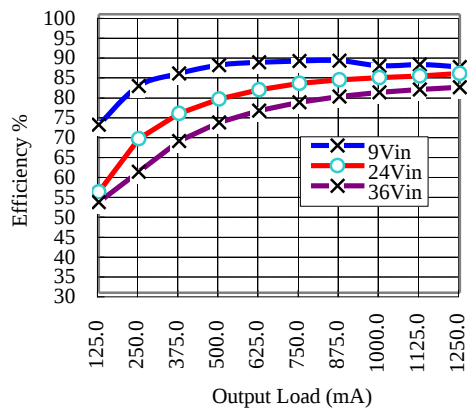
Efficiency vs. Load @ +25° Ambient, AEE04F36-L



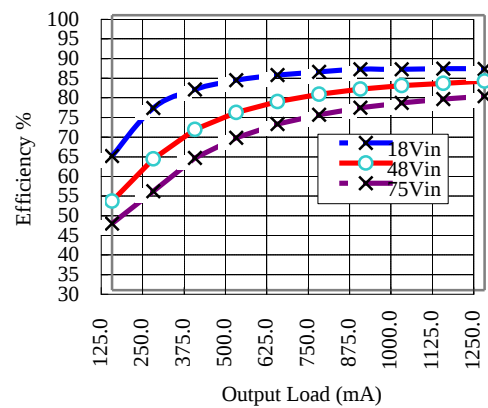
Efficiency vs. Load @ +25° Ambient, AEE03A18-L



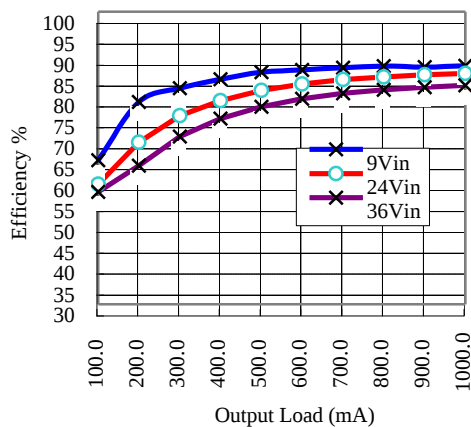
Efficiency vs. Load @ +25° Ambient, AEE03A36-L



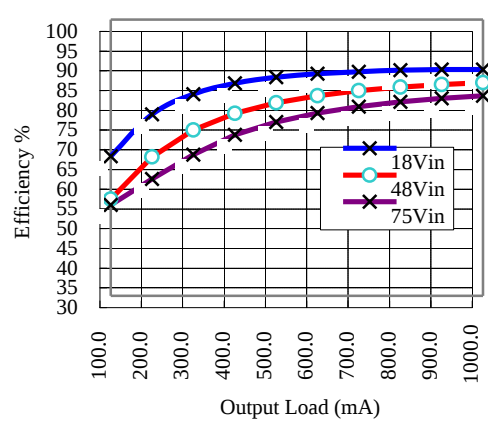
Efficiency vs. Load @ +25° Ambient, AEE01B18-L



Efficiency vs. Load @ +25° Ambient, AEE01B36-L

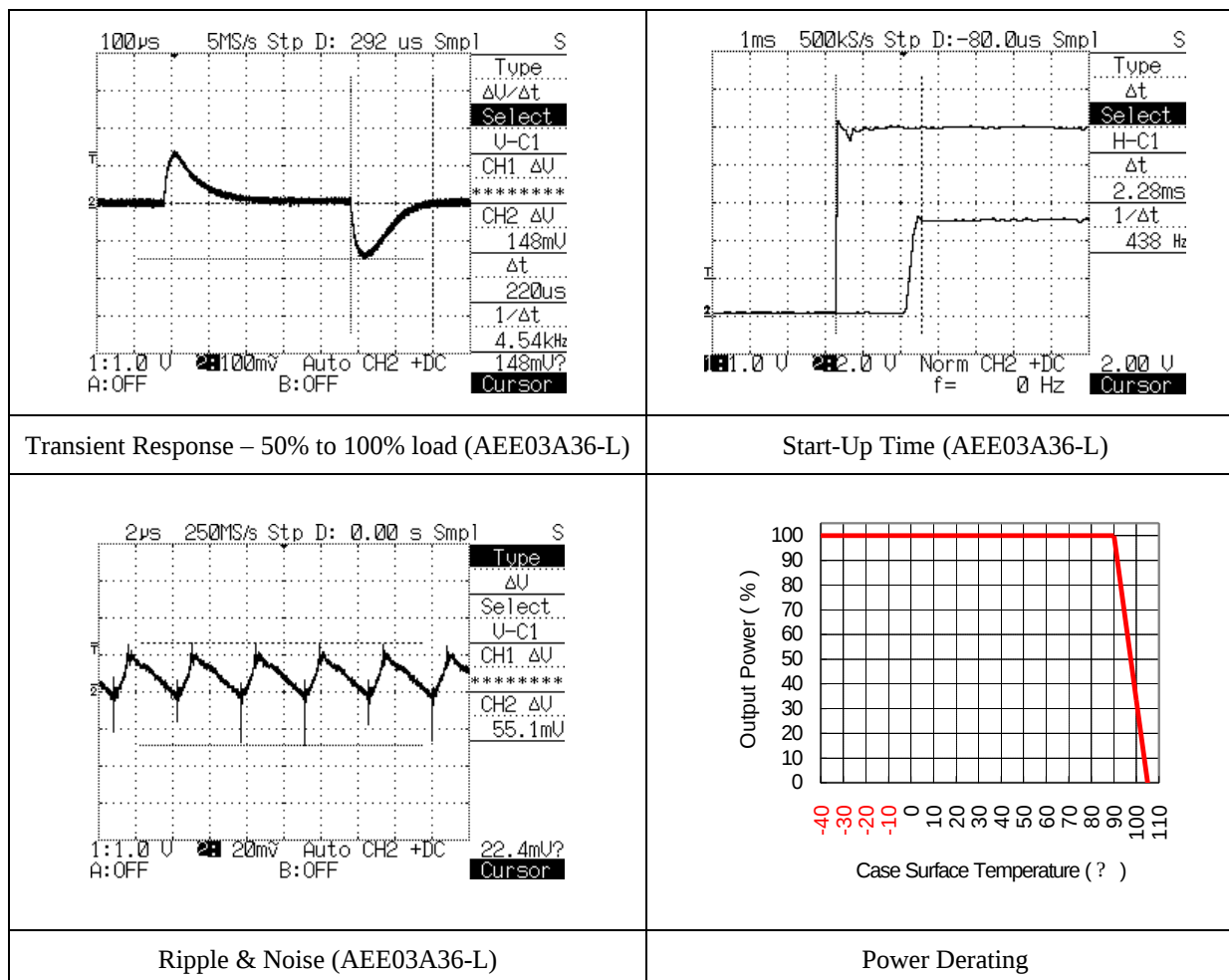


Efficiency vs. Load @ +25° Ambient, AEE01C18-L



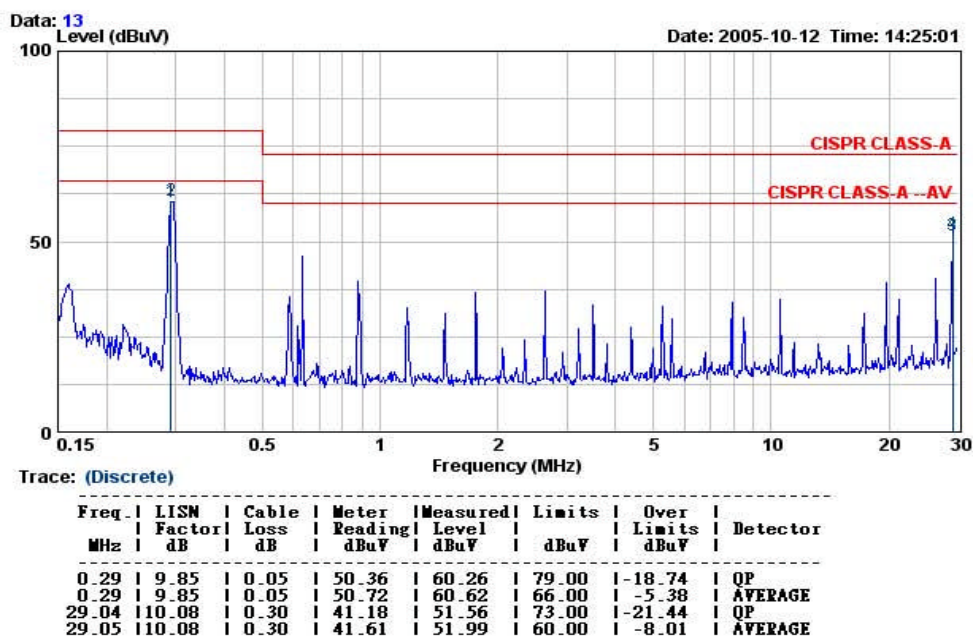
Efficiency vs. Load @ +25° Ambient, AEE01C36-L

Performance Curves

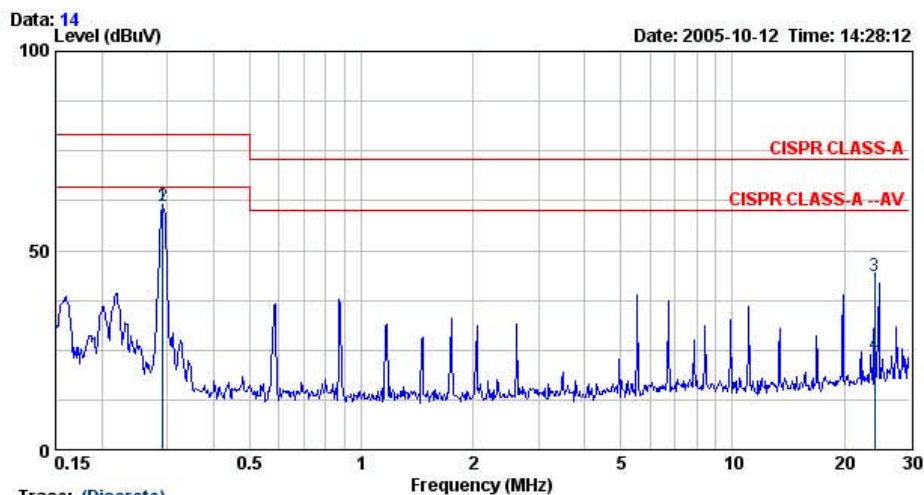


Conducted EMI Performance

EUT : CONVERTER Test voltage : 48Vdc
M/N : AEE03A36(F7W-4805S15W) Test mode : FULL LOAD
POL : NEUTRAL Engineer : TEMP : Humidity :

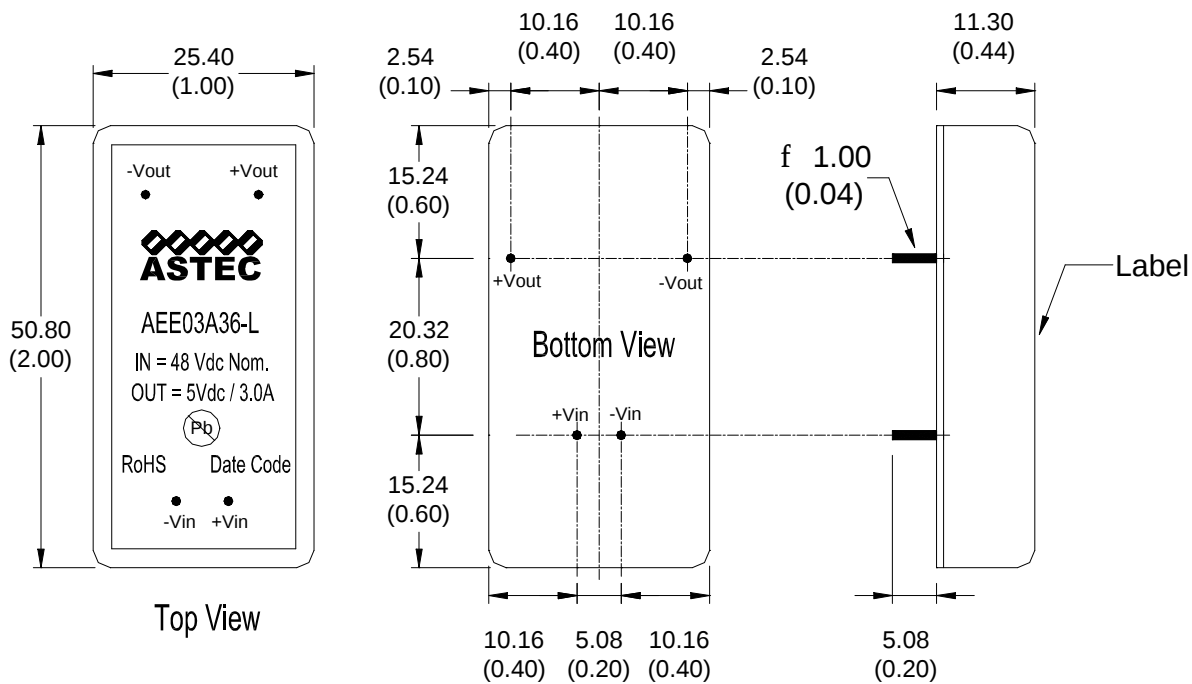


EUT : CONVERTER Test voltage : 48Vdc
M/N : AEE03A36(F7W-4805S15W) Test mode : FULL LOAD
POL : LINE Engineer : TEMP : Humidity :



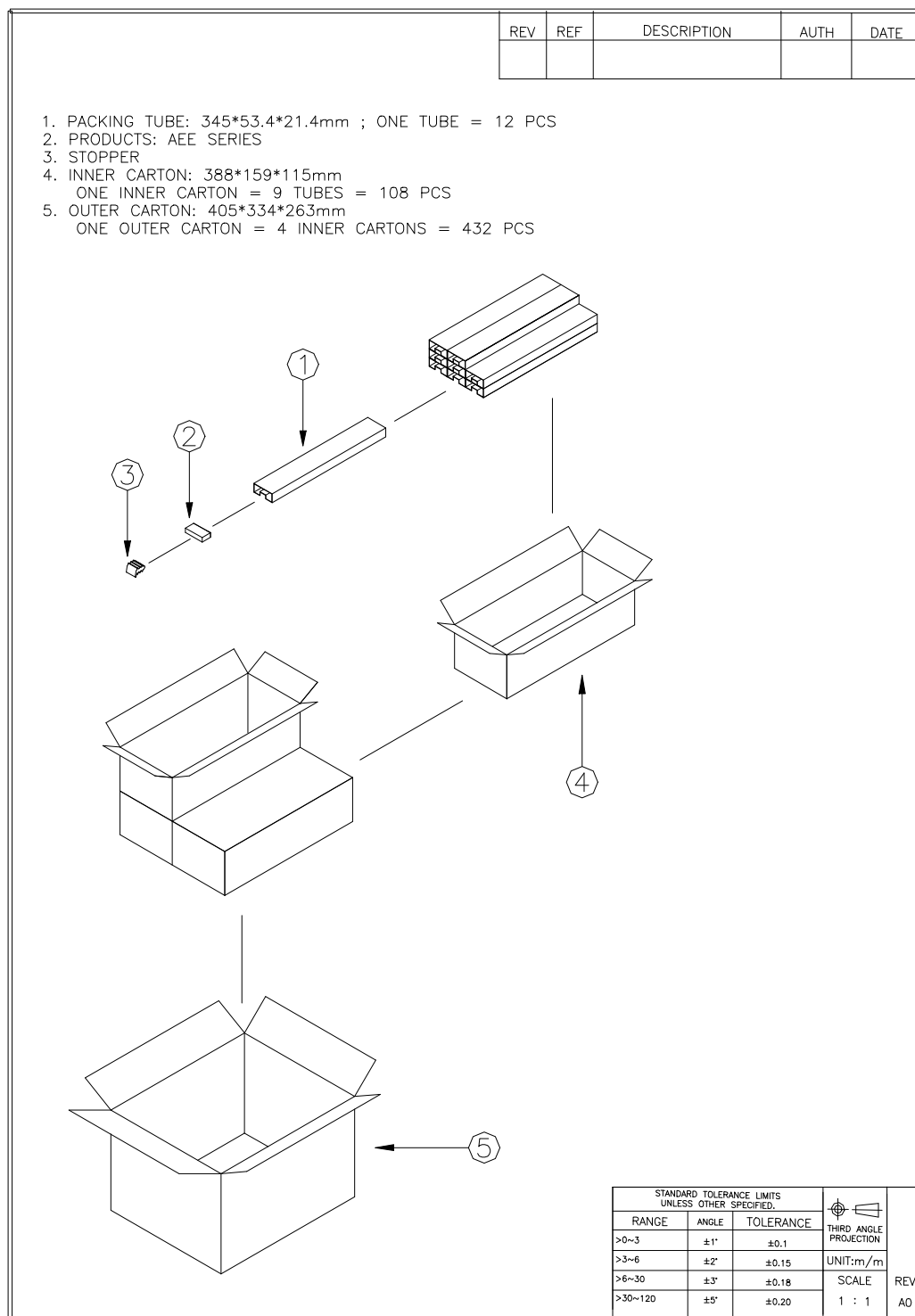
Freq.	LISM	Cable	Meter	Measured	Limits	Over	
MHz	Factor	Loss	Reading	Level	dBuV	Limits	Detector
0.29	9.85	0.05	51.19	61.09	79.00	-17.91	QP
0.29	9.85	0.05	51.32	61.22	66.00	-4.78	AVERAGE
24.12	110.00	0.59	33.11	43.70	60.00	-16.30	AVERAGE
24.12	110.00	0.59	13.21	23.80	73.00	-49.20	QP

Mechanical Dimensions and Module Pin Assignment



Outline Drawing for AEE Single Series

Package Information



Recommended Lead-Free Wave Soldering Temperature Profile

