

***AEE (15W) Isolated DC/DC Converter Module***  
***Industry Standard Size, 2" x 1" x 0.44"***  
***9-36V/18-75V Inputs, 3.3V/5V/±5V/12V/±12V/15V/±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 83% 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, 83% @ 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)**

### Electrical Parameters

#### Input

<b>Input range</b>	<b>9-36 VDC; 18-75 VDC</b>
<b>Efficiency</b>	<b>83% @ 5V (Typical)</b>

#### Output

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

### Safety

Designed to meet EN60950 (up to SELV limit)

### Environmental Specifications

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





## 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 AND DUAL 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
AEE03A18-L	24V / 9-36V	5V / 3A
AEE01AA18-L	24V / 9-36V	±5V / ±1.5A
AEE01B18-L	24V / 9-36V	12V / 1.25A
AEE00BB18-L	24V / 9-36V	±12V / ±0.625A
AEE01C18-L	24V / 9-36V	15V / 1A
AEE00CC18-L	24V / 9-36V	±15V / ±0.5A
AEE04F36-L	48V / 18-75V	3.3V / 4A
AEE03A36-L	48V / 18-75V	5V / 3A
AEE01AA36-L	48V / 18-75V	±5V / ±1.5A
AEE01B36-L	48V / 18-75V	12V / 1.25A
AEE00BB36-L	48V / 18-75V	±12V / ±0.625A
AEE01C36-L	48V / 18-75V	15V / 1A
AEE00CC36-L	48V / 18-75V	±15V / ±0.5A



## 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 ±2% (AEExxx18-L) 48V ±2% (AEExxx36-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 / $\pm 5V$	$I_{I,max}$	-	-	2.9	A	
	12V / $\pm 12V$	$I_{I,max}$	-	-	2.6	A	
	15V / $\pm 15V$	$I_{I,max}$	-	-	2.6	A	
	AEExxx36-L ( $V_I = 0$ to $V_{I,max}$ : $I_o = I_{o,max}$ )	3.3V	$I_{I,max}$	-	-	1.5	A
		5V / $\pm 5V$	$I_{I,max}$	-	-	1.5	A
		12V / $\pm 12V$	$I_{I,max}$	-	-	1.3	A
		15V / $\pm 15V$	$I_{I,max}$	-	-	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	5V	-	4	-	A	
		12V	-	3	-	A	
		15V	-	3	-	A	
	AEExxx36-L	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 ( $V_I = V_{I,min}$ to $V_{I,max}$ ; $I_o = I_{o,max}$ ; $T_A = 25^\circ\text{C}$ )	3.3V	$V_{o,set}$	3.23	3.30	3.37	$V_{dc}$	
	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	$V_{dc}$	
	±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	%	
	Cross ( $V_I = V_{I,nom}$ ; $I_o = +I_{o,max}, -I_{o,min}$ or $+I_{o,min}, -I_{o,max}$ to $+I_{o,max}, -I_{o,max}$ )	±5V/±12V/ ±15V	-	-	-	4	%
	Temperature ( $T_c = -40^\circ\text{C}$ to $+90^\circ\text{C}$ )	All	-	-	-	1	% $V_o$
	c) Output Ripple and Noise (Across 1µF @50V, X7R ceramic capacitor & 10µF @25V tantalum capacitor) See Figure 1. Peak-to-Peak (5 Hz to 20 MHz)	3.3V	-	-	-	100	mVp-p
5V / ±5V		-	-	-	100	mVp-p	
12V /		-	-	-	120	mVp-p	
±12V		-	-	-	120	mVp-p	
15V / ±15V		-	-	-	-	-	
d) Rated Output Current Single Output	3.3V	$I_o$	400	-	4000	mA	
	5V	$I_o$	300	-	3000	mA	
	12V	$I_o$	125	-	1250	mA	
	15V	$I_o$	100	-	1000	mA	
	Dual Output	±5V	$I_o$	±150	-	±1500	mA
		±12V	$I_o$	±63	-	±625	mA
		±15V	$I_o$	±50	-	±500	mA
e) Efficiency ( $V_I = V_{I,nom}$ ; $I_o = I_{o,max}$ ; $T_A = 25^\circ\text{C}$ )	3.3V	-	-	80	-	%	
	5V	-	-	83	-	%	
	12V	-	-	84	-	%	
	15V	-	-	84	-	%	
	±5V	-	-	82	-	%	
	±12V	-	-	83	-	%	
	±15V	-	-	84	-	%	
f) Switching Frequency	All	-	270	300	330	KHz	



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### 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/ $\pm 5V$	-	-	-	6	%Vo
Peak Deviation Settling Time (to $V_{o,nom}$ )	12V/ $\pm 12V$ / 15V/ $\pm 15V$	-	-	-	2	%Vo
	All	-	-	-	300	$\mu Sec$
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 $\Omega$
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



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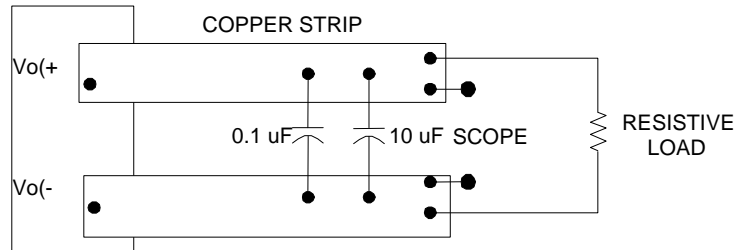
### **Basic Operation and Features**

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**

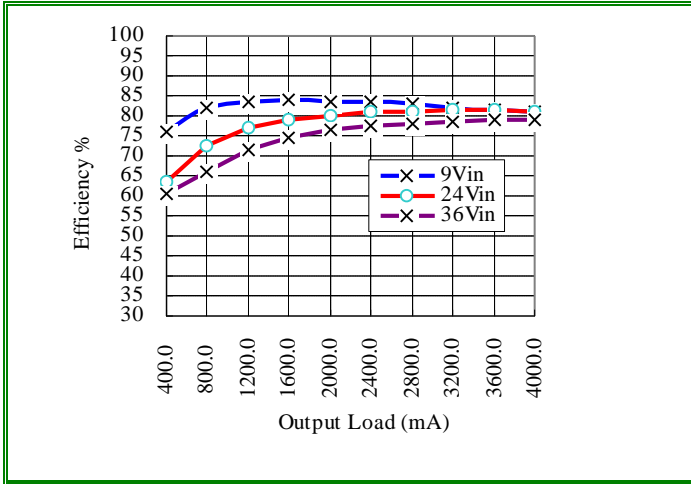


Note: Use a  $0.1\ \mu\text{F}$  @50V X7R ceramic capacitor and a  $10\ \mu\text{F}$  @ 25V tantalum capacitor. Scope measurement should be made using a BNC socket. Position the load between 51 mm and 76 mm (2 in. and 3 in.) from module.

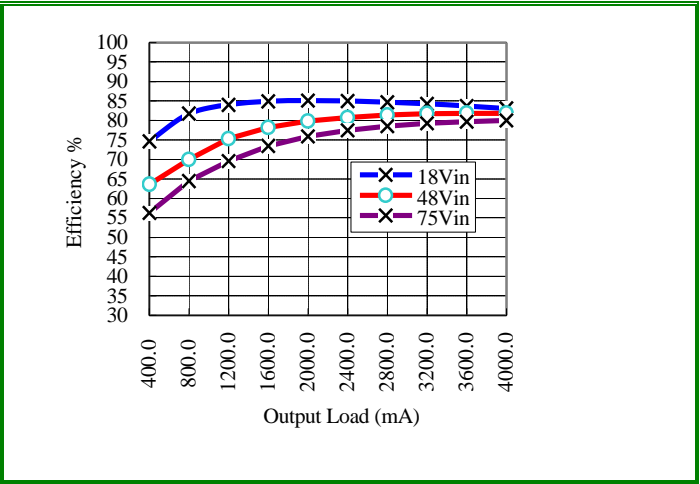
**Figure 1 : Peak-to-Peak Output Noise Measurement Test Setup.**



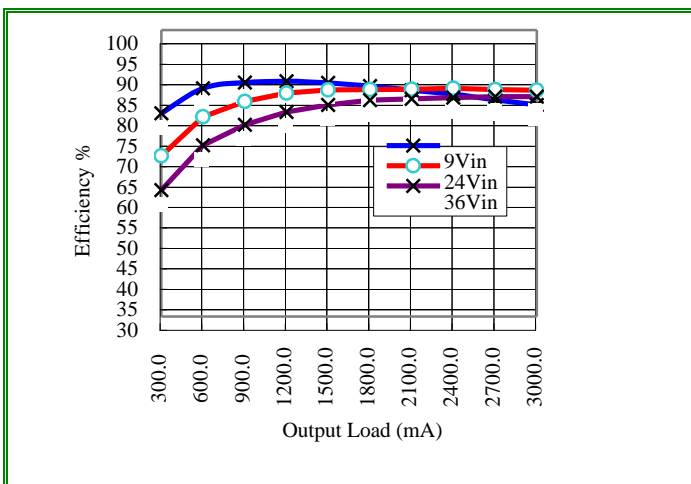
Performance Curves – Efficiency Curve



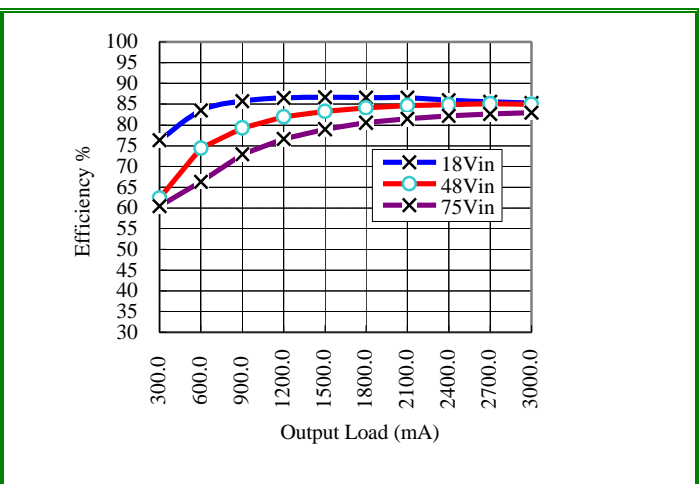
Efficiency vs. Load @ +25° Ambient, AEE04F18-L



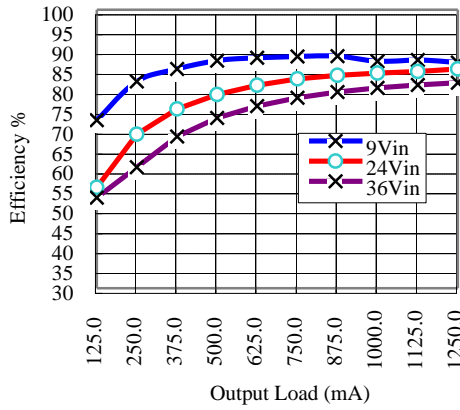
Efficiency vs. Load @ +25° Ambient, AEE04F36-L



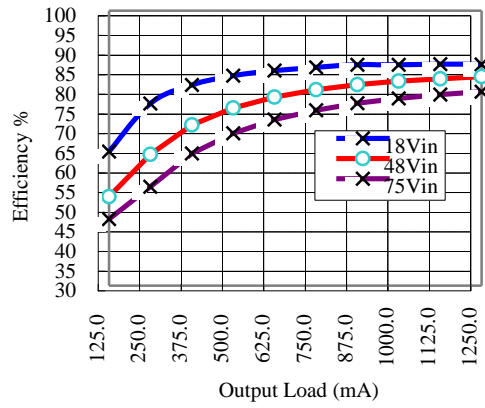
Efficiency vs. Load @ +25° Ambient, AEE03A18-L



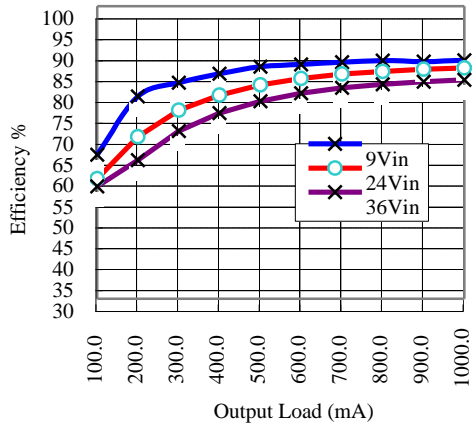
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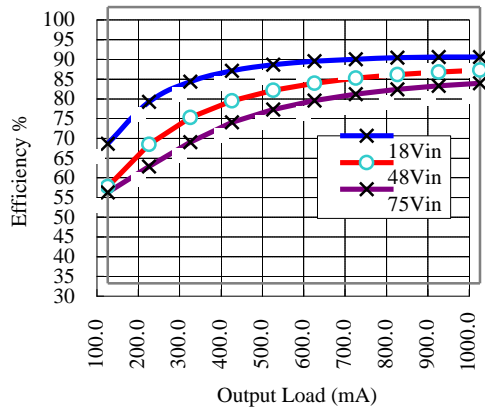
Efficiency vs. Load @ +25° Ambient, AEE01B18-L



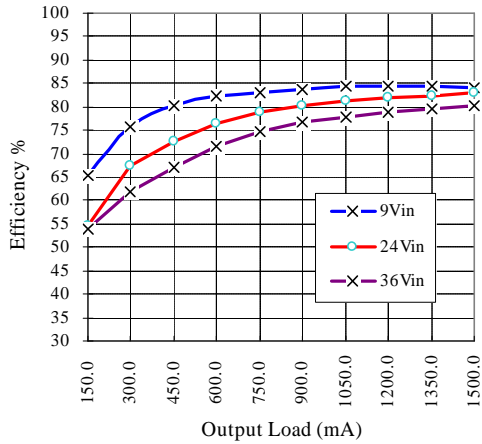
Efficiency vs. Load @ +25° Ambient, AEE01B36-L



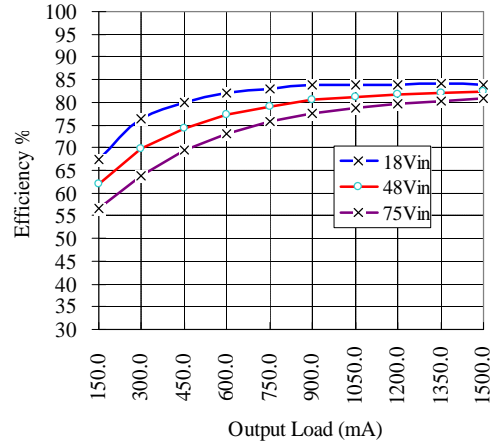
Efficiency vs. Load @ +25° Ambient, AEE01C18-L



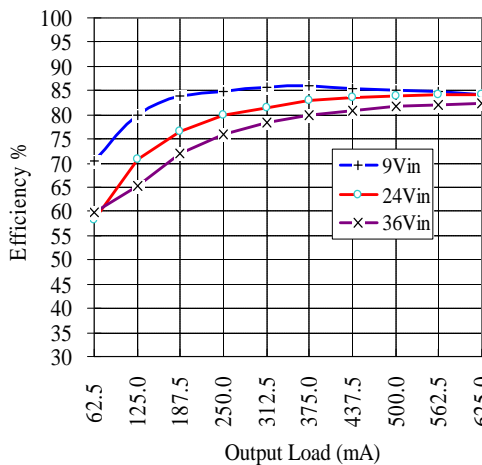
Efficiency vs. Load @ +25° Ambient, AEE01C36-L



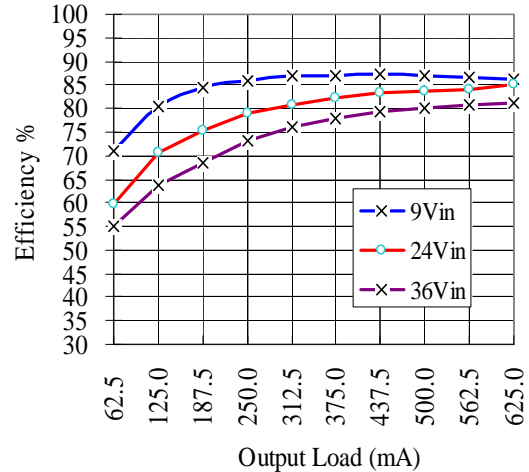
Efficiency vs. Load @ +25° Ambient, AEE01AA18-L



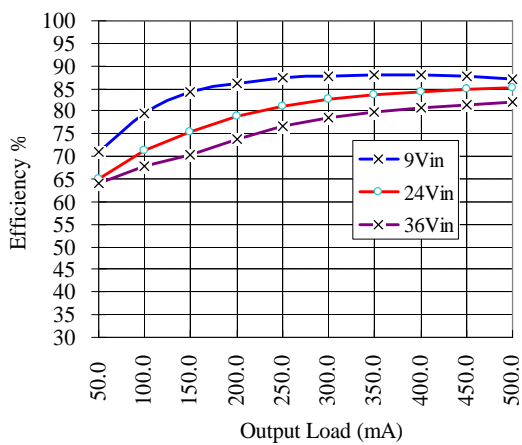
Efficiency vs. Load @ +25° Ambient, AEE01AA36-L



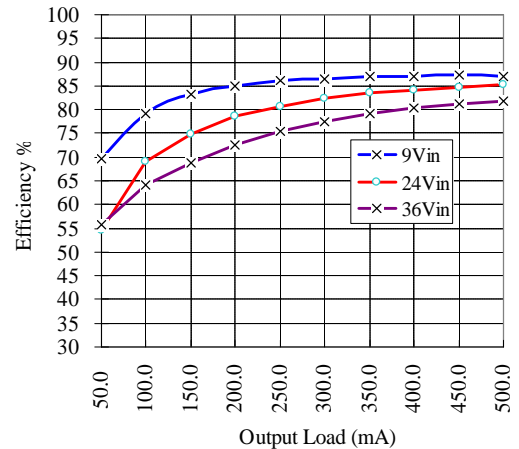
Efficiency vs. Load @ +25° Ambient, AEE00BB18-L



Efficiency vs. Load @ +25° Ambient, AEE00BB-L

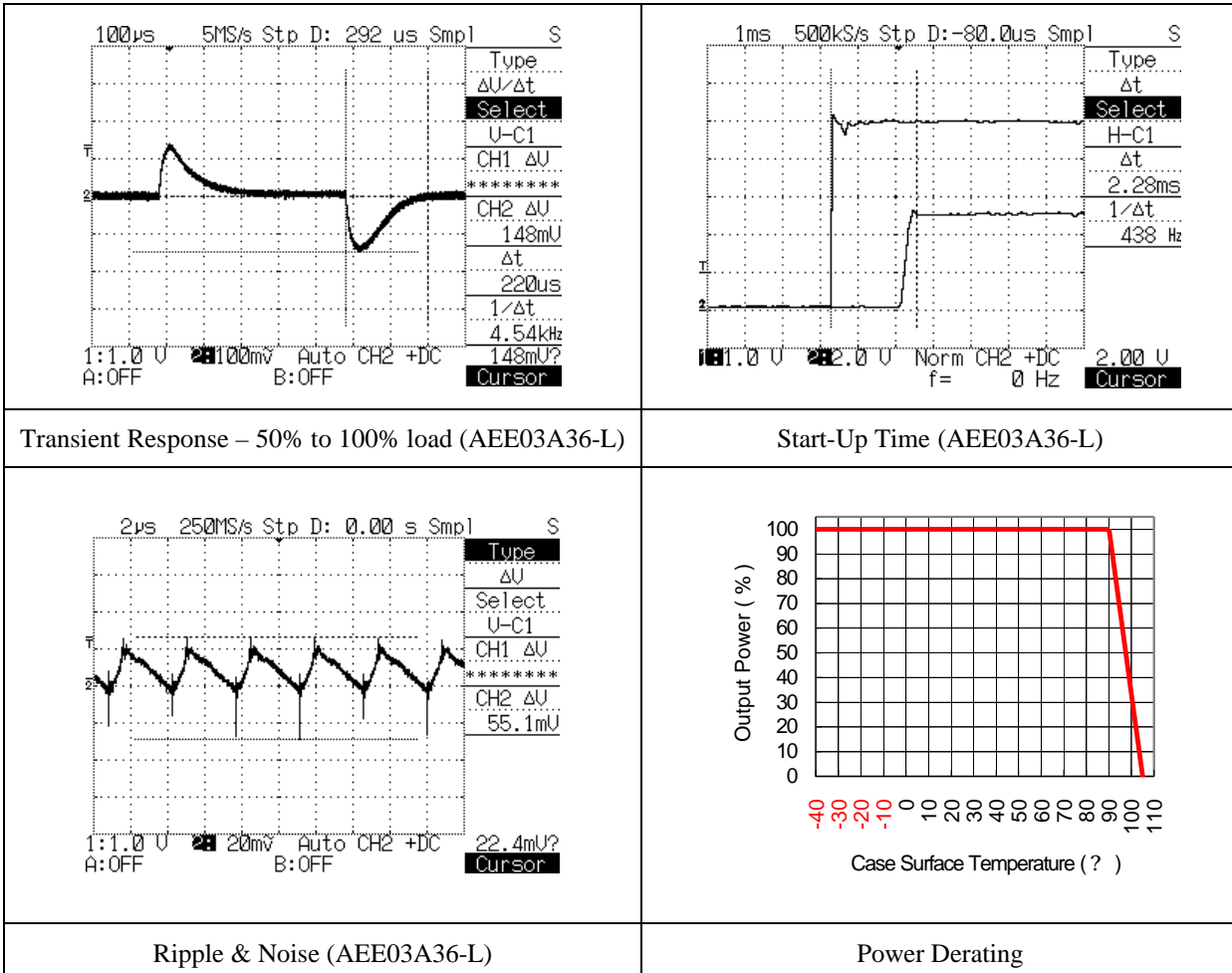


Efficiency vs. Load @ +25° Ambient, AEE00CC18-L



Efficiency vs. Load @ +25° Ambient, AEE00CC36-L

### Performance Curves





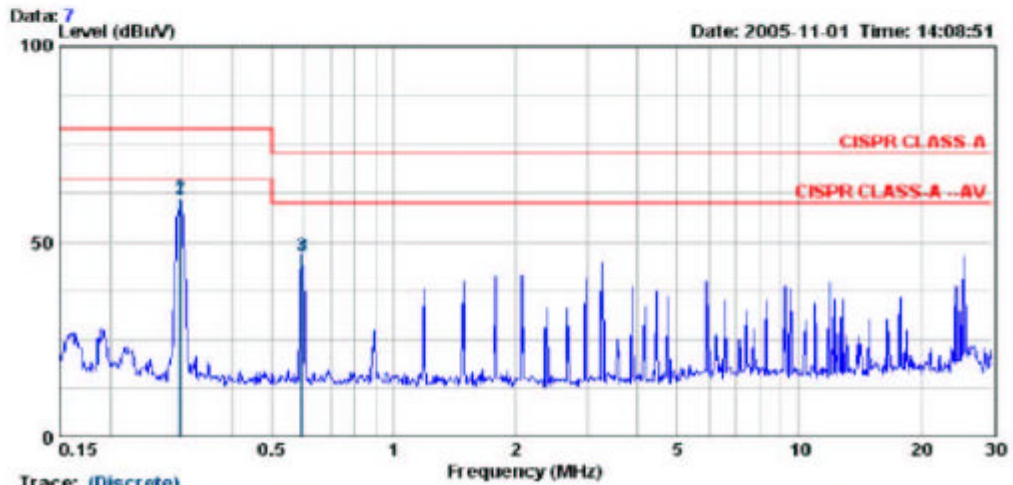
# Technical Reference Note AEE (15W) Family



## Conducted EMI Performance

```

EUT : CONVERTER          Test voltage : 48Vdc
M/M : AERD3A36          Test mode   : FULL LOAD
POL : LINE               Engineer  :          TEMP.    :          Humidity  :
  
```



Freq. MHz	LISM Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.30	9.86	0.05	50.74	60.65	79.00	-18.35	QP
0.30	9.86	0.05	51.19	61.10	66.00	-4.90	AVERAGE
0.59	9.90	0.05	36.74	46.69	60.00	-13.31	AVERAGE
0.59	9.90	0.05	36.24	46.19	73.00	-26.81	QP

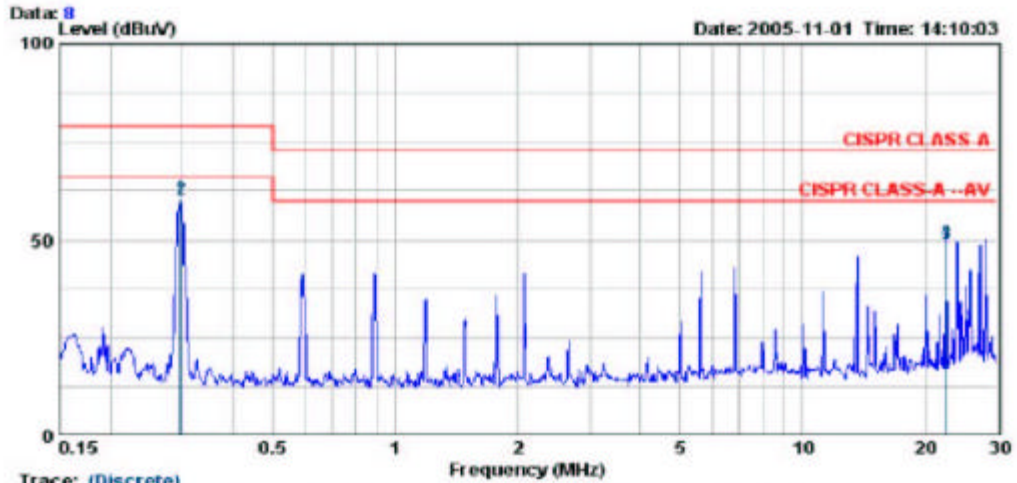


# Technical Reference Note AEE (15W) Family



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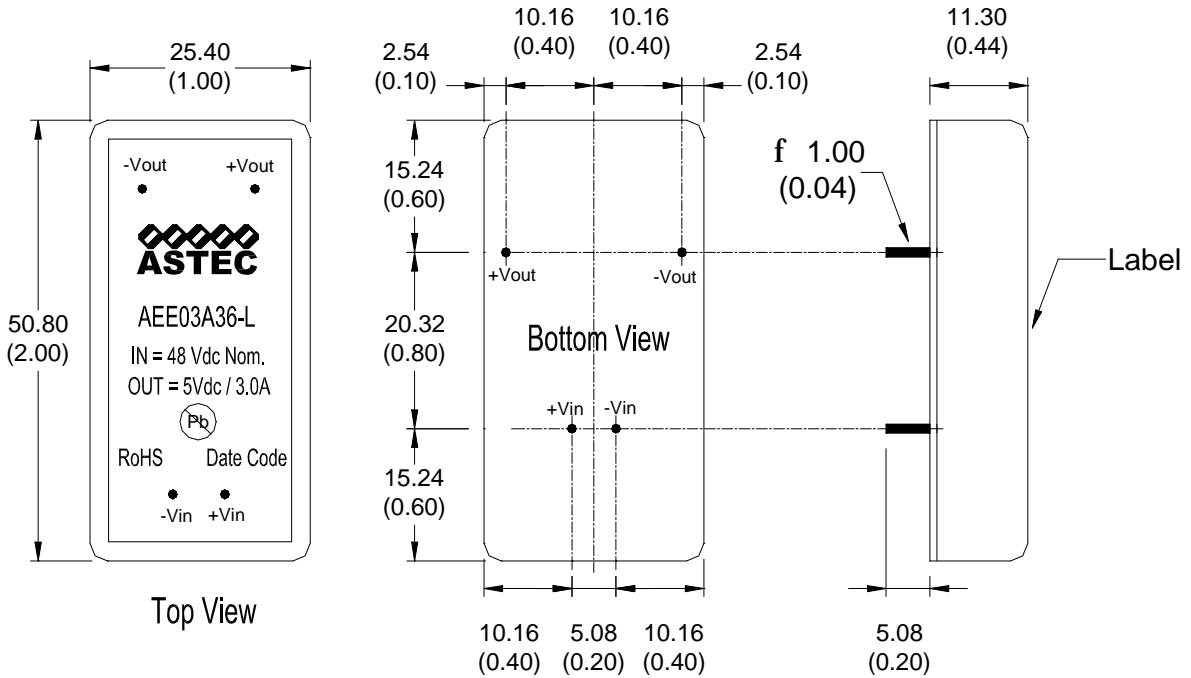
EUT : CONVERTER                      Test voltage : 48Vdc
-----
M/N : AER03A36                      Test mode   : FULL LOAD
-----
POL : NEUTRAL                        Engineer   :
                                TEMP.    :
                                Humidity  :
  
```



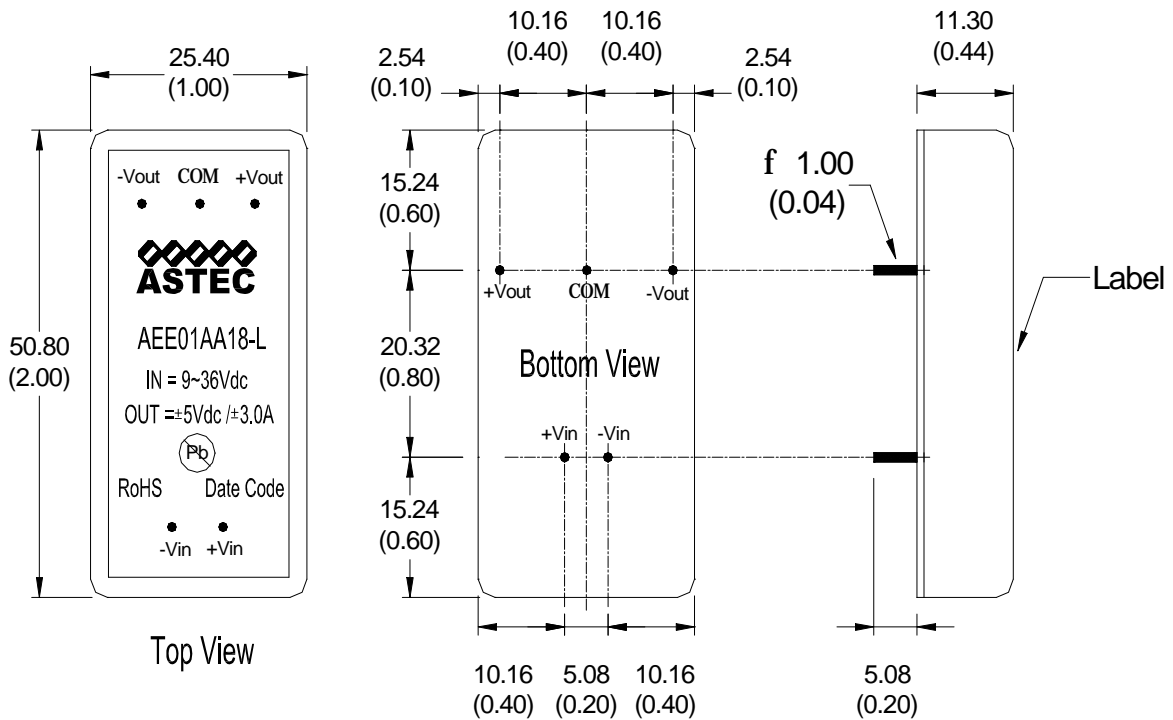
Trace: (Discrete)

Freq. MHz	LISM Factor	Cable Loss	Meter Reading	Measured Level	Limits	Over Limits	Detector
	dB	dB	dBuV	dBuV	dBuV	dBuV	
0.30	9.86	0.05	50.09	60.00	79.00	-19.00	QP
0.30	9.86	0.05	50.48	60.39	66.00	-5.61	AVERAGE
22.50	110.00	0.51	38.67	49.10	73.00	-23.90	QP
22.51	110.00	0.51	39.10	49.61	60.00	-10.39	AVERAGE

### Mechanical Dimensions and Module Pin Assignment



### Outline Drawing for AEE Single Series



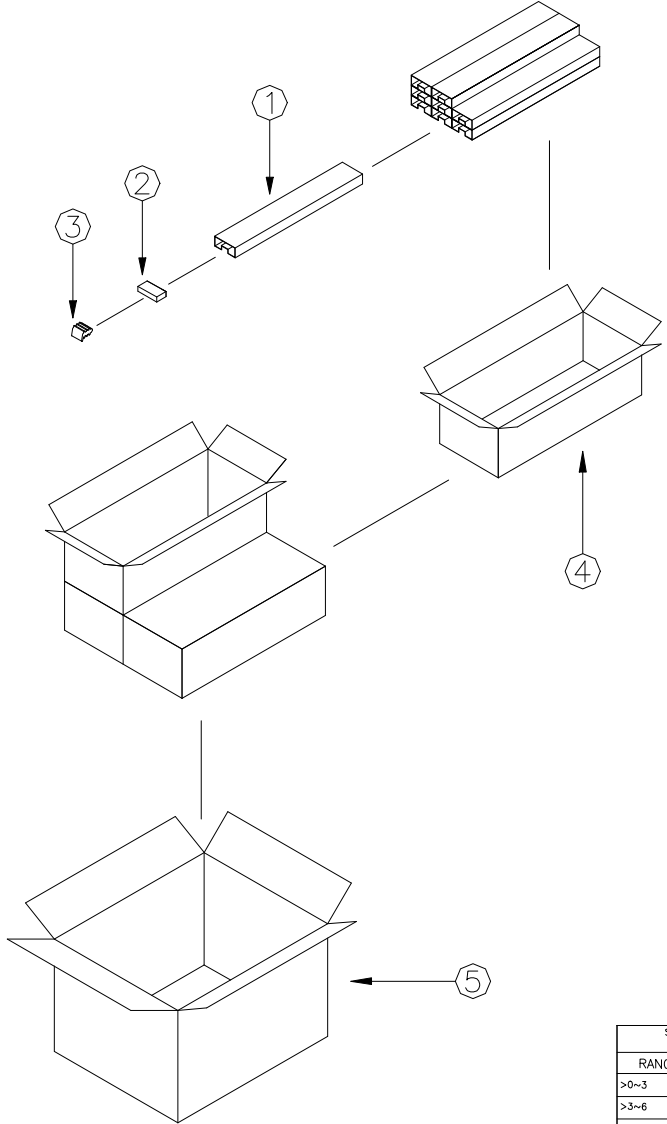
### Outline Drawing for AEE Dual Series

### Package Information

REV	REF	DESCRIPTION	AUTH	DATE

1. PACKING TUBE: 345\*53.4\*21.4mm ; ONE TUBE = 12 PCS
2. PRODUCTS: AEE SERIES
3. STOPPER
4. INNER CARTON: 388\*159\*115mm  
ONE INNER CARTON = 9 TUBES = 108 PCS
5. OUTER CARTON: 405\*334\*263mm  
ONE OUTER CARTON = 4 INNER CARTONS = 432 PCS

STANDARD TOLERANCE LIMITS UNLESS OTHER SPECIFIED.			THIRD ANGLE PROJECTION	REV
RANGE	ANGLE	TOLERANCE		
>0~3	±1'	±0.1	UNIT:m/m SCALE 1 : 1	A0
>3~6	±2'	±0.15		
>6~30	±3'	±0.18		
>30~120	±5'	±0.20		





# Technical Reference Note AEE (15W) Family



## Recommended Lead-Free Wave Soldering Temperature Profile

