

DESCRIPTION

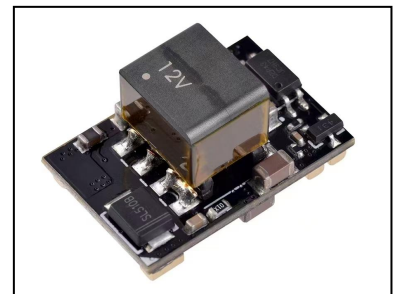
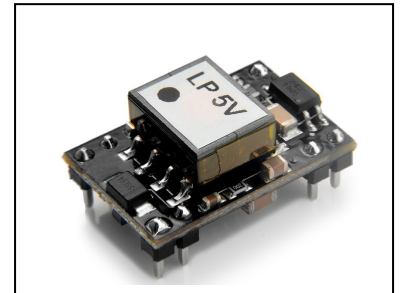
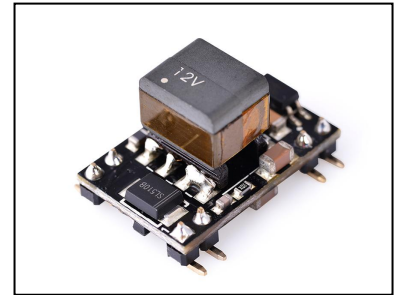
- PD (Powered Device) Integrated Module (Isolation Type)

FEATURES

- Fully IEEE 802.3af compliant
- 12 watt output load
- IEEE Power class programmable (Green)
- 1500 Volt DC isolation (Input to Output)
- 5V, 12V ,24V DC output voltage models
- Compact package minimum PCB footprint
- Overload and short circuit protection
- Wide input voltage (36V to 57V DC)
- Adjustable output voltage
- Support PoE applications in both of Fast / Gigabit Ethernet environments.
- Low output ripple and noise
- Low cost
- RoHS Compliant

APPLICATION AREAS

- Security and alarm systems
- Voice over IP phones
- Access control systems
- IP Cameras
- Displays, Net Monitors
- Public address systems
- Wireless access points
- Environmental control
- Telemetry
- Remote environmental monitoring



1 Product Overview

1.1 DP9900 Product Selector

Part Number	Nominal Output Voltage	Output Power	
		70°C	85°C
DP9905M	5.0V	9 Watts	6 Watts
DP9912M	12.0V	12 Watts	9 Watts
DP9924M	24.0V	12 Watts	11 Watts
DP9905LP	5.0V	7 Watts	4.5 Watts
DP9912LP	12.0V	10 Watts	6 Watts
DP9905MTB	5.0V	9 Watts	6 Watts
DP9912MTB	12.0V	12 Watts	9 Watts
DP9924MTB	24.0V	12 Watts	11 Watts

Table 1: Ordering Information

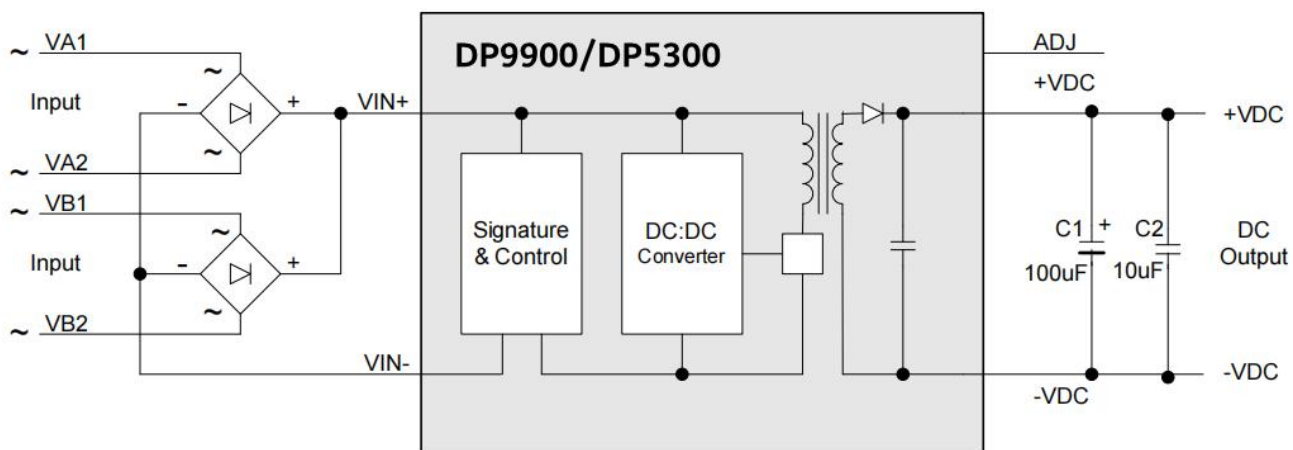


Figure 1: Block Diagram

1.2 Package Format and Pin Description

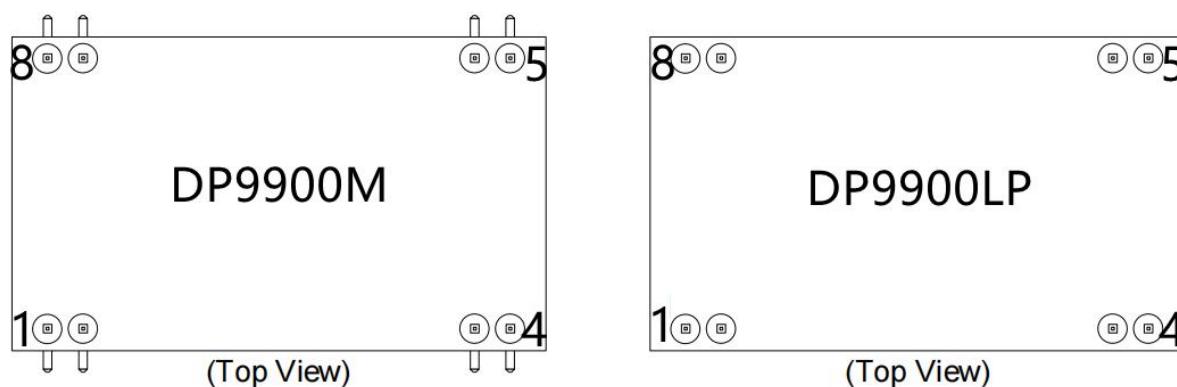


Figure 2: DP9900M and DP9900LP Package Format

Pin #	Name	Description
1	+VDC	DC Output. This pin provides the regulated output from the DC/DC converter.
2		
3	-VDC	DC Return. This pin is the return path for the +VDC output.
4	ADJ	Output Adjust. The output voltage can be adjusted from is nominal value, by connecting an external resistor from this pin to either the +VDC pin or the -VDC pin.
5	VIN+	Direct Input +. This pin connects to the positive (+) output of the input bridge rectifiers.
6		
7	VIN-	Direct Input -. This pin connects to the negative (-) output of the input bridge rectifiers.
8		

Table 2: DP9900M and DP9900LP Pin Description

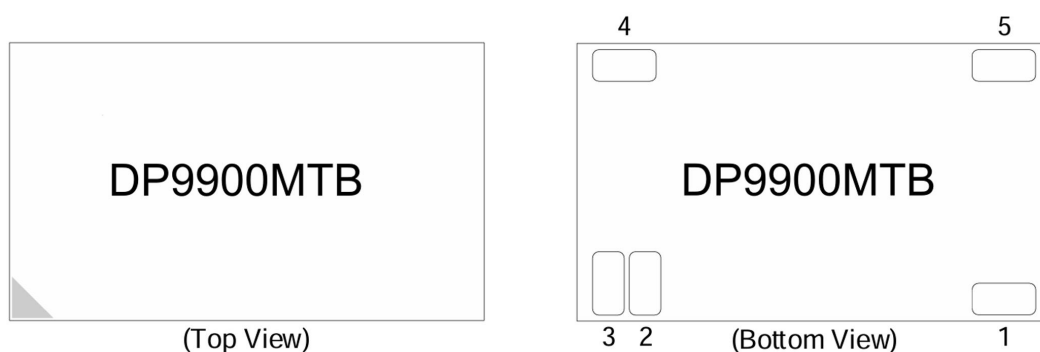


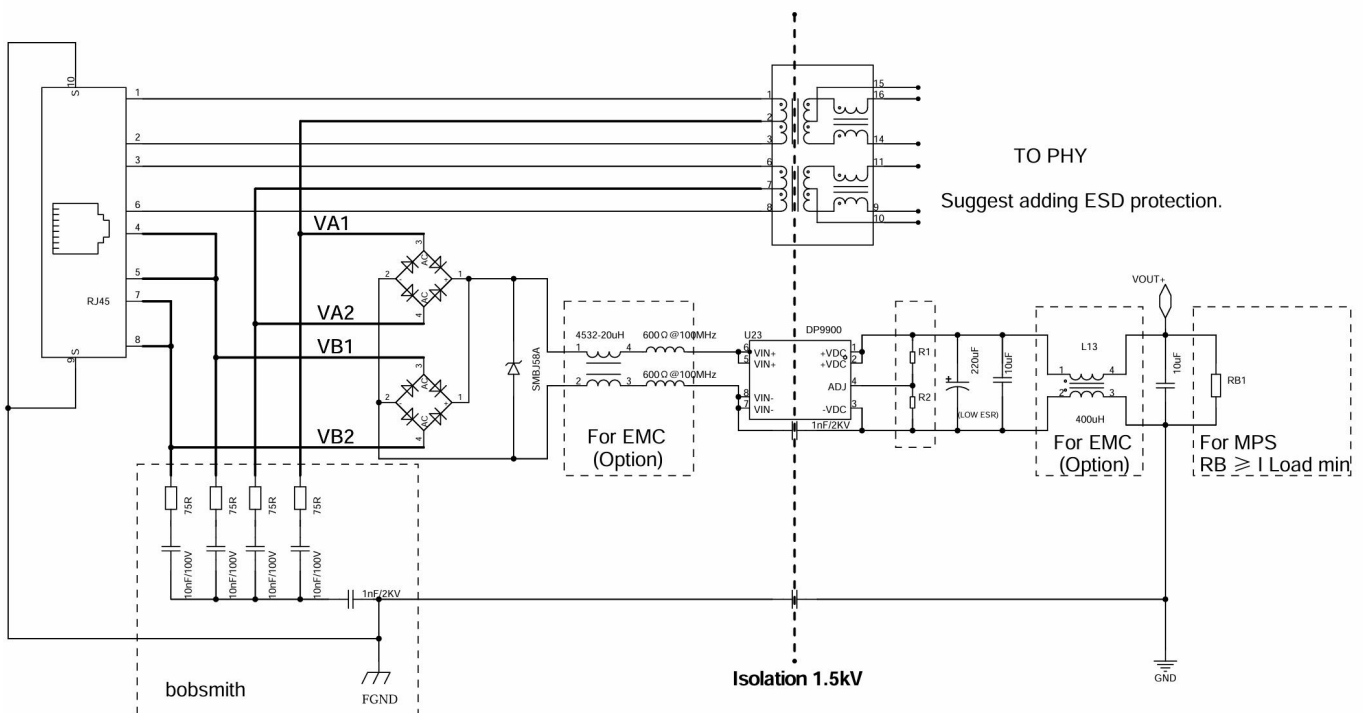
Figure 3: DP9900MTB Package Format

Pin #	Name	Description
1	+VDC	DC Output. This pin provides the regulated output from the DC/DC converter.
2	-VDC	DC Return. This pin is the return path for the +VDC output.
3	ADJ	Output Adjust. The output voltage can be adjusted from its nominal value, by connecting an external resistor from this pin to either the +VDC pin or the -VDC pin.
4	VIN+	Direct Input +. This pin connects to the positive (+) output of the input bridge rectifiers.
5	VIN-	Direct Input -. This pin connects to the negative (-) output of the input bridge rectifiers.

Table 3: DP9900MTB Pin Description

2 Functional Description

2.1 Typical Connections



10/100Mbps POE APPLICATION



Figure 4: Typical Connection Diagram

2.2 Output Voltage Adjustment

The DP9900 series has an ADJ pin, which allows the output voltage to be increased or decreased. Figure 4 shows how the ADJ pin is connected.

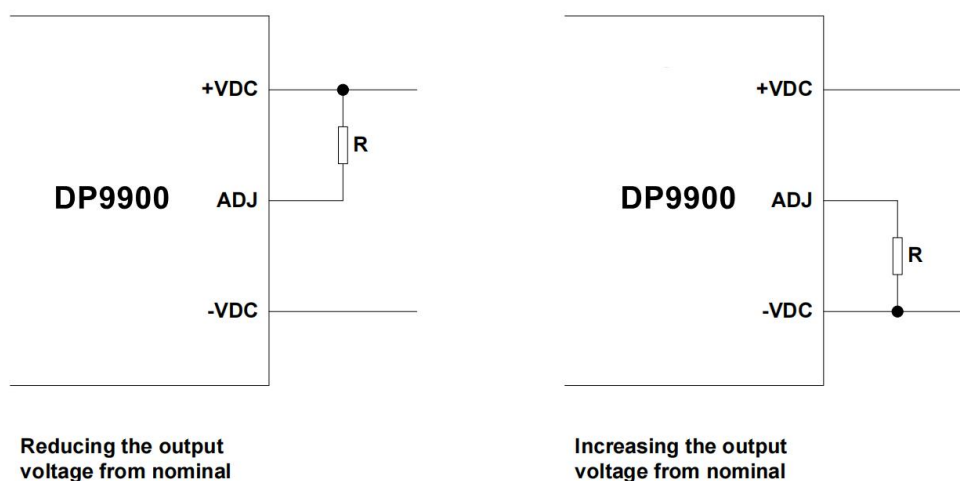


Figure 5: Output Adjustment

Reducing the output voltage, connect R between ADJ and +VDC			
Value of R	DP9905 output	DP9912 Output	DP9924 Output
Open Circuit	5.00V	12.07V	23.93V
0 Ohms	4.48V	10.0V	19.85V
100K	4.76V	11.15V	21.85V
470k	4.92V	11.76V	23.23V
Increasing the output voltage, connect R between ADJ and -VDC			
Value of R	DP9905 output	DP9912 output	DP9924 Output
Open Circuit	5.00V	12.07V	23.93V
0 Ohms	5.66V	12.75V	24.6V
100K	5.27V	12.34V	24.2V
470k	5.08V	12.16V	24.01V

Table 3: Output Adjustment Resistor (R) Value

3 Electrical Characteristics

3.1 Absolute Maximum Ratings

	Parameter	Symbol	Min	Max	Units
1	DC Supply Voltage	V _{CC}	-0.3	60	V
2	DC Supply Voltage Surge for 1ms	V _{SURGE}	-0.6	80	V
3	Storage Temperature	T _S	-40	+100	°C

3.2 Recommended Operating Conditions

	Parameter	Min	Typ	Max	Units
1	Input Supply Voltage	36	48	57	V
2	Under Voltage Lockout	30		36	V
3	Input Current		350	400	mA
4	Operating Temperature	-40	25	85	°C
5	IEEE 802.3af	Class 0			

3.3 DC Electrical Characteristics

	DC Characteristic	Variant	Sym	Min	Typ ¹	Max	Units
1	Nominal Output Voltage	DP9924	+VDC	23.5	24	24.5	V
		DP9912		11.6	12	12.4	
		DP9905		4.75	5	5.25	
2	Minimum Load ²	DP9924	I _{LOAD}	20			mA
		DP9912		40			
		DP9905		100			

	DC Characteristic	Variant	Sym	Min	Typ ¹	Max	Units
3	Output Current (VIN = 48V)	DP9924M/MTB	I _{OUT}		0.5		A
		DP9912M/MTB			1.0		
		DP9912LP			0.8		
		DP9905M/MTB			1.8		
		DP9905LP			1.4		
4	Line Regulation	DP9924	V _{LINE}		0.15		%
		DP9912			0.05		
		DP9905			0.05		
5	Load Regulation – Min to Max (VIN = 48V)	DP9924	V _{LOAD}		0.15		%
		DP9912			0.1		
		DP9905			0.1		
6	Output Ripple and Noise ⁵ @ ^{Max load} ³	DP9924M	V _{RN}		240		mV _{p-p}
		DP9924MTB			270		
		DP9912M			180		
		DP9912MTB			180		
		DP9912LP			230		
		DP9905M			110		
		DP9905MTB			110		
		DP9905LP			220		
7	Peak Efficiency	DP9924M	EFF		87		%
		DP9924MTB			87		
		DP9912M			88		
		DP9912MTB			88		
		DP9912LP			87		
		DP9905M			86		
		DP9905MTB			87		
		DP9905LP			84		
8	Short-Circuit Duration		T _{SC}			∞	sec
9	Isolation Voltage (I/O) - Impulse Test		VISO			1500	VPK

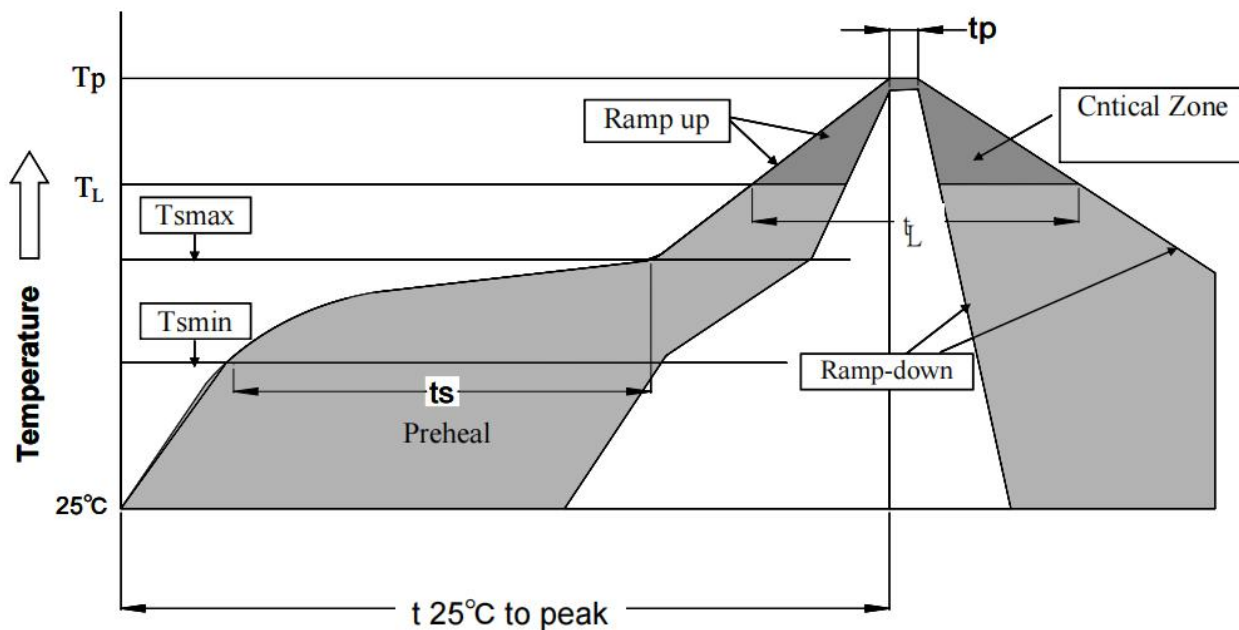
Note 1: Typical figures are at 25°C with a nominal 48V supply and are for design aid only. Not Guaranteed

Note 2: The module can emit an audible noise, if operated at less than the stated minimum I_{LOAD} and cause the PSE to fail its MPS.

Note 3: As the DP9900 has only 20 - 44 uf of MLCC, the output ripple is rather large. Increasing the output capacitance can help reduce the output ripple.

During SMT. Note the following furnace temperature curve for reference:

1. Recommended Reflow Soldering Curve:



Time →

$T_L = 217^{\circ}\text{C}$

$T_p = 245 \pm 10^{\circ}\text{C}$

$t_s = 60-180\text{s}$

$T_s \text{ max} = 200^{\circ}\text{C}$

$T_s \text{ min} = 150^{\circ}\text{C}$

$t_L = 60-150\text{s}$

$t_p = 20-40\text{s}$

$T_{25^{\circ}\text{C to peak}} = 8\text{min max}$

Ramp up rate = 3°C/s max

Ramp down rate = 6°C/s max

*ROHS Compliant

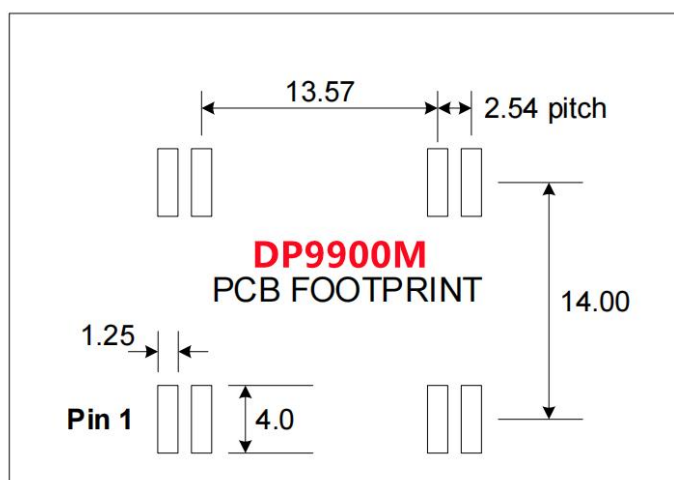
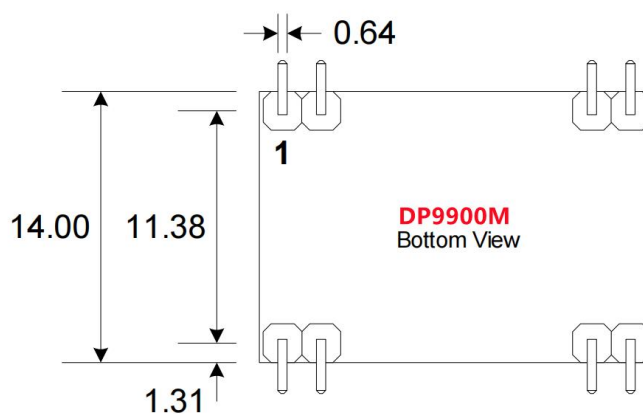
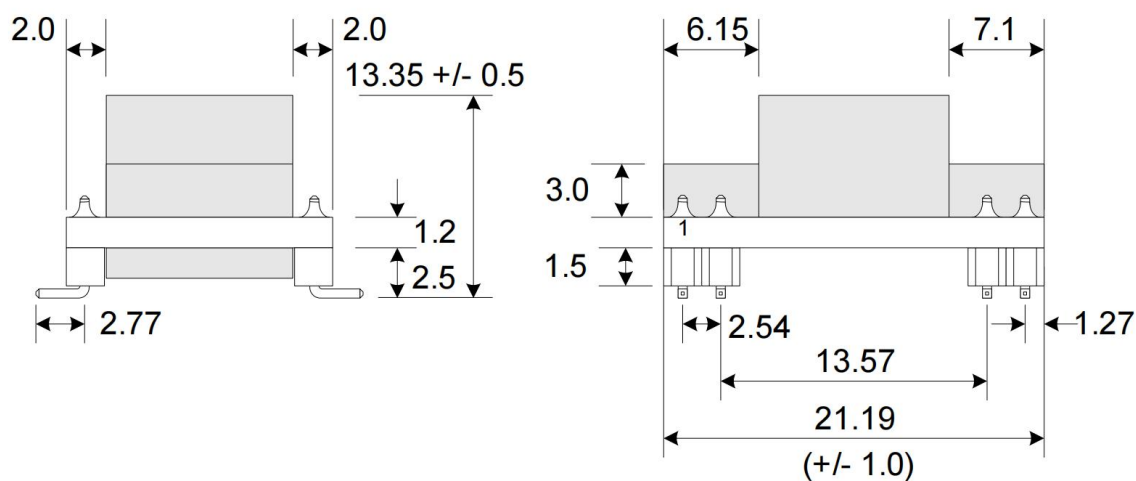
*Solder wire SAC 305 Sn 96.5/Ag 3.0/Cu 0.5

2: Moisture Sensitive Level:

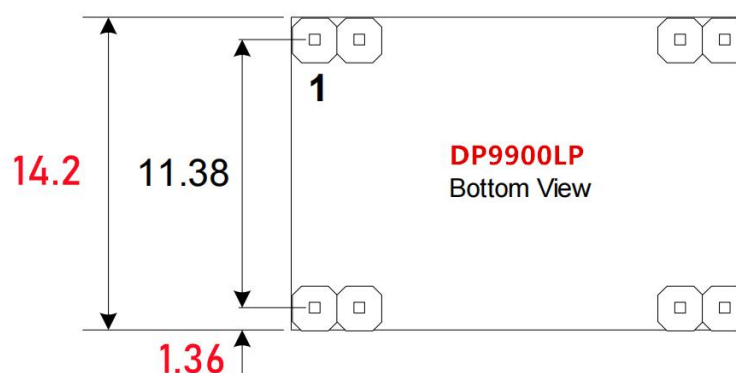
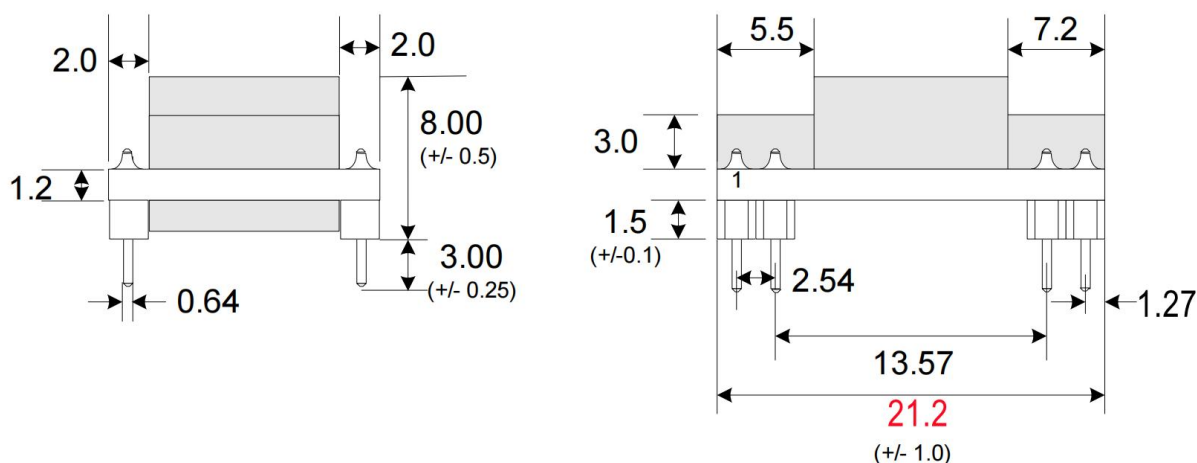
1. Level: 1
2. Floor Life: Unlimited
3. Storage Condition: $\leq 85^{\circ}\text{C}/85\% \text{ RH}$

4 Package Dimensions

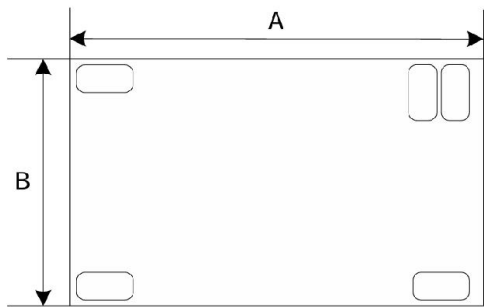
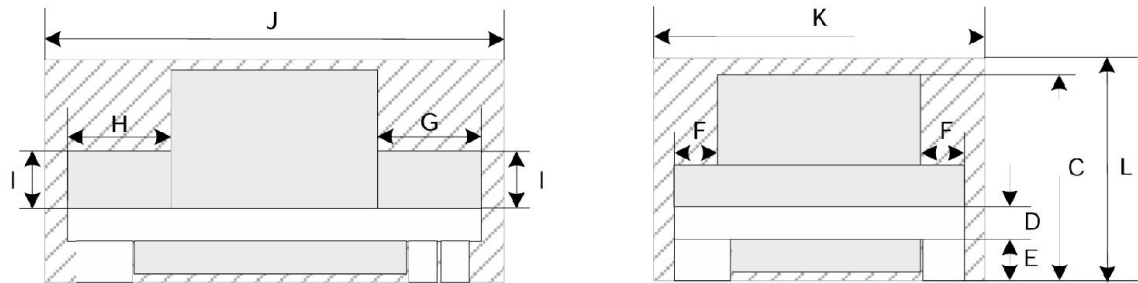
4.1 DP9900M



4.2 DP9900LP

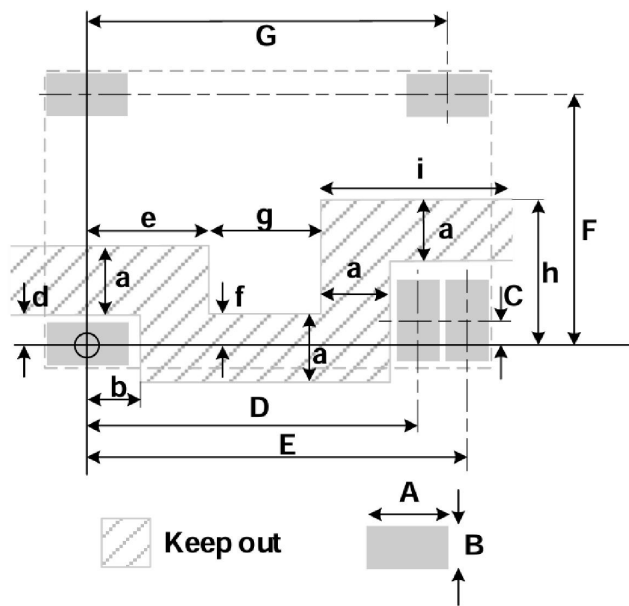


4.3 DP9900MTB



Dimension	Millimetres		Inches	
	Nominal	Max	Nominal	Max
A	21.21	22.21	0.835	0.874
B	13.92	14.92	0.548	0.587
C	13.40	13.90	0.528	0.547
D	1.20	1.32	0.047	0.052
E	1.70	1.85	0.067	0.073
F	1.87	2.13	0.074	0.084
G	6.97	7.23	0.275	0.285
H	6.02	6.28	0.237	0.247
I	2.87	3.13	0.113	0.123
J	22.61	-	0.890	-
K	15.32	-	0.603	-
L	13.90	-	0.547	-

 Keep Out Region – Must remain free of obstruction to ensure fit and function



Dimension	Millimetres	Inches
A	3.81	0.150
B	1.83	0.072
C	0.94	0.037
D	15.19	0.598
E	17.53	0.690
F	11.58	0.456
G	16.59	0.653
a	3.00	0.118
b	2.44	0.096
d	1.12	0.044
e	5.44	0.214
f	0.81	0.032
g	5.66	0.223
h	7.87	0.310
i	> 8.00	> 0.315

Typical Characteristics : $V_{out}=5V$

Only DP9905M , and no additional capacitors .



Full load start up from PSE

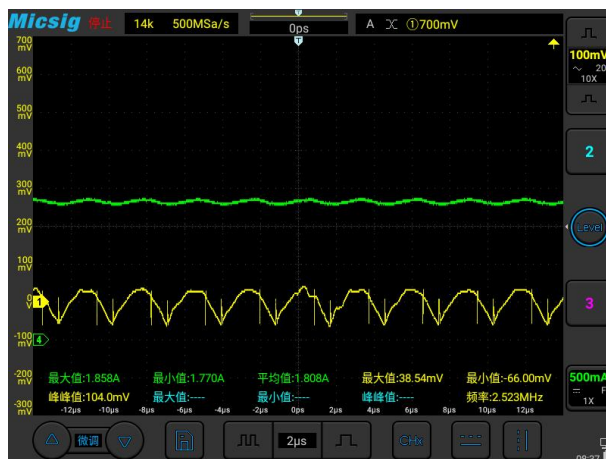


Transient Response $V_{IN}=52V$, $I_o=50\% \sim 100\% \sim 50\%$

Only DP9905LP , and no additional capacitors .

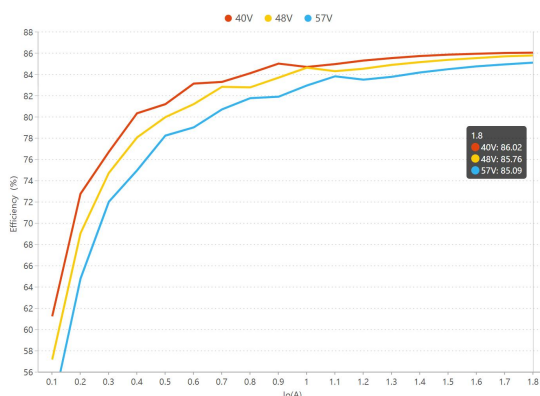


Full load start up from PSE

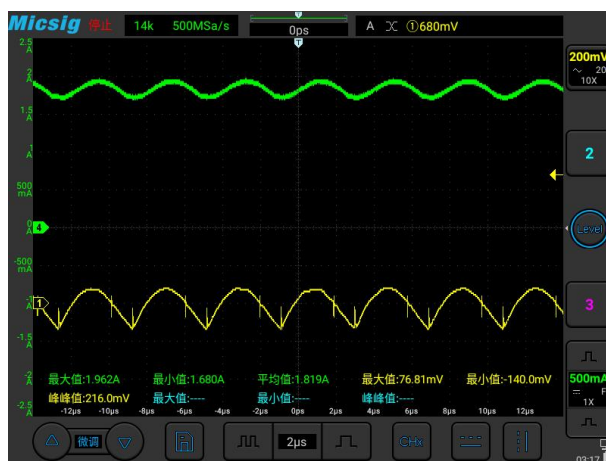


Noise $V_{IN}=52V, I_o=1.8A$ 20MHz Bandwidth

DP9905M Efficiency



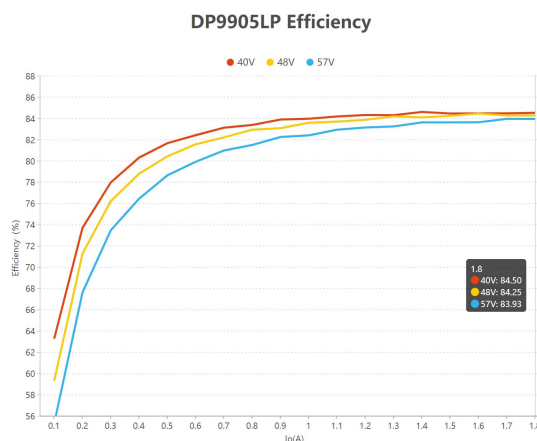
PoE Efficiency



Noise $V_{IN}=52V, I_o=1.8A$ 20MHz Bandwidth



Transient Response VIN=52V, Io=50%~100%~50%

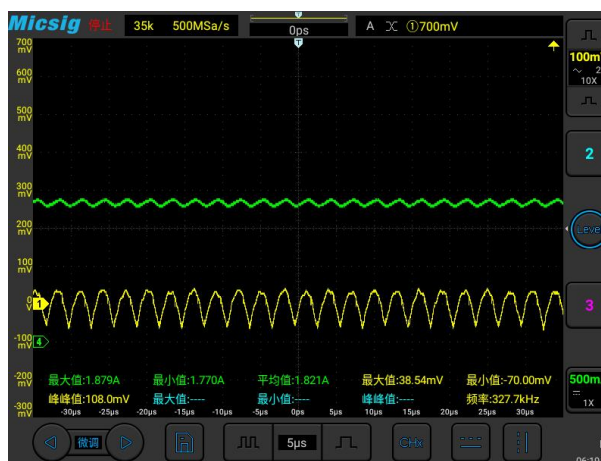


PoE Efficiency

Only DP9905MTB , and no additional capacitors .



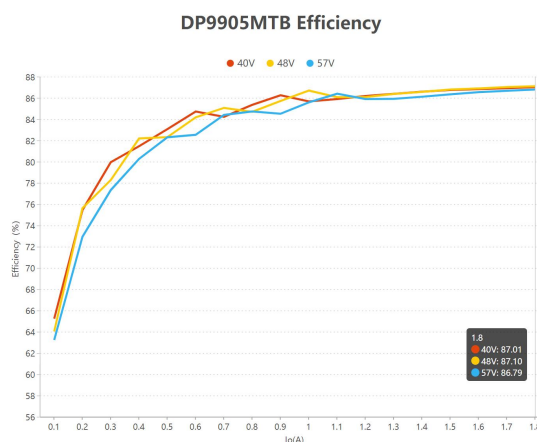
Full load start up from PSE



Noise VIN=52V,Io=1.8A 20MHz Bandwidth



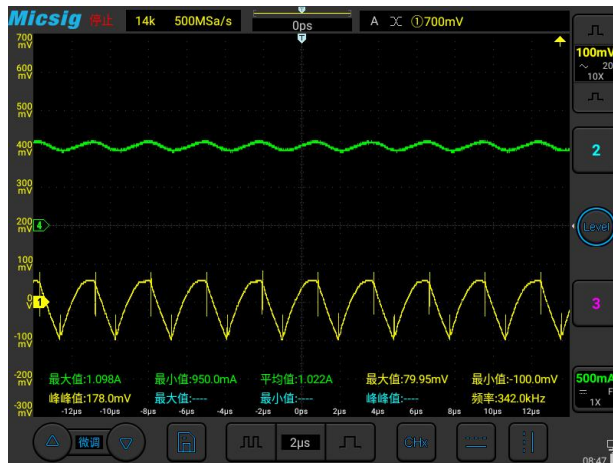
Transient Response VIN=52V, Io=50%~100%~50%



PoE Efficiency

Typical Characteristics : Vout=12V

Only DP9912M , and no additional capacitors .

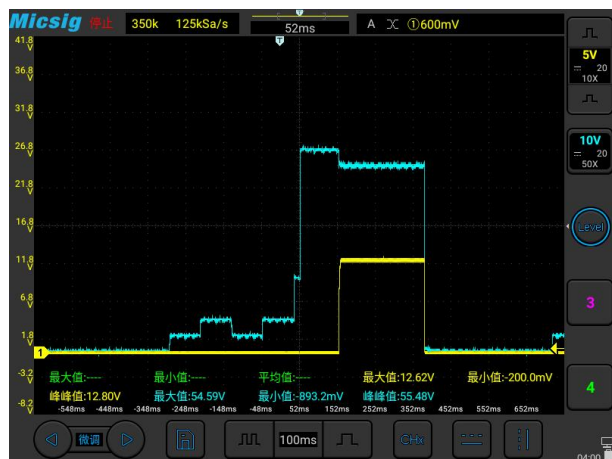


Full load start up from PSE

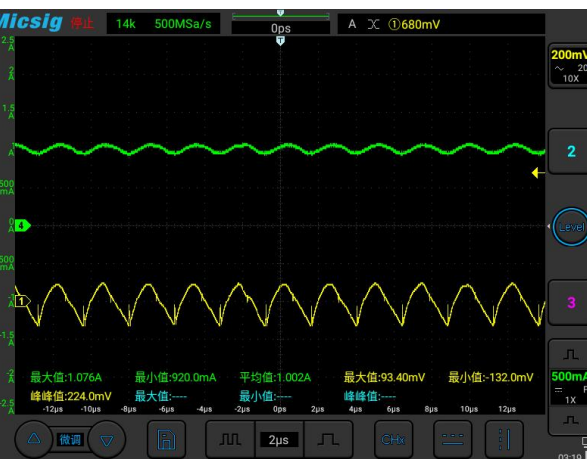


Transient Response VIN=52V, Io=50%~100%~50%

Only DP9912LP , and no additional capacitors .



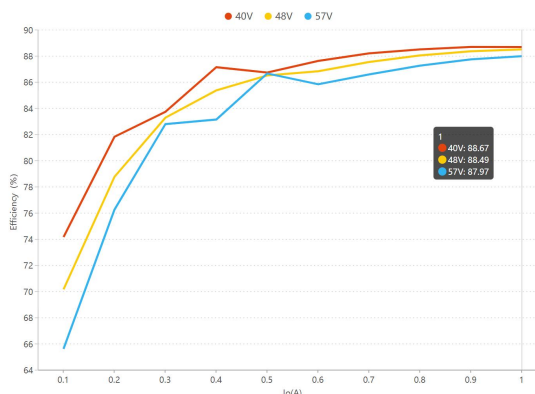
Full load start up from PSE



Noise VIN=52V,Io=1A 20MHz Bandwidth

Noise VIN=52V,Io=1A 20MHz Bandwidth

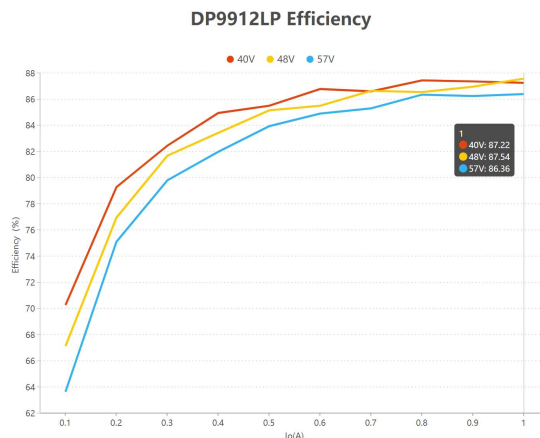
DP9912M Efficiency



PoE Efficiency



Transient Response VIN=52V, Io=50%~100%~50%

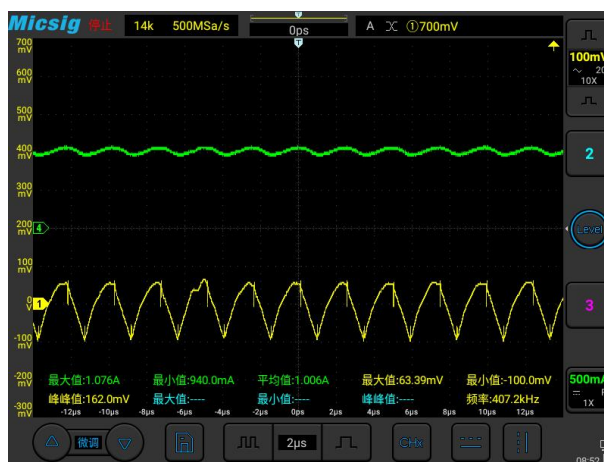


PoE Efficiency

Only DP9912MTB , and no additional capacitors .



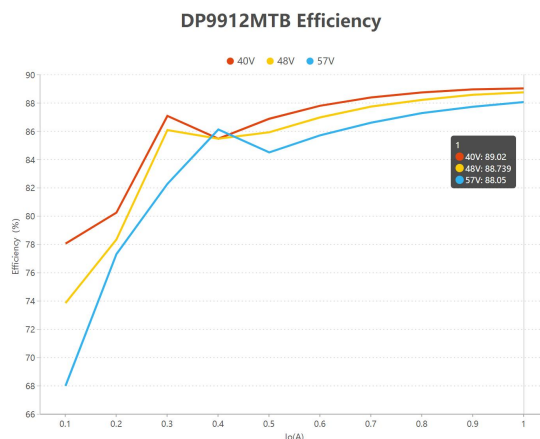
Full load start up from PSE



Noise VIN=52V,Io=1A 20MHz Bandwidth



Transient Response VIN=52V, Io=50%~100%~50%



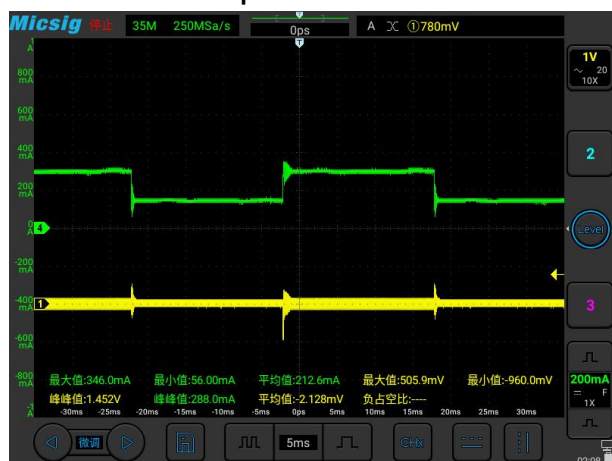
PoE Efficiency

Typical Characteristics : Vout=24V

Only DP9924M , and no additional capacitors .



Full load start up from PSE

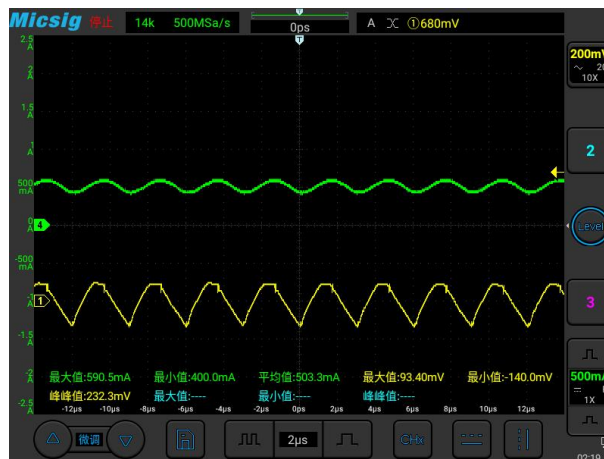


Transient Response VIN=52V, Io=50%~100%~50%

Only DP9924MTB , and no additional capacitors .

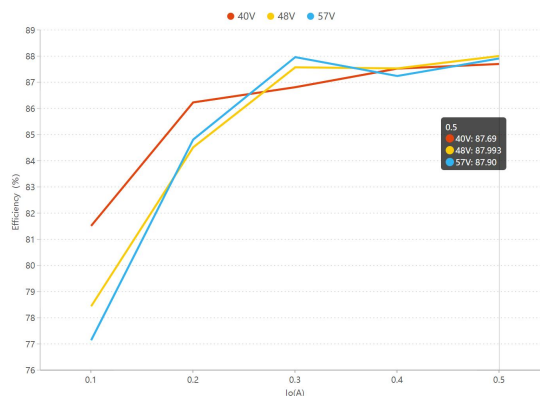


Full load start up from PSE

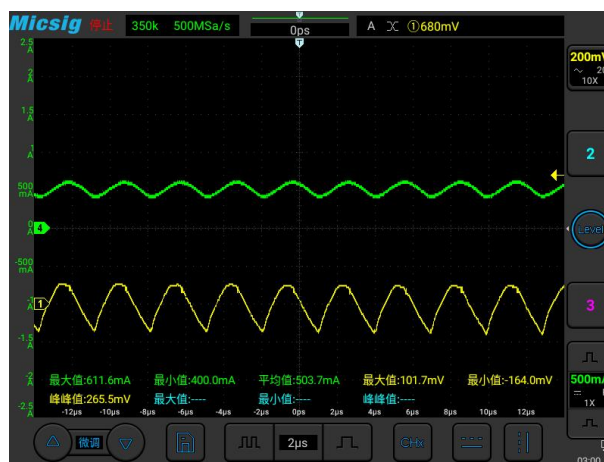


Noise VIN=52V,Io=0.5A 20MHz Bandwidth

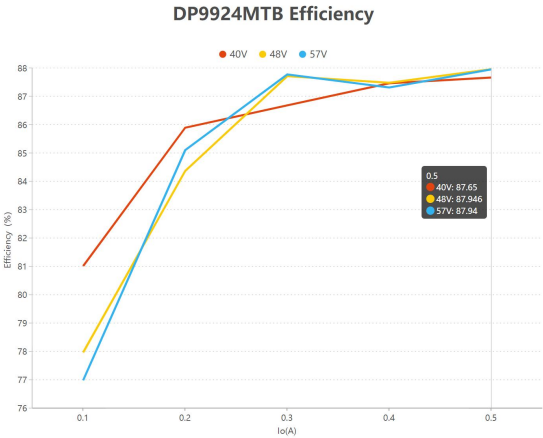
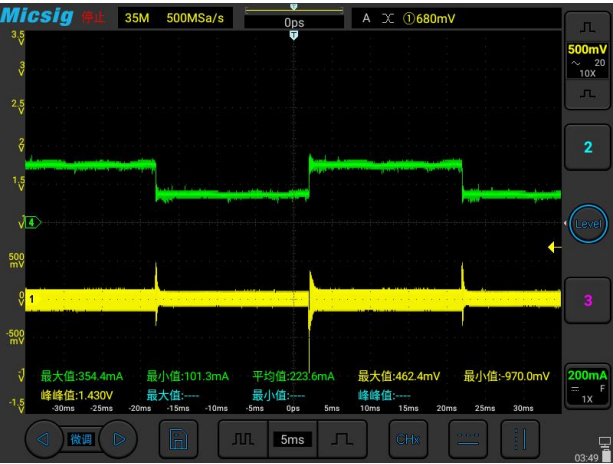
DP9924M Efficiency



PoE Efficiency



Noise VIN=52V,Io=0.5A 20MHz Bandwidth



PoE Efficiency