APE8903

3A Low Dropout Regulator with Enable

FEATURES

- **Adjustable Output Low to 0.8V**
- **Input Voltage as Low as 1.4V and VPP Voltage 5V**
- **600mV Dropout @ 3A, VO 1.2V**
- **Over Current and Over Temperature Protection**
- **Enable Pin**
- **Low Reverse Leakage (Output to Input)**
- **ESOP-8 (MP) Packages with Exposed Pad**
- **±2% Output Voltage**
- **VO Power OK Signal**
- **1.2V, 1.5V, 1.8V and 2.5V and Adjustable Output Voltage**
- **VO Pull Low Resistance when Disable**
- **RoHS Compliant**

APPLICATIONS

- **Motherboards**
- **Peripheral Cards**
- **Network Cards**
- **Set Top Boxes**
- **Notebook Computers**

DESCRIPTION

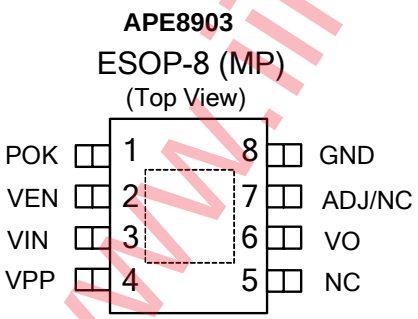
The APE8903 is a high performance positive voltage regulator designed for use in applications requiring very low Input voltage and very low dropout voltage at up to 3 amps. It operates with a V_{IN} as low as 1.4V and VPP voltage 5V with output voltage programmable as low as 0.8V. The APE8903 features ultra low dropout, ideal for applications where V_{OUT} is very close to V_{IN}. Additionally, the APE8903 has an enable pin to further reduce power dissipation while shutdown. The APE8903 provides excellent regulation over variations in line, load and temperature. The APE8903 provides a power OK signal to indicate if the voltage level of VO reaches 92% of its rating value.

The APE8903 is available in the exposed SOP-8 (MP) package. It is available with 1.2V, 1.5V, 1.8V and 2.5V internally preset outputs that are also adjustable using external resistors.

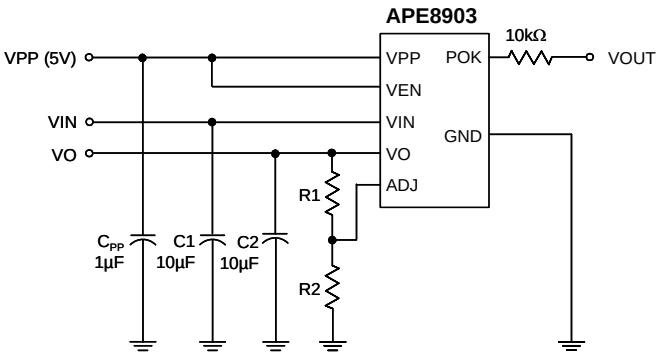
ORDERING INFORMATION

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE
APE8903MP	8903MP	-40°C~+85°C	ESOP-8 (with exposed pad)
APE8903MP-12	8903MP-12	-40°C~+85°C	
APE8903MP-15	8903MP-15	-40 °C~+85°C	
APE8903MP-18	8903MP-18	-40 °C~+85°C	
APE8903MP-25	8903MP-25	-40 °C~+85°C	

PIN CONFIGURATION



TYPICAL APPLICATION CIRCUIT

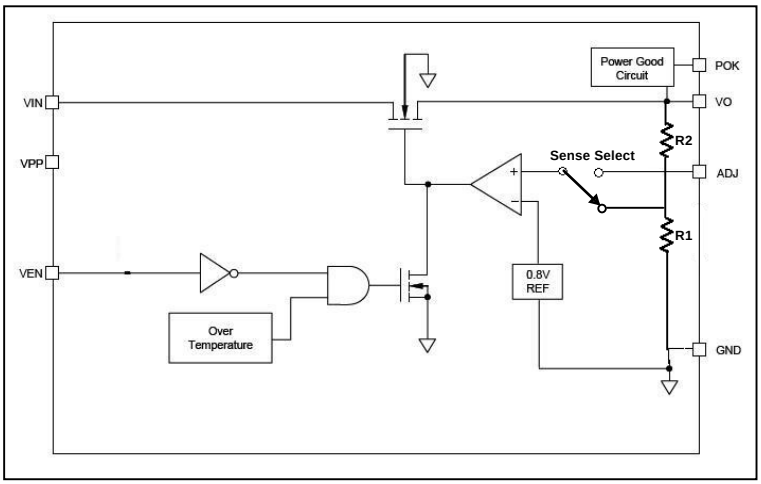


$$VO = \frac{0.8\ (R1+R2)}{R2}\ \text{Volts}$$

R2<120kΩ is recommended

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BLOCK DIAGRAM



PIN DESCRIPTION

PIN	NAME	FUNCTION
1	POK	Assert high once VO reaches 92% of its rating voltage. Open-drain output.
2	VEN	Enable Input. Pulling this pin below 0.4V turns the regulator off, reducing the quiescent current to a fraction of its operating value. The device will be enabled if this pin is left open.
3	VIN	Input voltage. Large bulk capacitance should be placed closely to this pin. A 10µF ceramic capacitor is recommended at this pin.
4	VPP	Input voltage for controlling circuit.
5	NC	Not connected.
6	VO	The power output of the device. A pull low resistance exists when deactivate device by VEN.
7	ADJ/NC	This pin, when it sets the output voltage by the internal feedback resistors, is NC pin. If external feedback resistors are used, the output voltage will be VO = 0.8(R1+R2)/R2 Volts.
8	GND	Reference ground.

DEFINITIONS

Dropout Voltage

The input/output Voltage differential at which the regulator output no longer maintains regulation against further reductions in input voltage. Measured when the output drops 2% below its nominal value, dropout voltage is affected by junction temperature, load current and minimum input supply requirements.

Line Regulation

The change in output voltage for a change in input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that average chip temperature is not significantly affected.

Layout Consideration

The output capacitors must be located as close to the V_{OUT} terminal of the device as possible. It is recommended to use a section of a layer of the PC board as a plane to connect the V_{OUT} pin to the output capacitors to prevent any high frequency oscillation that may result due to excessive trace inductance.

Load Regulation

The change in output voltage for a change in load current at constant chip temperature. The measurement is made under conditions of low dissipation or by using pulse techniques such that average chip temperature is not significantly affected.

Maximum Power Dissipation

The maximum total device dissipation for which the regulator will operate within specifications.

Quiescent Bias Current

Current which is used to operate the regulator chip and is not delivered to the load.

ABSOLUTE MAXIMUM RATINGS (Note 1)

V_{PP}, V_{IN}, Input Voltage. 6.5V
Power Dissipation Internally Limited (Note 2)
Maximum Junction Temperature. . . . . 150°C
Storage Temperature Range. . . . . -65°C ≤T_J ≤ +150°C
Thermal Resistance Junction to Ambient, (θ_{JA})
ESOP-8 (MP). . . . . .150°C/W
Thermal Resistance Junction to Case, (θ_{JC})
ESOP-8 (MP) . . . . . .15°C/W
ESD Rating (Human Body Model) 2kV

OPERATION CONDITIONS

V_{IN} Voltage. . . . . 1.4V ~5.5V
V_{PP} Voltage. . . . . 4.5V~5.5V
Vout Voltage. . . . . .0.8V~2.7V
Temperature Range. . . . . -40°C ≤T_A ≤ +85°C

ELECTRICAL CHARACTERISTICS

V_{PP}=5V, V_{IN} =2.5V, V_{EN}=V_{PP}, I_O=10mA, C_{IN}=10µF, C_{OUT} =10µF, T_A=T_J=25°C unless otherwise specified. (Note 3)

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
VIN						
Input Voltage Range	V_{IN}		1.4	---	5.5	V
Quiescent Current (Ground Current)	I_Q	V_O=1.8V, I_O=0mA	---	100	300	uA
VPP						
V_{PP} Voltage Range	V_{PP}		4.5	---	5.5	V
V_{PP} Current	I_{PPH}	V_O=1.8V, I_O=0mA	---	0.23	0.5	mA
		V_O=1.8V, I_O=3A	---	5	6	mA
	I_{PPL}	V_{EN}=0V	---	---	1	µA
VO						
Output Voltage (Internal Fixed Voltage)	V_O	V_{IN}=V_O+0.5V,V_O=1.8V	1.764	1.8	1.836	V
Line Regulation		V_{IN}=(V_O+0.5V) to 5V	---	0.2	1	%
Load Regulation		10mA≤I_O≤3A	---	0.6	1	%
Dropout Voltage	V_D	I_O=3A	---	---	600	mV
Short Circuit Current			---	4	---	A
V_O Pull Low Resistance		V_{EN}=0V	---	90	---	Ω
ADJ						
Reference Voltage	V_{REF}	V_{ADJ}=V_O	0.788	0.8	0.812	V
Adjust Pin Current	I_{ADJ}		---	20	100	nA
VEN						
V_{EN} Pin Voltage High	V_{ENH}		1.6	---	---	V
V_{EN} Pin Voltage Low	V_{ENL}		---	---	0.4	V
V_{EN} Pin Bias Current	I_{ENH}	V_{EN}=0V	---	12	20	µA
POK						
V_O Power OK Voltage	V_{THPOK}		---	92	---	%
Hysteresis	V_{HYPOK}		---	7	---	%
Over Temperature Protection						
Over Temperature	T_{OT}		---	150	---	°C
Over Temperature Hysteresis	T_{OTHY}		---	30	---	°C

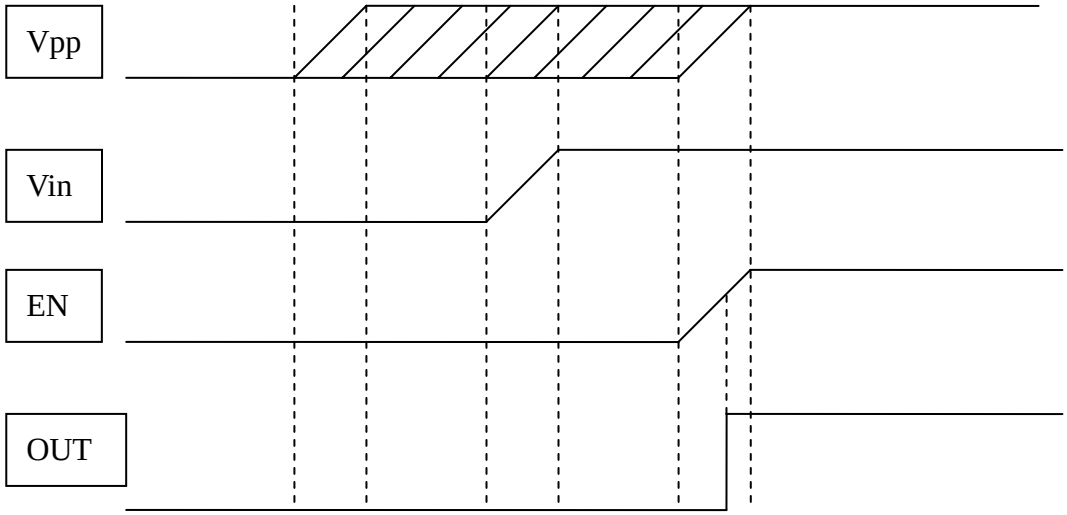
Note 1: Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Conditions are conditions under which the device functions but the specifications might not be guaranteed. For guaranteed specifications and test conditions see the Electrical Characteristics.

Note2: The maximum power dissipation is a function of the maximum junction temperature, T_{Jmax} ; total thermal resistance, θ_{JA}, and ambient temperature T_A. The maximum allowable power dissipation at any ambient temperature is (T_{jmax}-T_A) / θ_{JA}. If this dissipation is exceeded, the die temperature will rise above 150°C and IC will go into thermal shutdown.

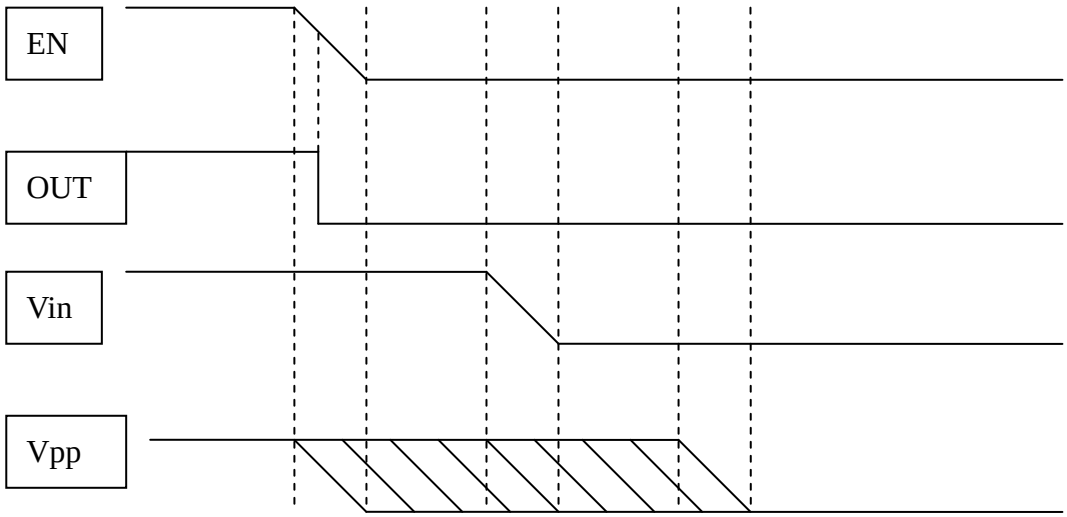
Note3: Low duty pulse techniques are used during test to maintain junction temperature as close to ambient as possible.

POWER SEQUENCE DIAGRAM

POWER ON SEQUENCE



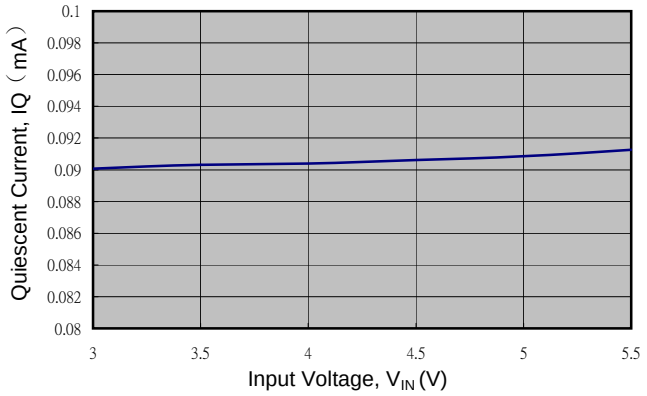
POWER OFF SEQUENCE



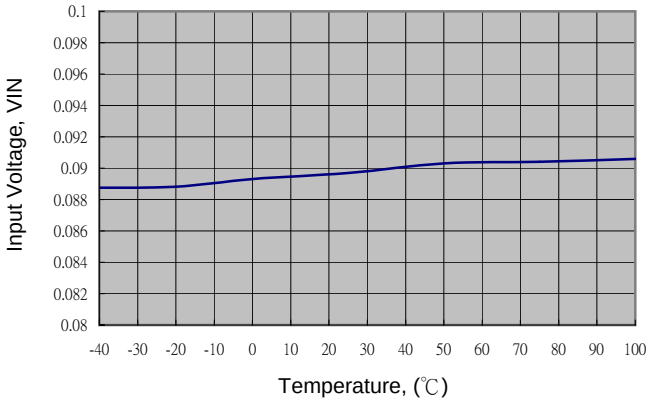
TYPICAL PERFORMANCES CHARACTERISTICS

(V_{CC}= 3.3V, T_A=25°C, unless otherwise noted.)

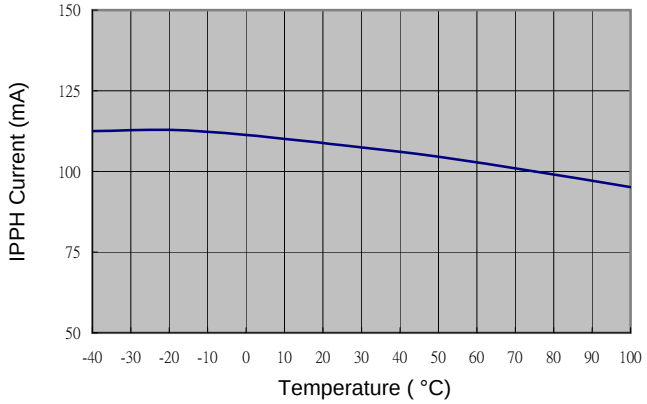
Quiescent Current vs. Input Voltage



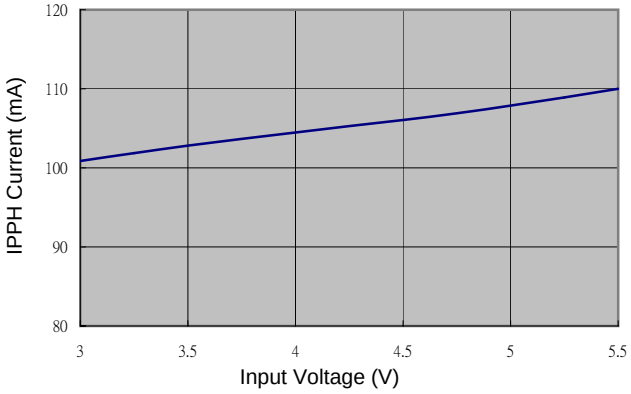
Quiescent Current vs. Temperature



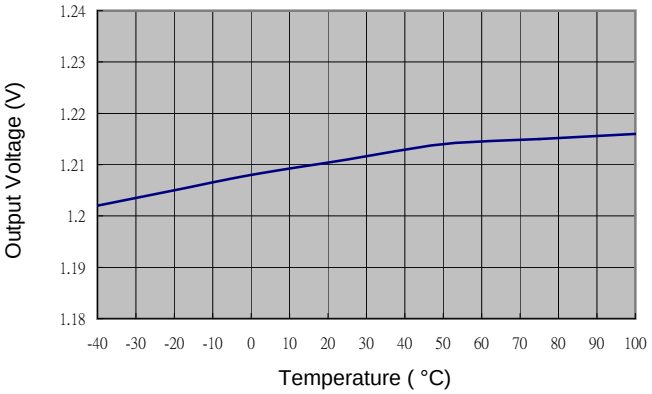
IPPH Current vs. Temperature



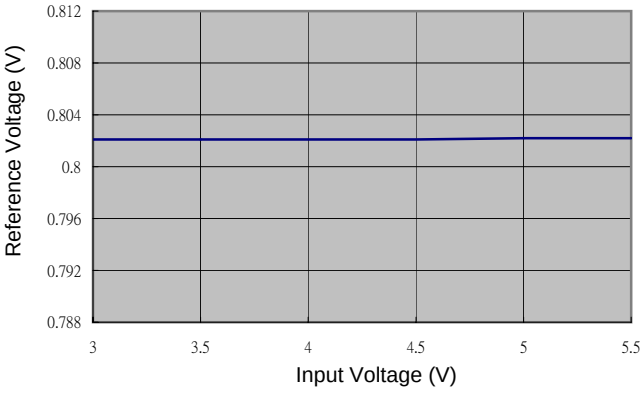
IPPH Current vs. Input Voltage



Output Voltage vs. Temperature

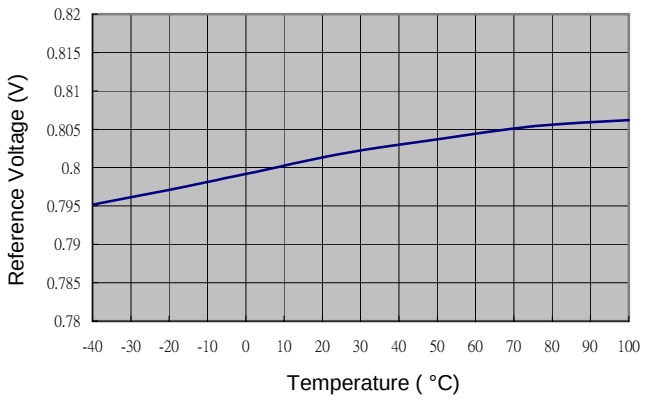


Reference Voltage vs. Input Voltage

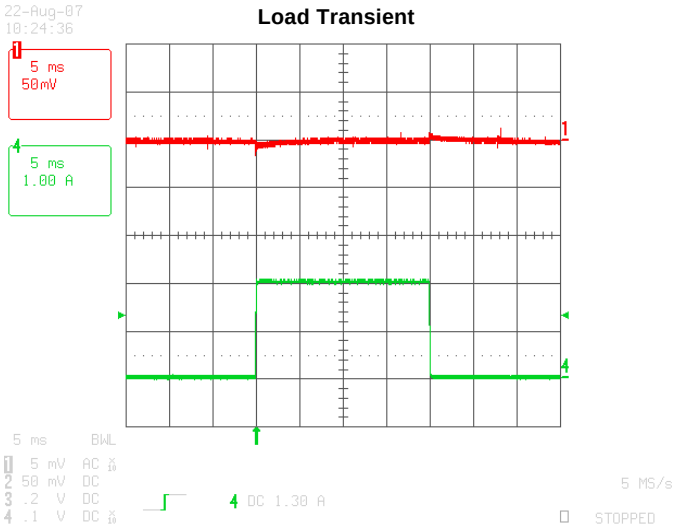


TYPICAL PERFORMANCES CHARACTERISTICS (continued)

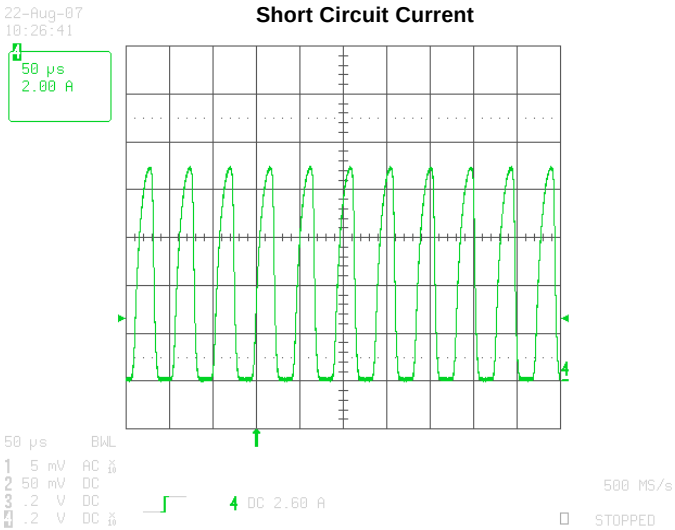
Reference Voltage vs. Temperature



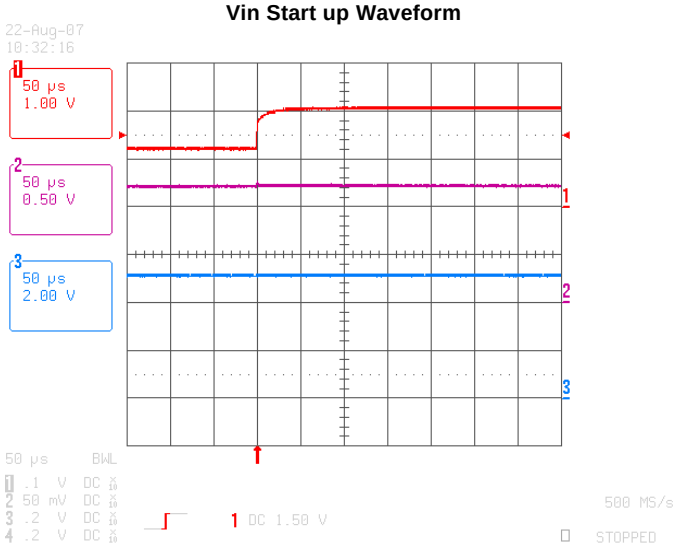
Load Transient



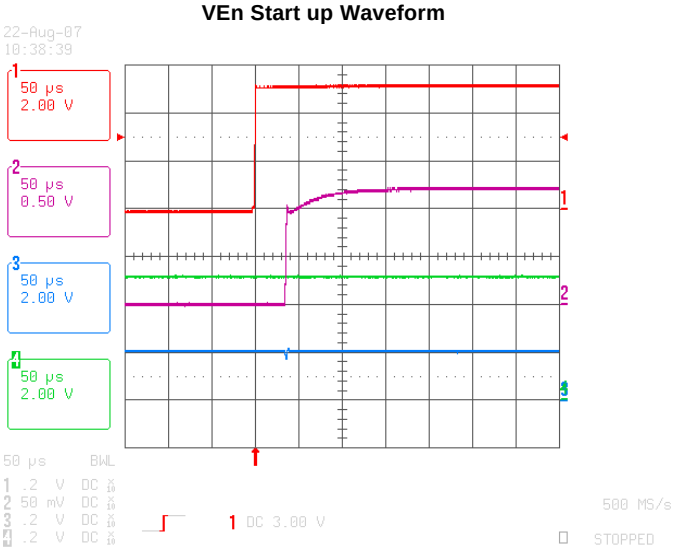
Short Circuit Current



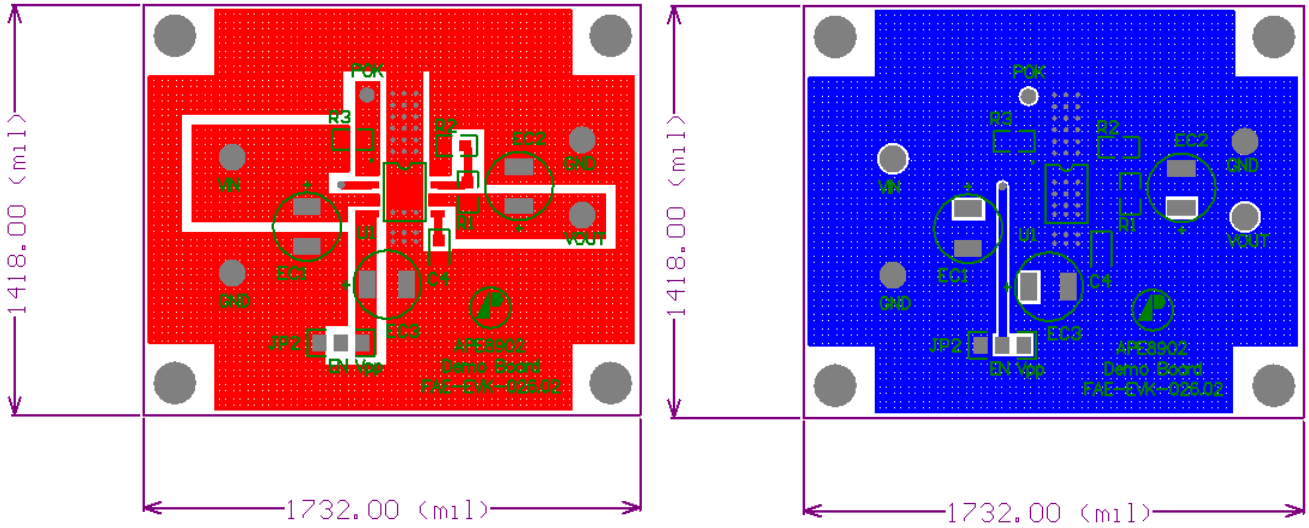
Vin Start up Waveform



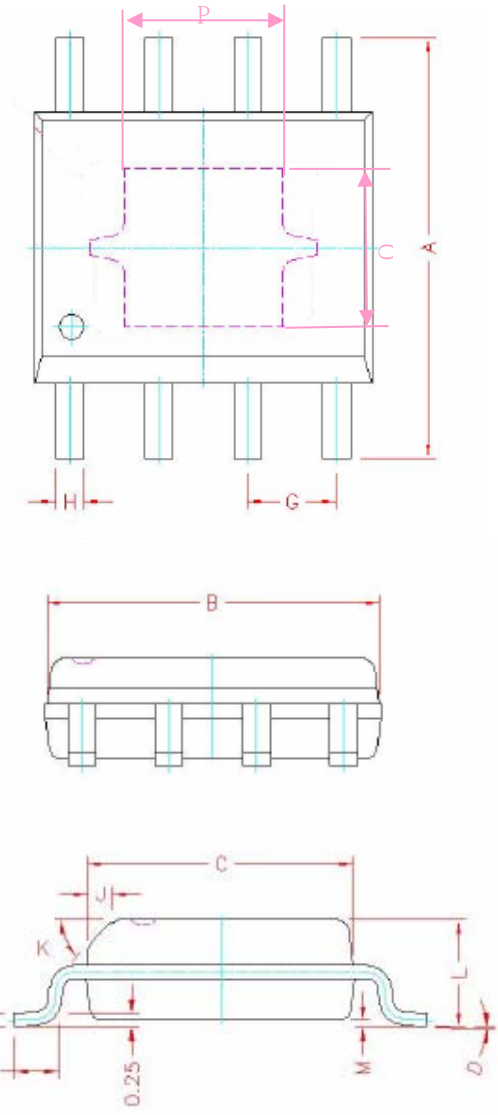
VEn Start up Waveform



DEMO BOARD FOOTPRINT



Package Outline : ESOP-8



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	5.80	6.00	6.20
B	4.80	4.90	5.00
C	3.80	3.90	4.00
D	0°	4°	8°
E	0.40	0.65	0.90
F	0.19	0.22	0.25
M	0.00	0.08	0.15
H	0.35	0.42	0.49
L	1.35	1.55	1.75
J	0.375 REF.		
K	45°		
G	1.27 TYP.		
P	2.15	2.25	2.35
Q	2.15	2.25	2.35

1.All Dimension Are In Millimeters.

2.Dimension Does Not Include Mold Protrusions.

Part Marking Information & Packing : ESOP-8

