AF1117A

1A Bipolar Linear Regulator

Features

- Maximum output current is 1000mA
- Range of operation input voltage: Max 15V
- Line regulation: 0.1%/V (typ.)
- Standby current: 2mA (typ.)
- Load regulation: 10mV (typ.)
- Environment Temperature: -20℃~85℃

Applications

- Power Management for ComputerMother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators For Switching Supplies

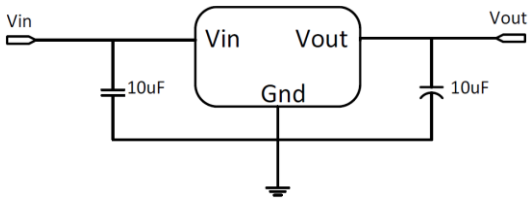
General Description

AF1117A is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1.0A load current. AF1117A features a very low standby current 2mA compared to 5mA of competitor.

Other than a fixed version, Vout = 1.2V, 1.8V, 2.5V, 3.3V, 5V, and 12V, AF1117A has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

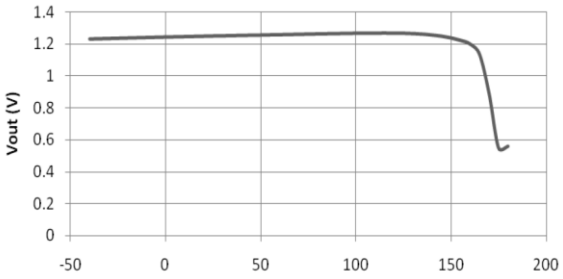
AF1117A offers thermal shut down and current limit functions, to assure the stability of chip and power system. And it uses trimming technique toguarantee output voltage accuracy within 2%. Other output voltage accuracy can be customized on demand, such as 1%.AF1117A is available in SOT-223, TO-252 power package.

Typical Application



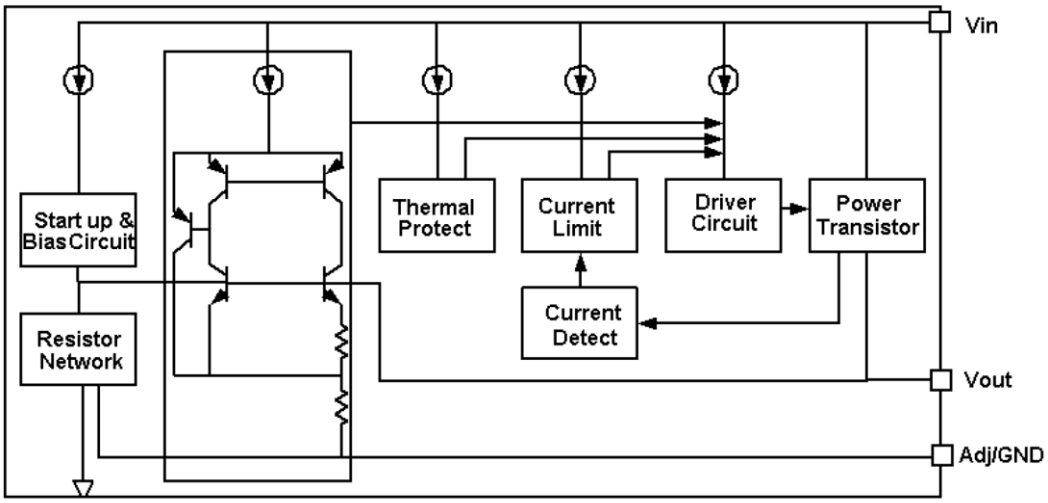
Application circuit of AF1117A fixed version

Typical Electrical Characteristic

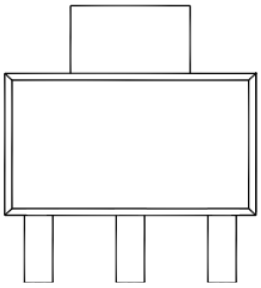


Temperature（℃）

- **Block Diagram**

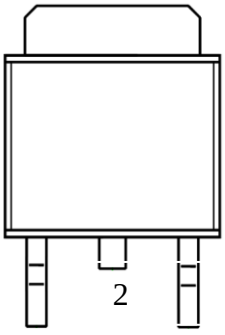


- **Pin Configuration**



TO-223

1：Vss/ADJ
2：Vout
3：Vin



TO-252

- **Marking Information**

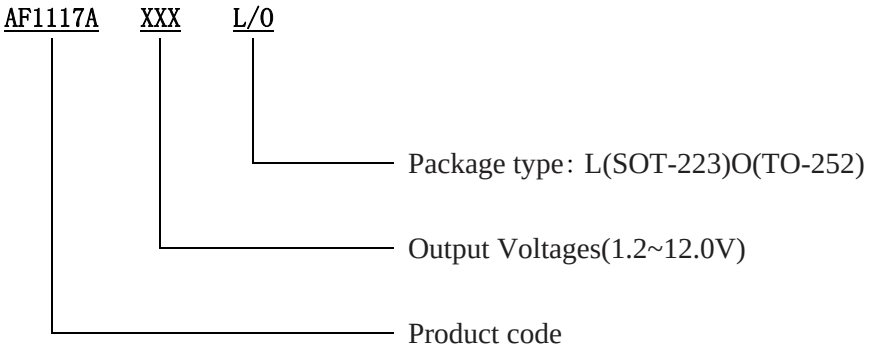
AMS1117 XX XXXXX

LotNumber:

Output Voltage：
1.2:1.2V
1.5:1.5V
1.8:1.8V
3.3:3.3V
5.0:5.0V
ADJ: adjustable

LOGO& Product code

- **Ordering Information**



- **Absolute Maximum Rating**

Parameter		Value
Max Input Voltage		15V
Max Power Dissipation(Pd)		1.2 W
Max Output Current		1A
Max Operating Junction Temperature(Tj)		150℃
Ambient emperature(Ta)		-40℃ – 85℃
Package Thermal Resistance	SOT-223	20℃ / W
	TO-252	12.5℃ / W
Storage Temperature(Ts)		-40℃ - 150℃
Lead Temperature & Time		260℃, 10S

Caution: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

Exceptional for AF1117A-12V, the maximum input voltage for AF1117A-12V is 20V.

- **Thermal Information**

Parameter	Package	Rating	Unit
Package thermal resistance	SOT-223	20	℃/W
	TO-252	12.5	℃/W

- **Electrical Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vref	Reference voltage	AF1117A-ADJ 10mA≤Iout≤1A,Vin=3.25V	1.225	1.25	1.275	V
Vout	Output voltage	AF1117A-1.2V 0≤Iout≤1A , Vin=3.2V	1.176	1.2	1.224	V
		AF1117A-1.8V 0≤Iout≤1A , Vin=3.8V	1 76	1.8	1.836	V
		AF1117A-2.5V	2.45	2.5	2.55	V

		0≤Iout≤1A , Vin=4.5V				
		AF1117A-3.3V 0≤Iout≤1A , Vin=5.3V	3.234	3.3	3.366	V
		AF1117A-5.0V 0≤Iout≤1A , Vin=7.0V	4.9	5	5.1	V
		AF1117A-12.0V 0≤Iout≤1A , Vin=14V	11.76	12	12.24	V
ΔVout	Line Regulation	AF1117A-1.2V Iout=10mA, 2.7V≤Vin≤10V		0.1	0.4	%/V
		AF1117A-ADJ Iout=10mA, 2.75V≤Vin≤12V		0.1	0.4	%/V
		AF1117A-1.8V Iout=10mA, 3.3V≤Vin≤12V		0.1	0.4	%/V
		AF1117A-2.5V Iout=10mA, 4.0V≤Vin≤12V		0.1	0.4	%/V
		AF1117A-3.3V Iout=10mA, 4.8V≤Vin≤12V		0.1	0.4	%
		AF1117A-5.0V Iout=10mA, 6.5V≤Vin≤12V		0.1	0.4	%/V
		AF1117A-1.8V Iout=10mA,13.5V≤Vin≤20V		0.1	0.4	%/V
ΔVout	Load rgulation	AF1117A-1.2V Vin =2.7V, 10mA≤Iout≤1A		10	32	mV
		AF1117A-ADJ Vin =2.75V, 10mA≤Iout≤1A		10	32	mV
		AF1117A-1.8V Vin =3.3V, 10mA≤Iout≤1A		10	32	mV
		AF1117A-2.5V Vin =4.0V, 10mA≤Iout≤1A		10	32	mV
		AF1117A-3.3 Vin =4.8V, 10mA≤Iout≤1A		10	32	mV
		AF1117A-5.0 Vin =6.5V, 10mA≤Iout≤1A		10	32	mV
		AF1117A-12.0V Vin =13.5V, 10mA≤Iout≤1A		10	32	mV
		AF1117A-ADJ Vin =2.75V, 10mA≤Iout≤1A		10	32	mV
Vdrop	Dropout voltage	Iout =100mA		1.23	1.3	V
		Iout=1.0A		1.3	1.5	V
Ilimit	Current limit	Vin-Vout=2V;Tj =25℃	0.8			A
Imin	Minimum load current	AF1117A-ADJ	2	10	mA	Imin
Iq	Quiescent	AF1117A-1.2V, in=10V		2	5	mA

	Current	AF1117A-1.8V, in 12V		2	5	mA
		AF1117A-2.5V,Vin=12V		2	5	mA
		AF1117A-3.3V,Vin=12V		2	5	mA
		AF1117A-5.0V,Vin=12V		2	5	mA
		AF1117A-12.0V,Vin=20V		2	5	mA
I_{adj}	Adjust pin current	AF1117A-ADJ Vin=5V,10mA≤Iout≤1A		55	120	uA
PSRR	1117A	f=100Hz, Cout=104		-65		dB
		f=1KHz, Cout=104		-65		dB
		f=10KHz, Cout=104		-60		dB
		f=22KHz, Cout=104		-57		dB
Ichang	Ia j change	AF1117A-ADJ Vin=5V,10mA≤Iout≤1A		0.2	10	uA
ΔV/ΔT	Temperature coefficien			±100		ppm
θ_{JC}	Thermal resistance	SOT-223		20		℃/W
		TO-252		12.5		

Note1: All test are conducted under ambient temperature 25℃ and within a short period of time 20ms

Note2: Load current smaller than minimum load current of AF1117A-ADJ will lead to unstable or oscillation output.

- **Detailed Description**

AF1117A is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, bandgap, thermal shutdown, current limit, power transistors and its driver circuit and so on.

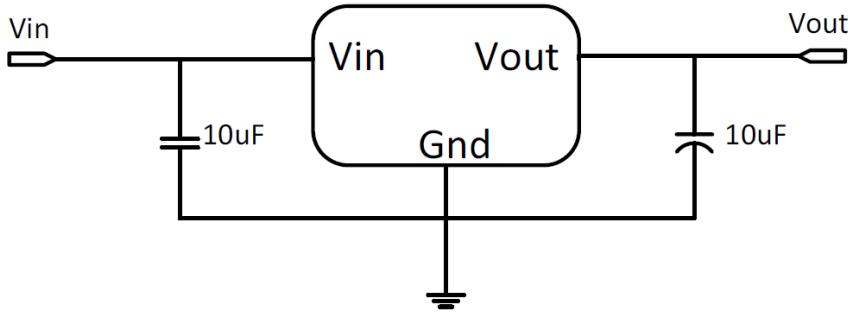
The thermal shut down modules can assure chip and its application system working safety when the junction temperature is larger than 140℃.

The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The temperature coefficient is under 100 ppm/℃. And the accuracy of output voltage is guaranteed by trimming technique.

- **Typical Application**

AF1117A has an adjustable version and six fixed versions (1.2V, 1.8V, 2.5V, 3.3V, 5V and 12V)

Fixed Output Voltage Version

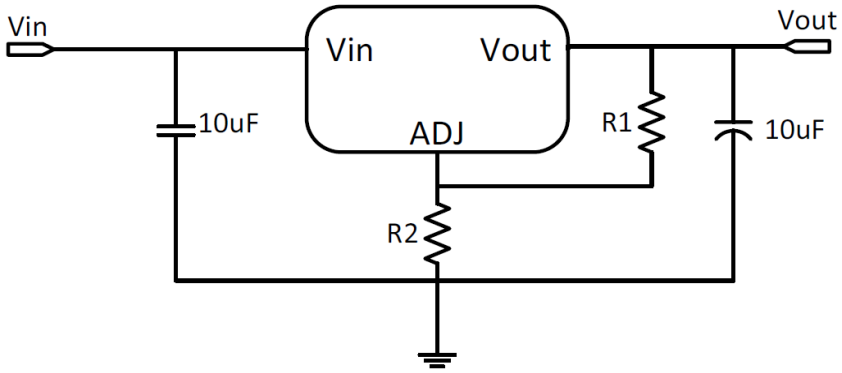


Application circuit of AF1117A fixed version

1) Recommend using 10uF tan capacitor as bypass capacitor (C1) for all application circuit.

2) Recommend using 10uF tan capacitor to assure circuit stability.

- **Adjustable Output Voltage Version**



Application Circuit of AF1117A-ADJ

The output voltage of adjustable version follows the equation: $Vout=1.25\times(1+R2/R1)+I_{Adj}\times R2$. We can ignore I_{Adj} because I_{Adj} (about 50uA) is much less than the current of R1 (about 2~10mA).

1) To meet the minimum load current (>10mA) requirement, R1 is recommended to be 125ohm or lower. As AF1117A-ADJ can keep itself stable at load current about 2mA, R1 is not allowed to be higher than 625ohm.

2) Using a bypass capacitor (C_{ADJ}) between the ADJ pin and ground can improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of C_{ADJ} should be less than R1 to prevent ripple from being amplified. As R1 is normally in the range of 100Ω~500Ω, the value of C_{ADJ} should satisfy this equation: $1/(2\pi\times fripple\times C_{ADJ})<R1$.

- **Thermal Considerations**

We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by AF1117A is very large. AF1117A seriesuses SOT-223 package type and its thermal resistance is about 20 ℃/W. And the copper area of application board can affect the total thermal resistance. If copper area is 5cm*5cm (two sides), the resistance is about 30 ℃/W. So the total thermal resistance is about 20 ℃/W + 30 ℃/W. We can decrease total thermal resistance by increasing copper area in application board. When there is no good heat dissipation copper are in PCB, the total thermal resistance will be as high as 120 ℃/W, then the power dissipation of AF1117A could allow

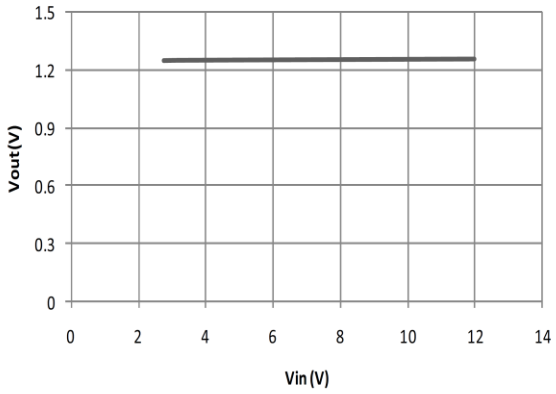
on itself is less than 1W. And furthermore, AF1117A will work at junction temperature higher than 125℃ under such condition and no lifetime is guaranteed.

- **Typical Performance Characteristics**

T=25℃ unless specified.

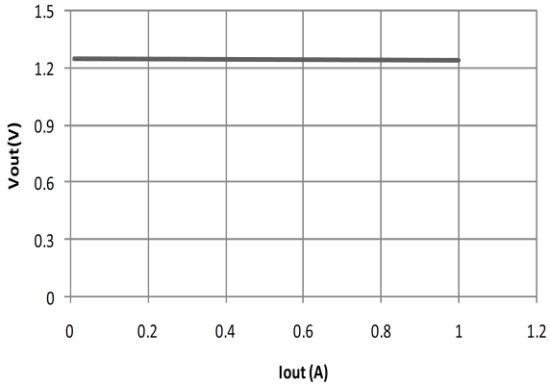
Line Regulation

AF1117A-ADJ Vout Vs. Vin



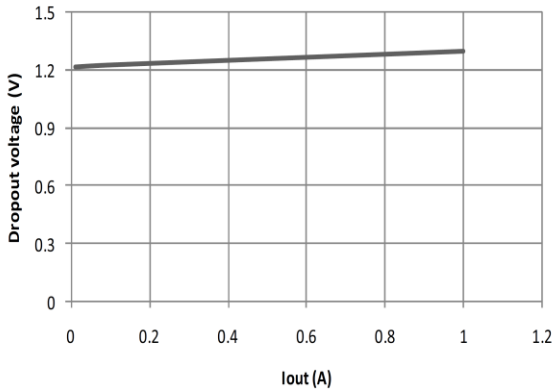
Load Regulation

AF1117A-ADJ Vout Vs. Iout



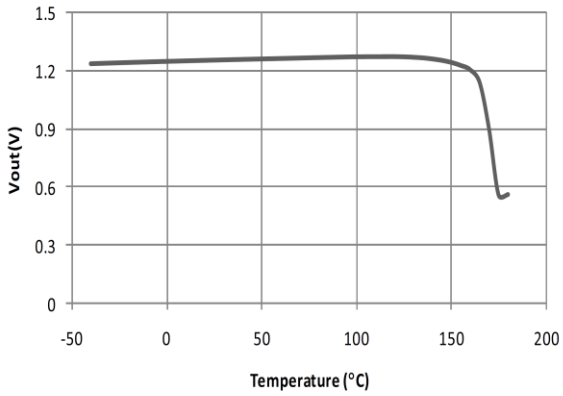
Dropout Voltage

AF1117A-ADJ Dropout Vs. Iout



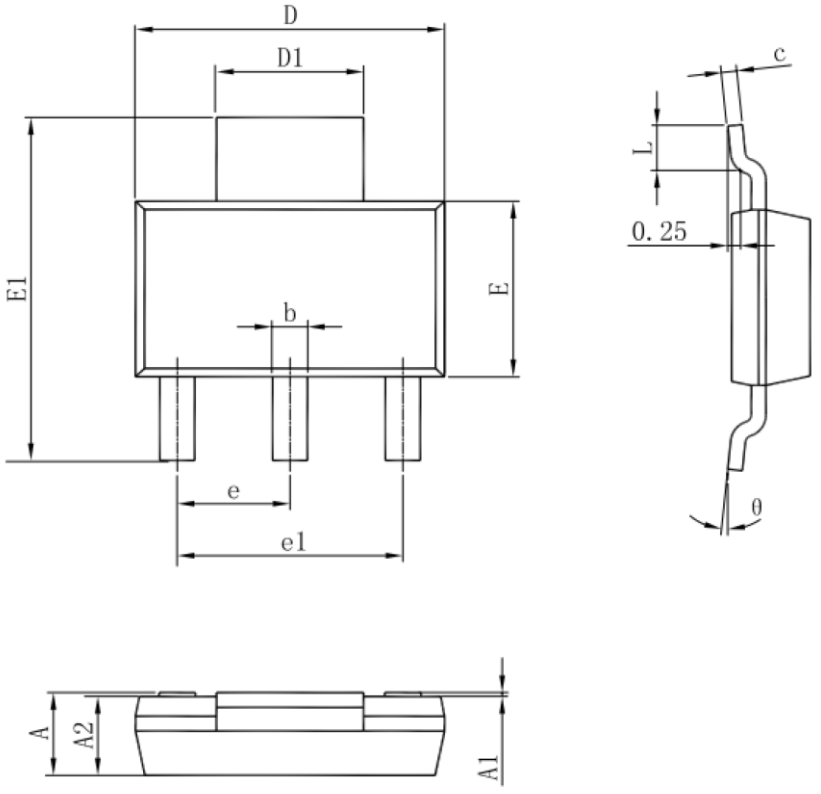
Thermal performance with OTP

AF1117A-ADJ Vout Vs. Temp



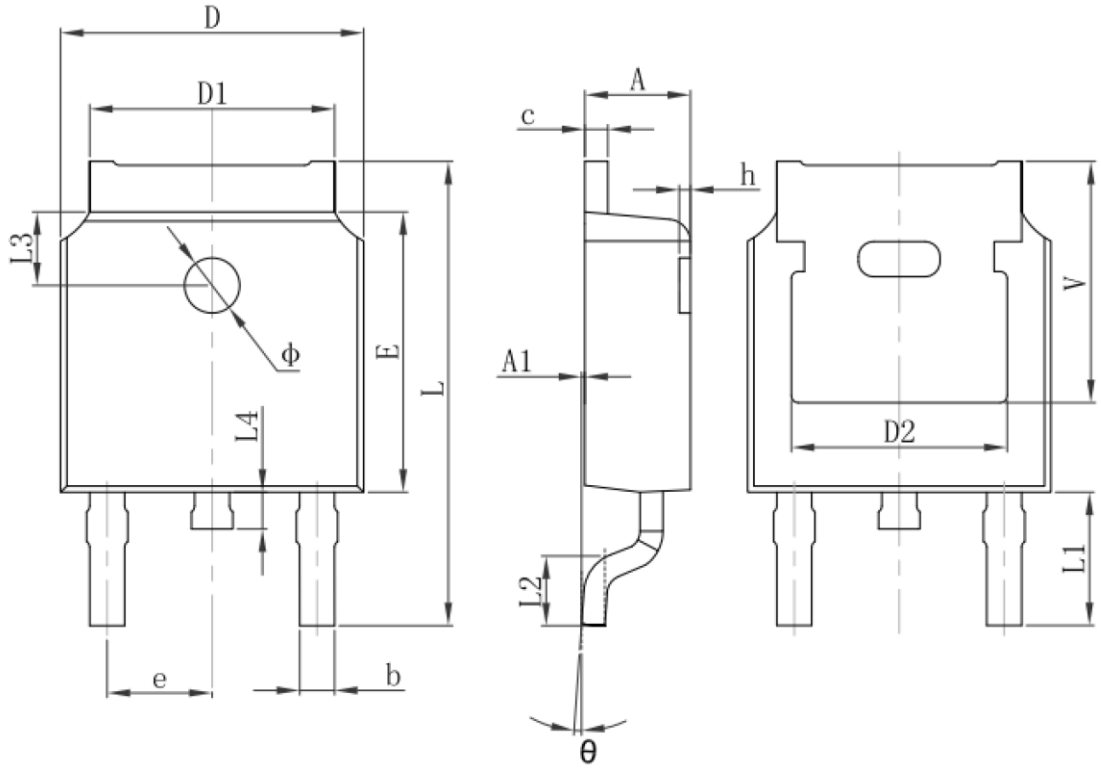
- **Package Information**

SOT-223



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.200	6.400	0.244	0.252
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
e	2.300(BSC)		0.091(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
θ	0°	10°	0°	10°

TO-252-2L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	

DISCLAIMER

AFSEMI RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. AFSEMI DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICIENCE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

THE GRAPHS PROVIDED IN THIS DOCUMENT ARE STATISTICAL SUMMARIES BASED ON A LIMITED NUMBER OF SAMPLES AND ARE PROVIDED FOR INFORMATIONAL PURPOSE ONLY. THE PERFORMANCE CHARACTERISTICS LISTED IN THEM ARE NOT TESTED OR GUARANTEED. IN SOME GRAPHS, THE DATA PRESENTED MAY BE OUTSIDE THE SPECIFIED OPERATING RANGE (E.G,. OUTSIDE SPECIFIED POWER SUPPLY RANGE) AND THEREFORE OUTSIDE THE WARRANTED RANGE.