



## 1.2A Bipolar Linear Regulator

### ➤ Features

- Maximum output current is 1.2A
- Input Voltage Range: 2.5V~22V
- Line regulation: 0.1%/V(typ.)
- Standby current: 4mA (typ.)
- Load regulation: 5mV(typ.)
- Over-temperature Protection
- Environment Temperature: -20~85(°C)

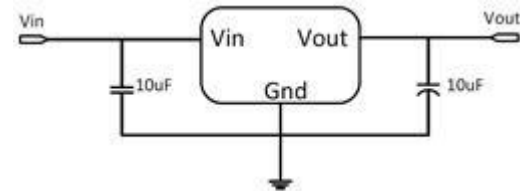
### ➤ General Description

AF1117M is a series of low dropout three-terminal regulators with a dropout of 1.15V at 1.2A load current. AF1117M features a very low standby current 4mA compared to 5mA of competitor.

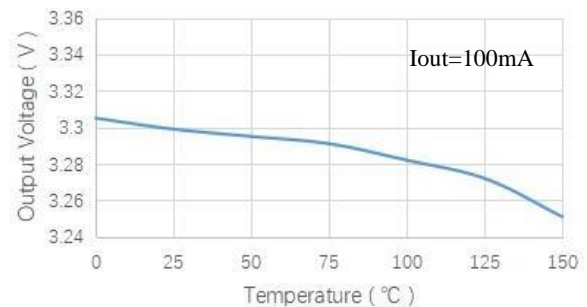
AF1117M offers thermal shut down and current limit functions, to assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within 2%.

Other output voltage accuracy can be customized on demand, such as 1%.AF1117M is available in SOT-223 and SOT-89 package.

### ➤ Typical Applications



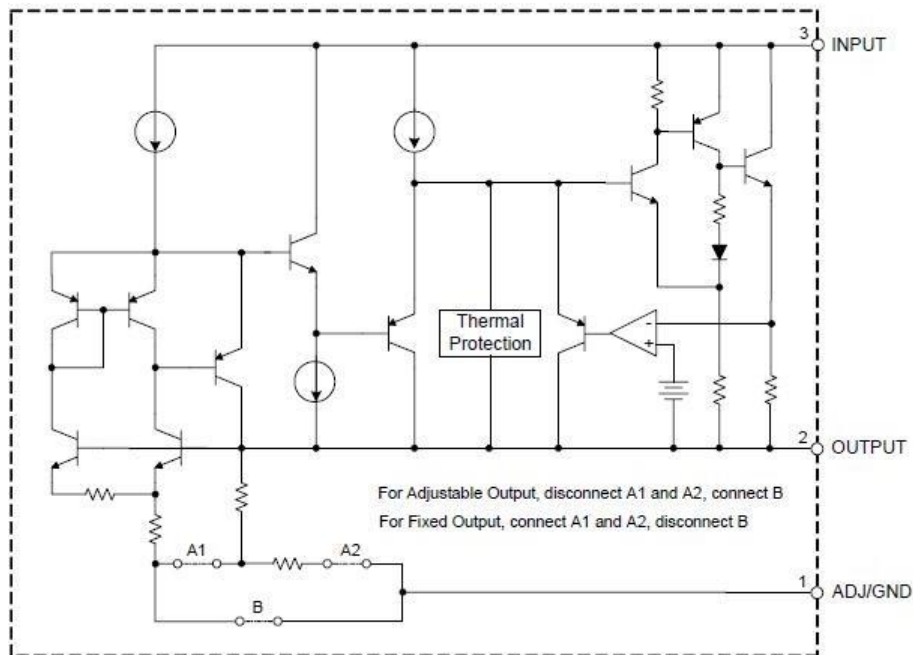
### ➤ Typical Electrical Characteristic



### ➤ Applications

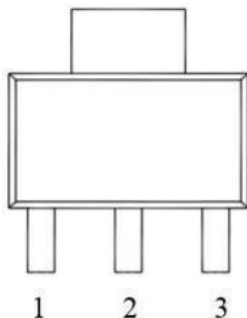
- Power management for Computer Mother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators for Switching Supplies

➤ **Block Diagram**



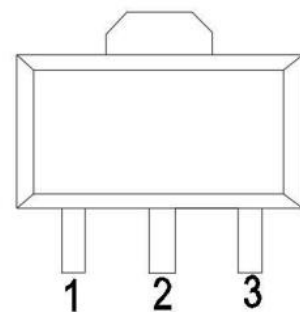
➤ **Pin Configuration**

SOT-223



1.Vss/Adj 2.Vout 3.Vin

SOT-89



1.GND 2.Vout 3.Vin

➤ **Absolute Maximum Rating**

Parameter	Value	
Max Input Voltage	22V	
Max Power Dissipation(Pd)	1.2 W	
Max Output Current	1.2A	
Recommended operating junction temperature(Tj)	-20~125°C	
Max Operating Junction Temperature(Tj)	150°C	
Ambient Temperature(Ta)	-40°C – 85°C	
Package Thermal Resistance	SOT-223	20°C / W
	SOT-89	30°C / W
Storage Temperature(Ts)	-40°C - 150°C	
Lead Temperature & Time	260°C, 10s	

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



➤ **Selection Table**

Marking	Part No.	Output Voltage	Package/ Shipping
AF1117M XXX YZZZ	XXX=1V2	1.2V	SOT-223 Tape and Reel 2.5K/Reel SOT-89 Tape and Reel 1K/Reel
	XXX=1V5	1.5V	
	XXX=1V8	1.8V	
	XXX=2V5	2.5V	
	XXX=2V8	2.85V	
	XXX=3V3	3.3V	
	XXX=5V0	5.0V	
	XXX=ADJ	ADJ	
	YYZZ	Date code	

➤ **Ordering Information**

AF 1117M—XX L/P

① ② ③ ④

①	Standard
②	Product Name
③	Output Voltages e.g. 12=1.2V
④	L: SOT-223 Package P: SOT-89 Package

➤ **Electrical Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vref	Reference voltage	AF1117M-ADJ 10mA ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 3.25V	1.225	1.25	1.275	V
Vout	Output voltage	AF1117M-1.2V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 3.2V	1.176	1.2	1.224	V
		AF1117M-1.5V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 3.5V	1.47	1.5	1.53	V
		AF1117M-1.8V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 3.8V	1.764	1.8	1.836	V
		AF1117M-2.5V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 4.5V	2.45	2.5	2.55	V
		AF1117M-2.85V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 4.85V	2.793	2.85	2.907	V
		AF1117M-3.3V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 5.3V	3.234	3.3	3.366	V
		AF1117M-5.0V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 7.0V	4.9	5	5.1	V
OTP	Thermal Shutdown	V <sub>IN</sub> = 5V, V <sub>O</sub> = 3.3V, I <sub>O</sub> = 20mA		+185		°C



## AF1117M

$\Delta V_{out}$	Line Regulation	AF1117M-1.2V $I_{out}=10mA, 2.7V \leq V_{in} \leq 10V$		2	10	mV
		AF1117M-1.5V $I_{out}=10mA, 3V \leq V_{in} \leq 12V$		2	10	mV
		AF1117M-ADJ $I_{out}=10mA, 2.75V \leq V_{in} \leq 12V$		2	10	mV
		AF1117M-1.8V $I_{out}=10mA, 3.3V \leq V_{in} \leq 12V$		2	10	mV
		AF1117M-2.5V $I_{out}=10mA, 4.0V \leq V_{in} \leq 12V$		2	10	mV
		AF1117M-2.85V $I_{out}=10mA, 4.35V \leq V_{in} \leq 12V$		2	10	mV
		AF1117M-3.3V $I_{out}=10mA, 4.8V \leq V_{in} \leq 12V$		2	10	mV
		AF1117M-5.0V $I_{out}=10mA, 6.5V \leq V_{in} \leq 12V$		2	10	mV
$\Delta V_{out}$	Load Regulation	AF1117M-1.2V $V_{in} = 2.7V, 10mA \leq I_{out} \leq 1A$		5	10	mV
		AF1117M-1.5V $V_{in} = 3V, 10mA \leq I_{out} \leq 1A$		5	12	mV
		AF1117M-ADJ $V_{in} = 3V, 10mA \leq I_{out} \leq 1A$		5	10	mV
		AF1117M-1.8V $V_{in} = 3.3V, 10mA \leq I_{out} \leq 1A$		5	12	mV
		AF1117M-2.5V $V_{in} = 4.0V, 10mA \leq I_{out} \leq 1A$		5	15	mV
		AF1117M-2.85V $V_{in} = 4.35V, 10mA \leq I_{out} \leq 1A$		5	15	mV
		AF1117M-3.3V $V_{in} = 4.8V, 10mA \leq I_{out} \leq 1A$		6	18	mV
		AF1117M-5.0V $V_{in} = 6.5V, 10mA \leq I_{out} \leq 1A$		10	25	mV
$V_{drop}$	Dropout voltage	$I_{out} = 100mA$		1.12	1.3	V
		$I_{out} = 1A$		1.15	1.3	V
$I_{limit}$	Current limit	$V_{in} - V_{out} = 2V; T_j = 25^\circ C$		1.7		A
$I_q$	Quiescent Current	AF1117M-1.2V, $V_{in} = 10V$		4	6	mA
		AF1117M-1.5V, $V_{in} = 12V$		4	6	mA
		AF1117M-1.8V, $V_{in} = 12V$		4	6	mA
		AF1117M-2.5V, $V_{in} = 12V$		4	6	mA
		AF1117M-2.85V, $V_{in} = 12V$		4	6	mA
		AF1117M-3.3V, $V_{in} = 12V$		4	6	mA
		AF1117M-5.0V, $V_{in} = 12V$		4	6	mA
$I_{Adj}$	Adjust pin current	AF1117M-ADJ $V_{in} = 3.25V, I_{out} = 10mA$	20	42	80	$\mu A$
PSRR	Ripple Rejection Rate	$V_{in} = 7.0V$ $+1V_{pp}$	$I_{out} = 50mA$ 100Hz		-62	dB
			$I_{out} = 50mA$ 1KHz		-60	dB
			$I_{out} = 50mA$ 10KHz		-55	dB
			$I_{out} = 50mA$ 100KHz		-42	dB
$\Delta V/\Delta T$	Temperature coefficient			$\pm 100$		ppm
$\theta_{JC}$	Thermal resistance	SOT-223		20		$^\circ C/W$
		SOT-89		30		$^\circ C/W$
$\theta_{JA}$	Thermal Resistance Junction-to-Ambient (No air flow)	SOT-223 (No heat sink)		136		$^\circ C/W$
		SOT-89 (No heat sink)		200		$^\circ C/W$



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

### ➤ Detailed Description

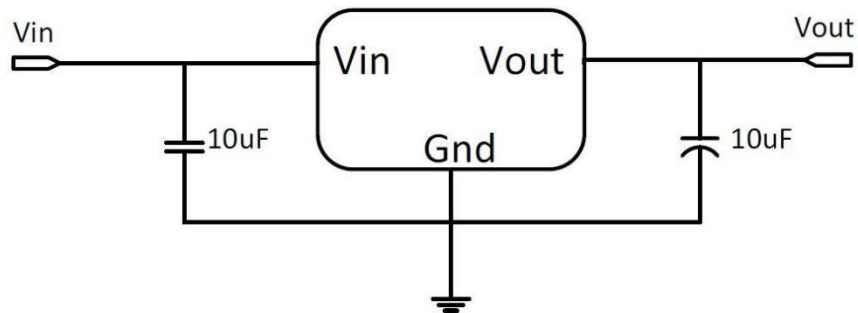
AF1117M is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors. It is composed of some modules including start-up circuit, bias circuit, bandgap, thermal shutdown, current limit, power transistors and its driver 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°C.

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

### ➤ Typical Application

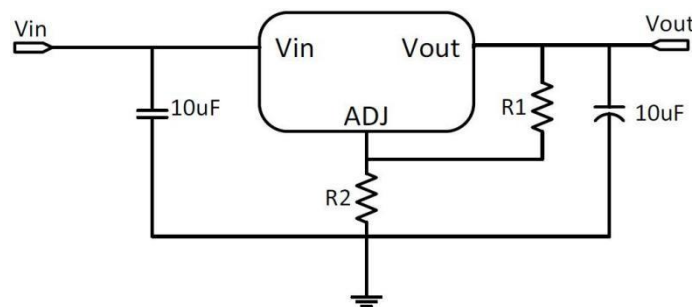
AF1117M has seven fixed versions (1.2V, 1.5V, 1.8V, 2.5V, 2.85V, 3.3V and 5V)  
Fixed Output Voltage Version



Application circuit of AF1117M 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 AF1117-ADJ



The output voltage of adjustable version follows the equation:  $V_{out}=1.25\times(1+R_2/R_1)+I_{Adj}\times R_2$ . We can ignore  $I_{Adj}$  because  $I_{Adj}$  (about 50uA) is much less than the current of  $R_1$  (about 2~10mA).

1) To meet the minimum load current (>10mA) requirement,  $R_1$  is recommended to be 125ohm or lower. As AF1117-ADJ can keep itself stable at load current about 2mA,  $R_1$  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  $R_1$  to prevent ripple from being amplified. As  $R_1$  is normally in the range of 100Ω~500Ω, the value of  $C_{ADJ}$  should satisfy this equation:  $1/(2\pi\times f_{ripple}\times C_{ADJ})<R_1$ .

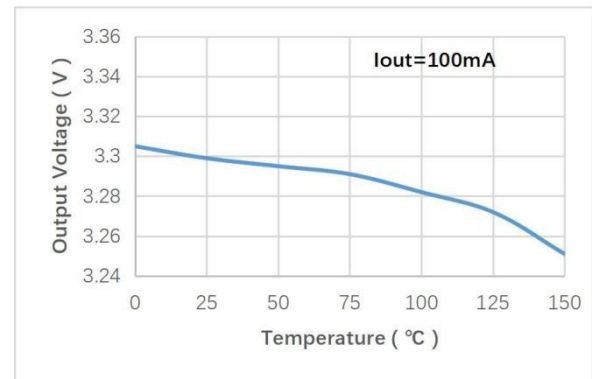
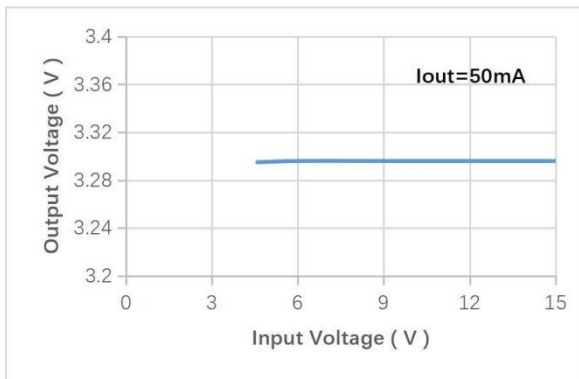
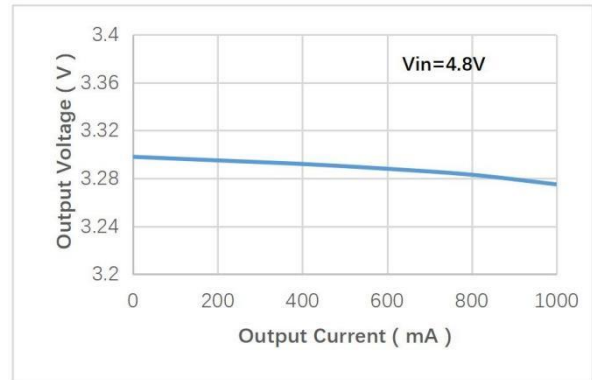
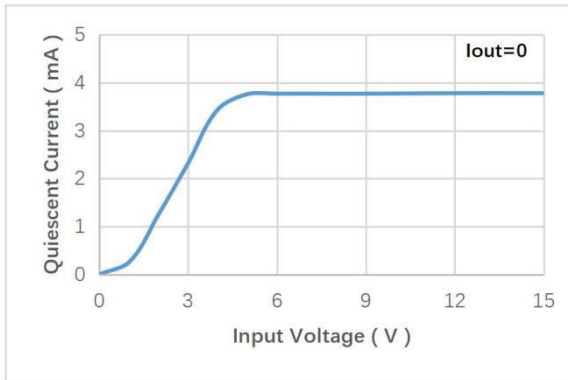
#### ➤ Thermal Considerations

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 AF1117M is very large. AF1117M series uses SOT-223 package type and its thermal resistance is about 20°C/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°C/W. So the total thermal resistance is about 20°C/W + 30°C/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°C/W, then the power dissipation of AF1117M could allow on itself is less than 1W. And furthermore, AF1117M will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

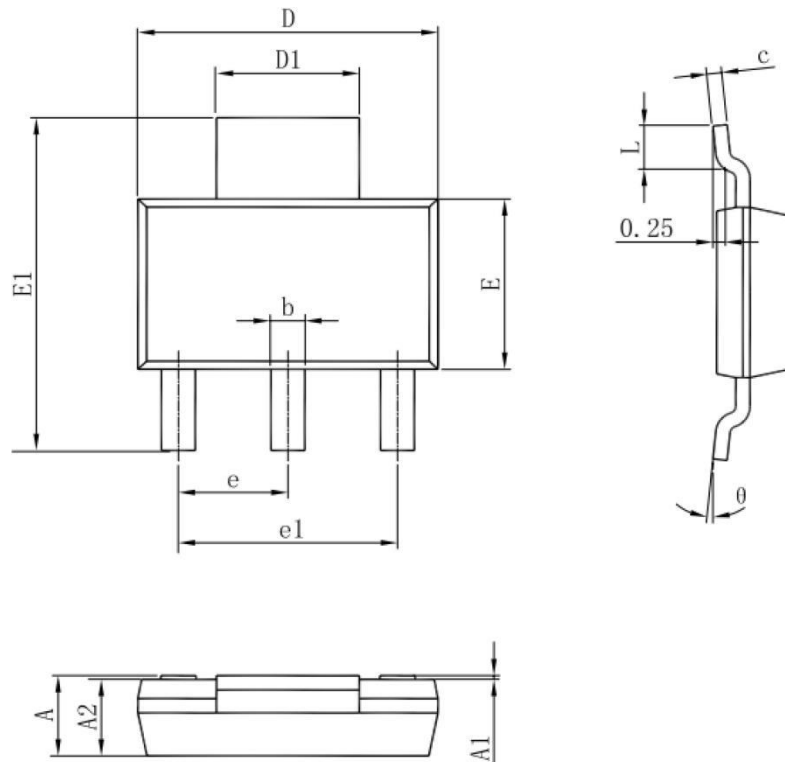


➤ Typical Performance Characteristics

T=25°C unless specified.

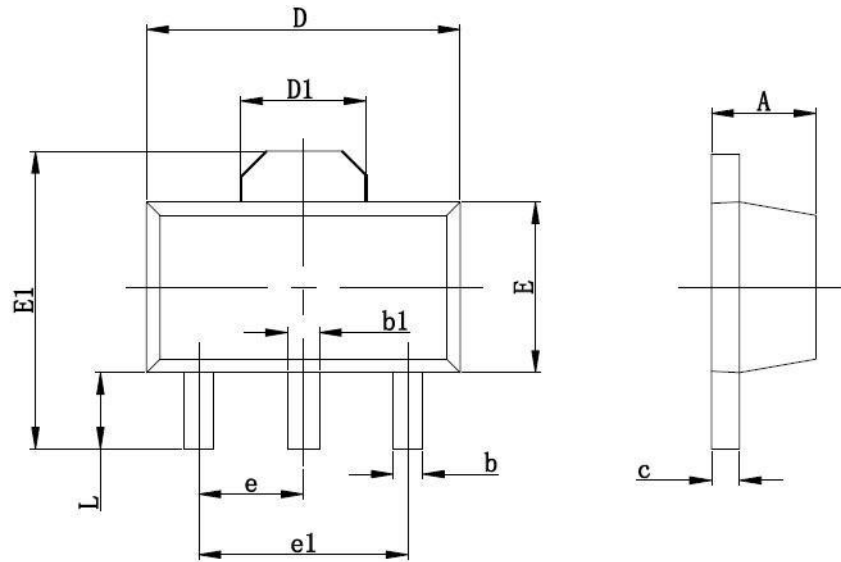


## ➤ Package Information

**SOT-223**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.480	1.800	0.058	0.071
A1	0.000	0.150	0.000	0.006
A2	1.450	1.700	0.057	0.067
b	0.660	0.820	0.026	0.032
c	0.200	0.350	0.008	0.014
D	6.200	6.600	0.244	0.260
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.150	0.269	0.281
e	2.286(BSC)		0.09(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.760	1.160	0.030	0.046
Θ	0°	10°	0°	10°



**SOT-89**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.350	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1,550 REF		0.061 REF	
E	2.350	2.550	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.100	0.035	0.047



**DISCLAIMER**

SSCSEMI RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. SSCSEMI 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.