Advanced Power Electronics Corp.

APE8805

600mA LOW DROPOUT LINEAR REGULATOR

Features

- Low Dropout Voltage of 600mV at 600mA
- Guaranteed 600mA Output Current
- Very Low Quiescent Current at about 30uA
- Max. ± 2%Output Accuracy
- Needs Only 1μF Capacitor for Stability
- Thermal Shutdown Protection
- Current Limit Protection
- Low-ESR Ceramic Capacitor for Output Stability
- RoHS Compliant

Applications

- DVD/CD-ROMs, CD/RWs
- Wireless Devices
- LCD Modules
- Battery Power Systems
- Card Readers
- XDSL Routers

Description

The APE8805 series are low dropout, positive linear regulators with very low quiescent current. The APE8805 can supply 600mA output current with a low dropout voltage at about 600mV.
The APE8805 regulator is able to operate with output capacitors as small as 1μF for stability. Other than the current limit protection APE8805 also offers on chip thermal shutdown feature providing protection against overload or any condition when the ambient temperature exceeds the junction temperature.
The APE8805 series are available in fixed output voltage ranging from 1.8 volt , 2.5 volt and 3.3 volt. The APE8805 series are available in space-saving SOT-23, SOT-89, and SOT-223 packages.

Typical Application Circuit

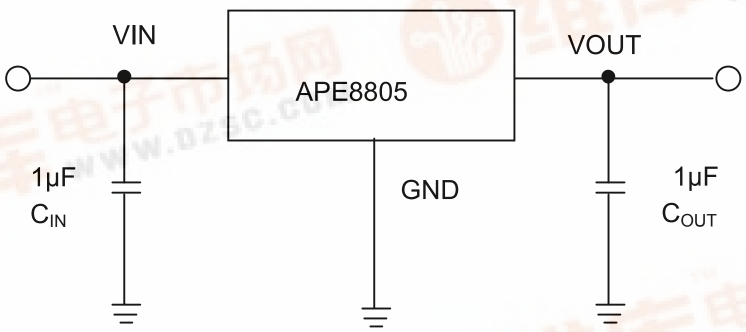


Figure 1. Typical Application Circuit of APE8805

Note：To prevent oscillation, it is recommended to use minimum 1μF X7R or X5R dielectric capacitors if ceramics are used as input/output capacitors.

Ordering Information

APE8805 □ - □

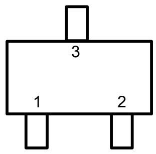
Output Voltage
18: 1.8V
25: 2.5V
33: 3.3V

Package Type
N: SOT-23
G: SOT-89
GR: SOT-89
K: SOT-223

Note：The devices are available in fixed voltages range of 1.8V , 2.5V& 3.3V. Please consult APEC sales office or authorized distributor for availability of special output voltages.

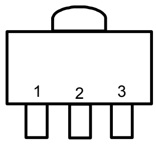
Pin Assignments

SOT-23(N)



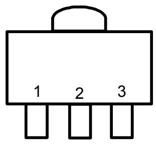
TOP VIEW
1. GND
2. VOUT
3. VIN

SOT-89(G)



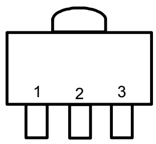
TOP VIEW
1. GND
2. VIN
3. VOUT

SOT-89(GR)



TOP VIEW
1. VOUT
2. GND
3. VIN

SOT-223(K)



TOP VIEW
1. VOUT
2. GND
3. VIN

Figure 2. Pin Assignment of APE8805

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Input Voltage	V_{IN}		6	V
Maximum Junction Temperature	T_J		150	ºC
Power Dissipation SOT-23	P_D		0.4	W
Power Dissipation SOT-89	P_D		0.57	W
Power Dissipation SOT-223	P_D		0.74	W
Package Thermal Resistance SOT-23	θ_{JA}		250	°C/W
Package Thermal Resistance SOT-89	θ_{JA}		175	°C/W
Package Thermal Resistance SOT-223	θ_{JA}		135	°C/W
Storage Temperature Range	T_S	-65	150	ºC
Lead Temperature (Soldering, 10 sec.)	T_{LEAD}		260	ºC

Note：Stresses beyond those listed under “Absolute Maximum Ratings" may cause permanent damage to the device.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}	2.8	5.5	V
Operating Junction Temperature Range	T_J	-40	125	°C

Electrical Characteristics

($V_{IN}=V_{OUT}+1V$ or $V_{IN}=2.8V$ whichever is greater, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$, $T_A=25$ °C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage Accuracy	ΔV_{OUT}	I_O= 1mA	-2		+2	%
Current Limit	I_{LIMIT}	$R_{Load}=1\Omega$	600			mA
Quiescent Current	I_Q	I_O= 0mA		30	50	µA
Dropout Voltage (Note 1)	V_{DROP}	I_O=600mA $1.2V \le V_{OUT} \le 2.0V$ $2.0V < V_{OUT} \le 2.8V$ $2.8V < V_{OUT} \le 4.5V$		1400 800 600		mV
Line Regulation	ΔV_{LINE}	I_O=1mA, $V_{IN}=V_{OUT}$ +1V to 5V		1	5	mV
Load Regulation (Note 2)	ΔV_{LOAD}	I_O=0mA to 600mA		13	50	mV
Ripple Rejection	PSRR	$V_{IN}=V_{OUT}+1V$ f_{RIPPLE} = 120Hz, C_{OUT} = 1µF		60		dB
Temperature Coefficient	TC	I_{OUT} = 1mA, V_{IN} = 5V		50		ppm/ °C
Thermal Shutdown Temperature	TSD			160		°C
Thermal Shutdown Hysteresis	ΔTSD			25		°C

Note 1：The dropout voltage is defined as $V_{IN}-V_{OUT}$, which is measured when V_{OUT} drop about 100mV.
Note 2：Regulation is measured at a constant junction temperature by using 40ms current pulse and load regulation in the load range from 0mA to 600mA.

Functional Pin Description

Pin Name	Pin Function
VIN	Power is supplied to this device from this pin which is required an input filter capacitor. In general, the input capacitor in the range of 1µF to 10µF is sufficient.
VOUT	The output supplies power to loads. The output capacitor is required to prevent output voltage unstable. The APE8805 is stable with an output capacitor 1µF or greater. The larger output capacitor will be required for application with large transit load to limit peak voltage transits, besides could reduce output noise, improve stability, PSRR.
GND	Common ground pin

Block Diagram

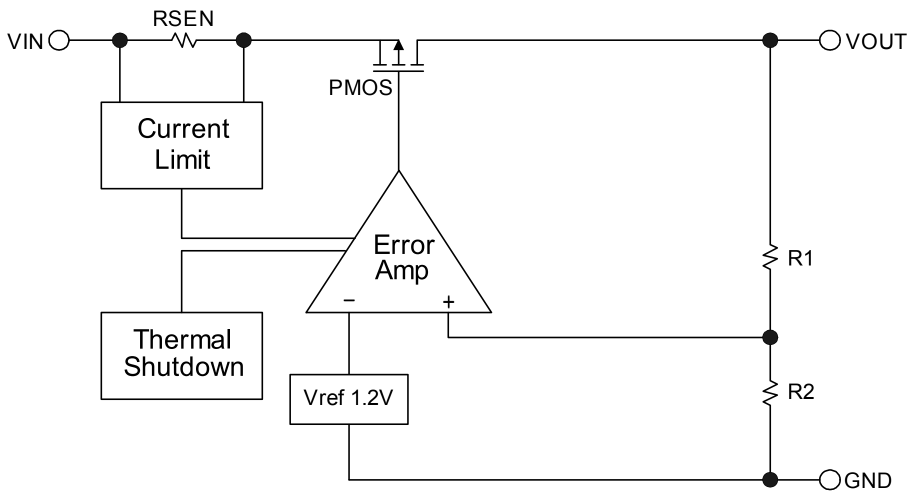


Figure 3. Block Diagram of APE8805

Application Information

The APE8805 series are low dropout linear regulators that could provide 600mA output current at dropout voltage about 600mV. Besides, current limit and on chip thermal shutdown features provide protection against any combination of overload or ambient temperature that could exceed junction temperature.

1.Output and Input Capacitor

The APE8805 regulator is designed to be stable with a wide range of output capacitors. The ESR of the output capacitor affects stability. Larger value of the output capacitor decreases the peak deviations and provides to improve transition response for larger current changes. The capacitor types (aluminum, ceramic, and tant- alum) have different characterizations such as temperature and voltage coefficients. All ceramic capacitors are manufactured with a variety of dielectrics, each with different behavior across temperature and applications. Common dielectrics used are X5R, X7R and Y5V. It is recommended to use 1uF to 10uF X5R or X7R dielectric ceramic capacitors with 30mΩ to 50mΩ ESR range betw- een device outputs to ground for transient stability. The APE8805 is designed to be stable with low ESR ceramic capacitors and higher values of capacitors and ESR could improve output stability. So the ESR of output capacitor is very important beca- use it generates a zero to provide phase lead for loop stability.

There are no requirements for the ESR on the input capacitor, but its voltage and temperature coefficient have to be considered for device application environment.

2.Protection Features

In order to prevent overloading or thermal cond- ition from damaging device, APE8805 regulator has internal thermal and current limiting functions designed to protect the device. It will rapidly shut off PMOS pass element during overloading or over temperature condition.

3.Thermal Consideration

The power handling capability of the device will be limited by maximum operation junction temp- erature (125°C). The power dissipated by the device will be estimated by PD = IOUT × (VIN-VOUT). The power dissipation should be lower than the maximum power dissipation listed in "Absolute Maximum Ratings" section.

Typical Performance Curves

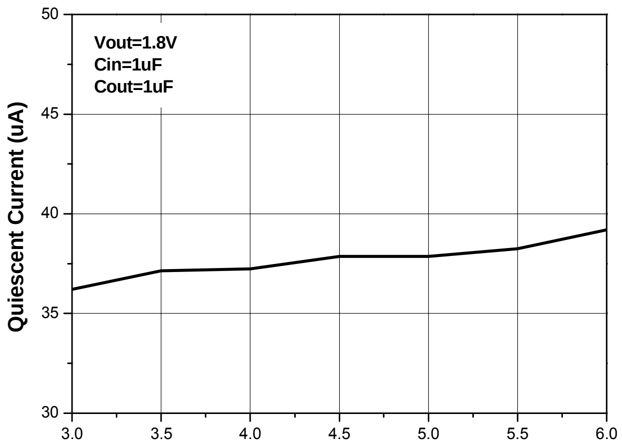


Figure 4. Quiescent Current vs. Input Voltage

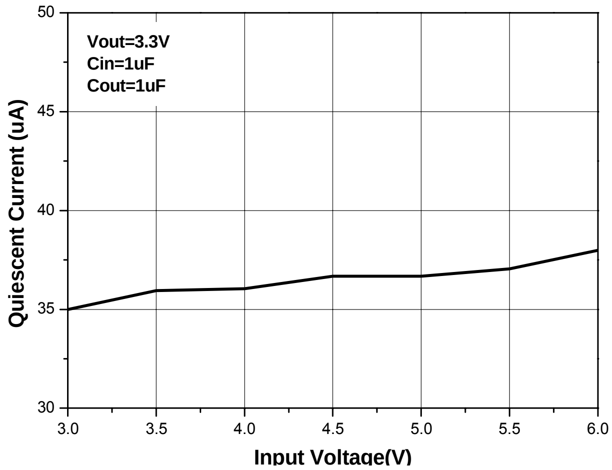


Figure 5. Quiescent Current vs. Input Voltage

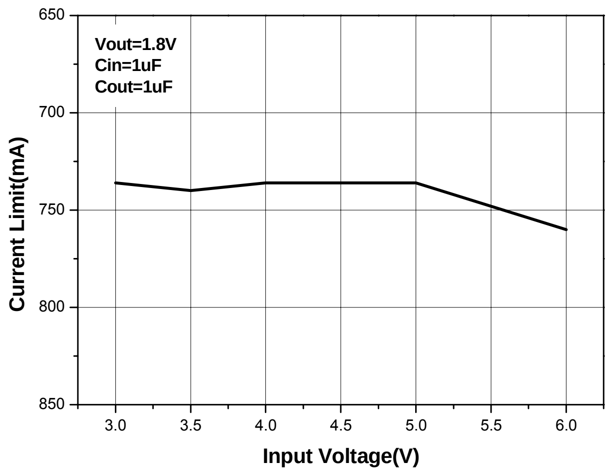


Figure 6. Current limit vs. Input Voltage

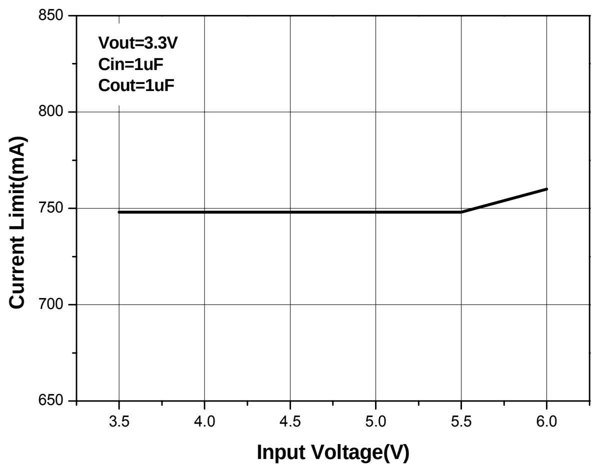


Figure 7. Current Limit vs. Input Voltage

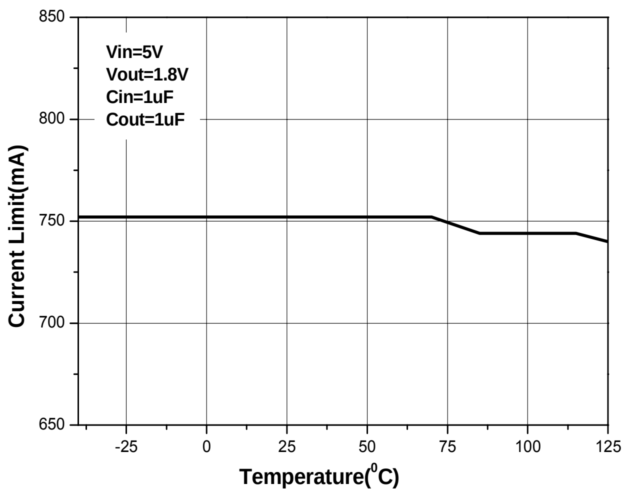


Figure 8. Current limit vs. Temperature

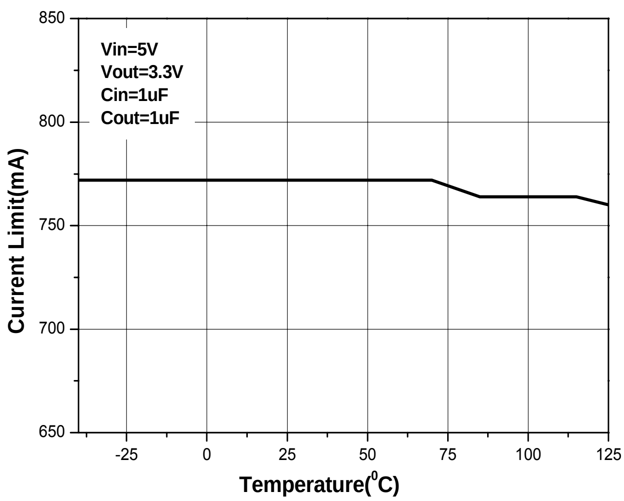


Figure 9. Current limit vs. Temperature

Typical Performance Curves (Continued)

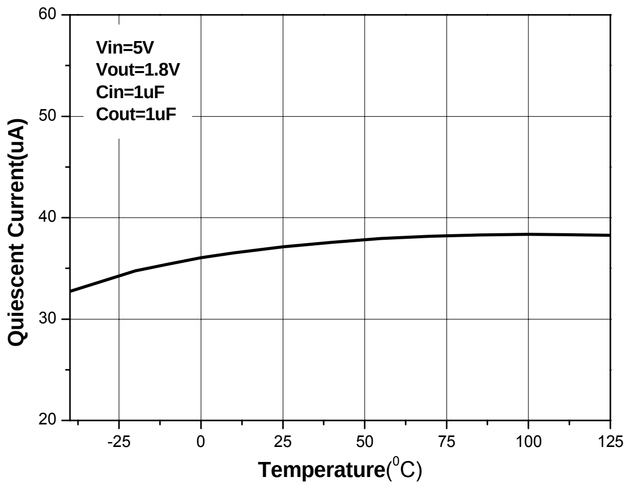


Figure 10. Quiescent Current vs. Temperature

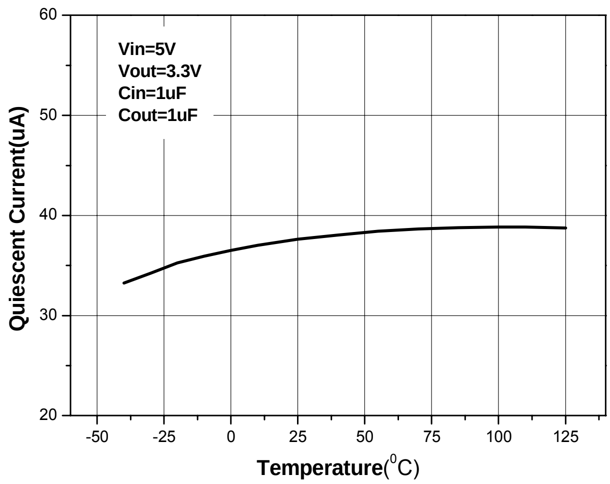


Figure 11. Quiescent Current vs. Temperature

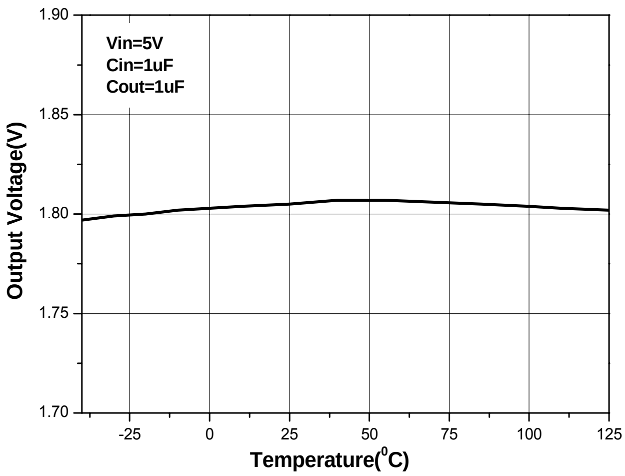


Figure 12. Temperature Stability

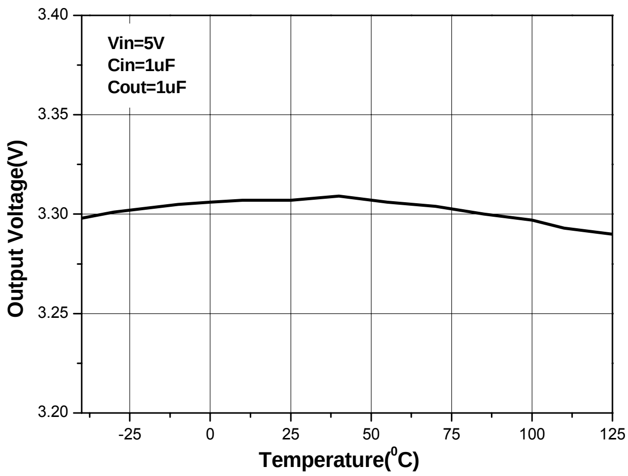


Figure 13. Temperature Stability

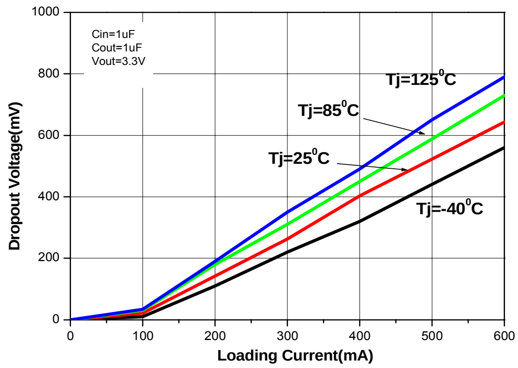


Figure 14. Dropout Voltage vs. Loading Current

Typical Performance Curves (Continued)

V_{IN}=4V I_{OUT}= 1mA to150mA

V_{OUT}=3.3V C_{IN}=1uF C_{OUT}=1uF

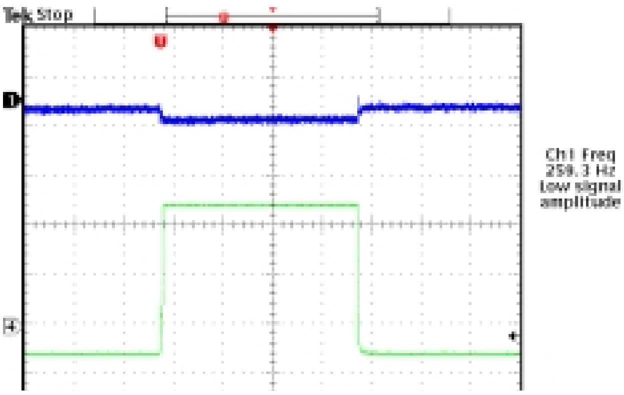


Figure 15. Load Transition Response

V_{IN}=4V I_{OUT}=1mA to 150mA

V_{OUT}=3.3V C_{IN}=1uF C_{OUT}=4.7uF

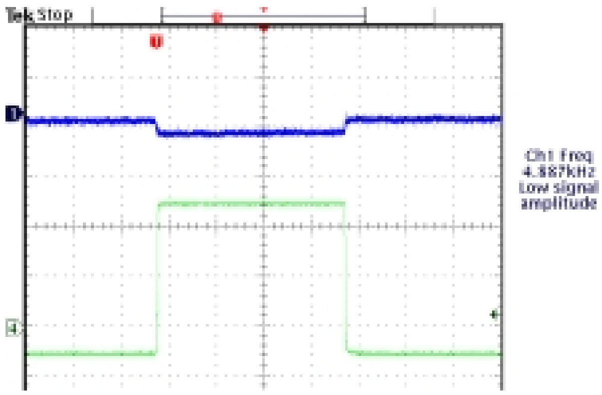


Figure 16. Load Transition Response

V_{IN}=3V to 4V I_{OUT}=10mA V_{OUT}= 1.8V C_{IN}=1uF C_{OUT}=1uF

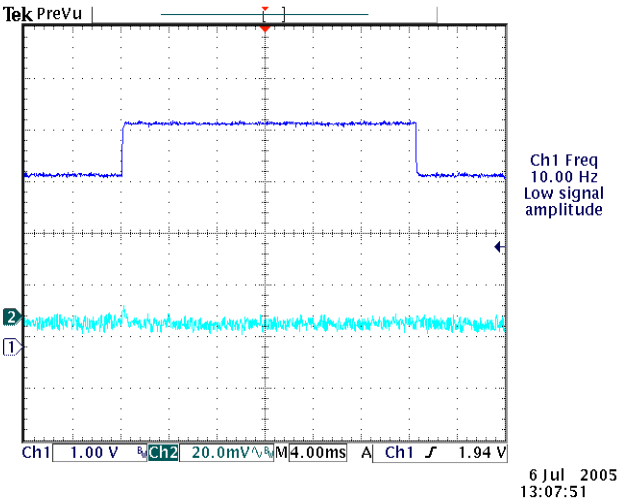


Figure 17. Line Transition Response

V_{IN}=3V to 4V I_{OUT}=10mA V_{OUT}= 1.8V C_{IN}=1uF C_{OUT}=4.7uF

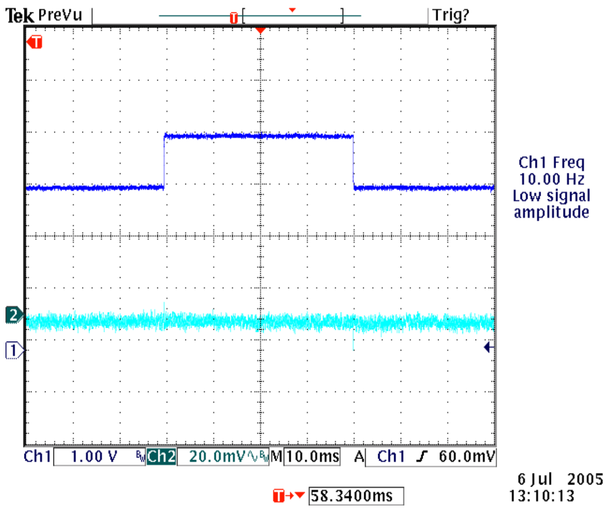
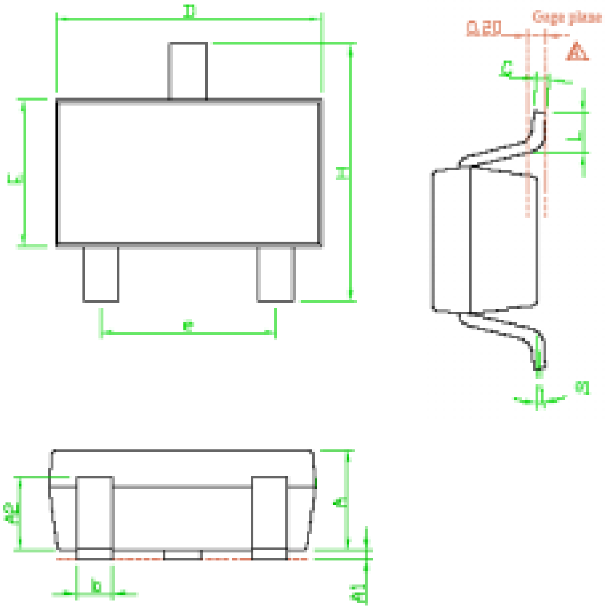


Figure 18. Line Transition Response

Outline Information

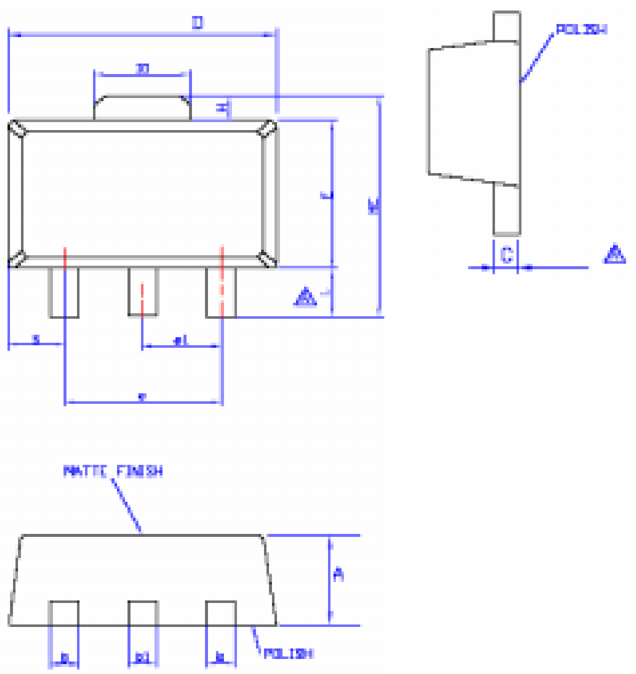
SOT-23 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	**NOM**	**MAX**
A	1.00	1.10	1.30
A1	0.00	---	0.10
A2	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.40	1.60	1.80
e	---	1.90(TYP)	---
H	2.60	2.80	3.00
L	0.37	---	---
θ1	1°	5°	9°

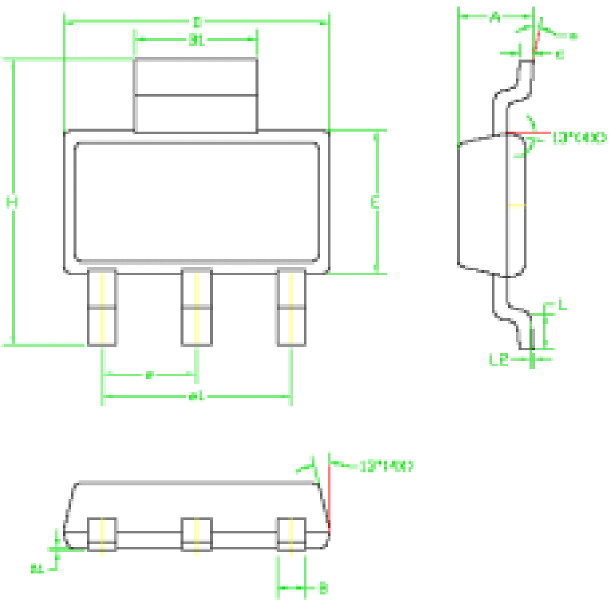
Note 1：Package Body Sizes Exclude Mold Flash Protrusions or Gate Burrs.
Note 2：Tolerance ± 0.1000 mm(4mil) Unless Otherwise Specified.
Note 3：Coplanarity：0.1000 mm
Note 4：Dimension L Is Measured in Gage plane.

SOT-89 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	**NOM**	**MAX**
A	1.40	1.50	1.60
L	0.89	1.04	1.20
b	0.36	0.42	0.48
b1	0.41	0.47	0.53
C	0.38	0.40	0.43
D	4.40	4.50	4.60
D1	1.40	1.60	1.75
HE	---	---	4.25
E	2.40	2.50	2.60
e	2.90	3.00	3.10
H	0.35	0.40	0.45
S	0.65	0.75	0.85
e1	1.40	1.50	1.60

SOT-223 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	**NOM**	**MAX**
A	1.55		1.80
A1	0.02		0.12
B	0.60		0.80
B1	2.90		3.10
c	0.24		0.32
D	6.30		6.70
E	3.30		3.70
e	2.30 BSC		
e1	4.60 BSC		
H	6.70		7.30
L	0.90 MIN		
L2	0.06 BSC		
α	0º		10 º

Life Support Policy

APEC's products are not authorized for use as critical components in life support devices or other medical systems.