300mA LOW DROPOUT LINEAR REGULATOR

FEATURES

- Low Dropout Voltage of 250mV at 300mA
- Guaranteed 300mA Output Current
- Very Low Quiescent Current at about 30uA
- ±2% Output Voltage Accuracy for 1.5V,1.8V, 2.5V 2.8V, 3V, 3.3V & 3.6V
- Needs Only 1µF Capacitor for Stability
- Thermal Shutdown Protection
- Current Limit Protection
- Low-ESR Ceramic Capacitor for Output Stability.
- Tiny SOT-23 and SOT-89 packages
- Halogen Free & RoHS Compliant product

APPLICATIONS

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

DESCRIPTION

The APE8800 series are low dropout, positive linear regulators with very low quiescent current. The APE8800 can supply 300mA output current with a low dropout voltage at about 250mV.
The APE8800 regulator is able to operate with output capacitors as small as 1µF for stability. Other than the current limit protection APE8800 also offers on chip thermal shutdown feature providing protection against overload or any condition when the ambient temperature exceeds the junction temperature.
The APE8800 series are offering three different fixed output voltage types including 1.5V, 1.8V, 2.5V 2.8V, 3V, 3.3 & 3.6 volt.
The APE8800 series are available in low-profile, space-saving 3-lead SOT-23 and SOT-89 packages.

TYPICAL APPLICATION CIRCUIT

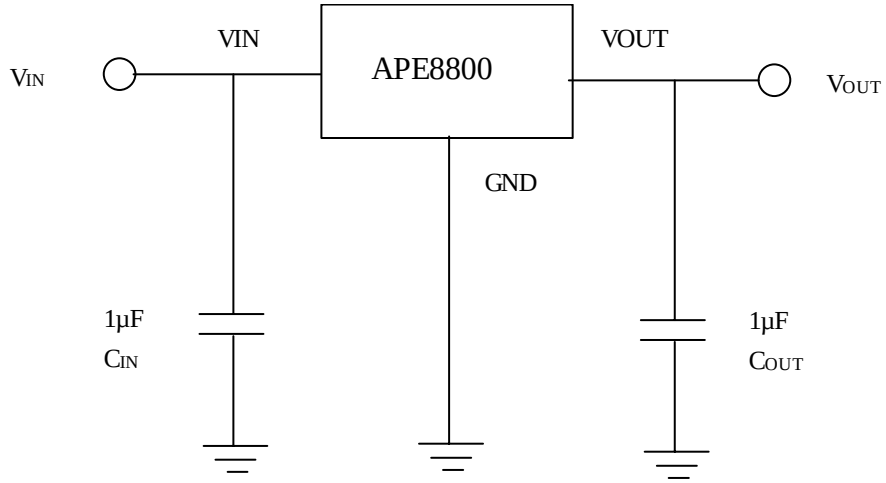


Figure 1. Typical Application Circuit of APE8800

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

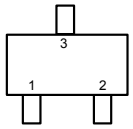
APE8800□-□ -HF ← Halogen Free

Output Voltage
15: 1.5V 18: 1.8V
25: 2.5V 28: 2.8V
30: 3.0V 33: 3.3V
36: 3.6V

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

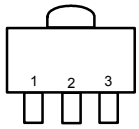
PIN ASSIGNMENTS

SOT-23(N)



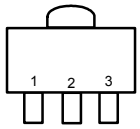
TOP VIEW
1. GND
2. VOUT
3. VIN

SOT-89(G)



TOP VIEW
1. GND
2. VIN
3. VOUT

SOT-89(GR)



TOP VIEW
1. VOUT
2. GND
3. VIN

Figure 2. Pin Assignment of APE8800

Note：The devices are available in fixed voltages 1.5V, 1.8V, 2.5V, 2.8V, 3V, 3.3V & 3.6V

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
Package Thermal Resistance SOT-23	θ_{JA}		250	°C/W
Package Thermal Resistance SOT-89	θ_{JA}		175	°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
Ambient Temperature Range	T_A	-40	125	°C

ELECTRICAL CHARACTERISTICS

(V_{IN}=V_{OUT}+1V or V_{IN}=2.8V whichever is greater, C_{IN}=1μF, C_{OUT}=1μF, 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}=1Ω	300			mA
Quiescent Current	I_Q	I_O= 0mA		30	50	μA
Dropout Voltage (Note 1)	V_{DROP}	I_O=300mA, 1.2V ≤ V_{OUT} ≤ 2.0V		1100		mV
		I_O=300mA, 2.0V < V_{OUT} ≤ 2.8V		350		
		I_O=300mA, 2.8V < V_{OUT} ≤ 4.5V		250		
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 300mA		6	20	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 pulse current and load regulation in the load range from 0mA to 300mA.

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 APE8800 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

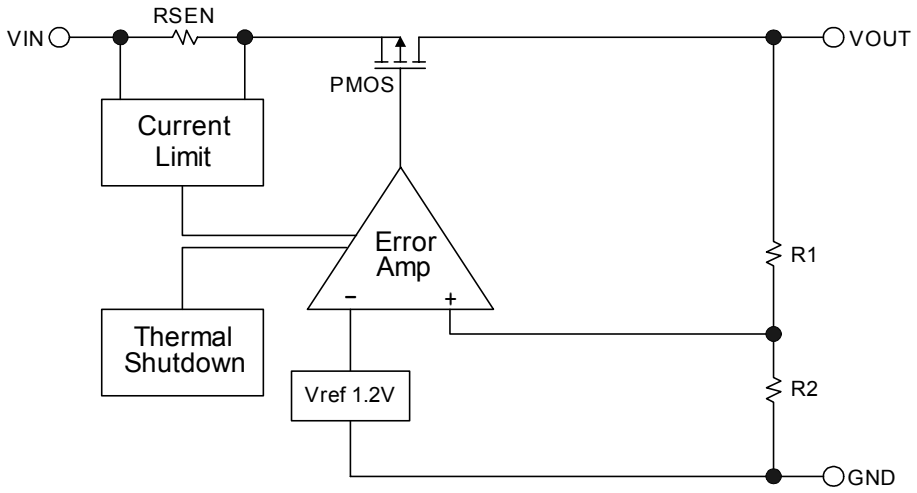


Figure 3. Block Diagram of APE8800

APPLICATION INFORMATION

The APE8800 series are low dropout linear regulators that could provide 300mA output current at dropout voltage about 300mV. 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 APE8800 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 tantalum) 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 between device outputs to ground for transient stability. The APE8800 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 because 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 condition from damaging the device, APE8800 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 temperature (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 CURVE

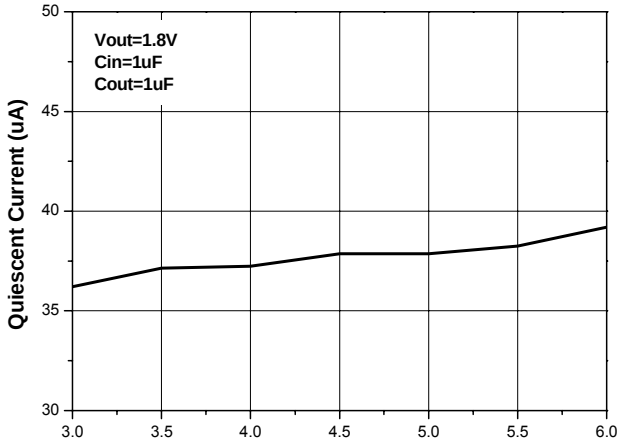


Figure 4. Quiescent Current vs. Input Voltage

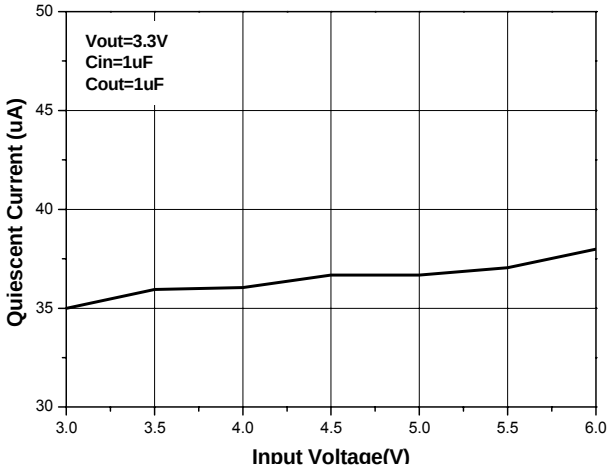


Figure 5. Quiescent Current vs. Input Voltage

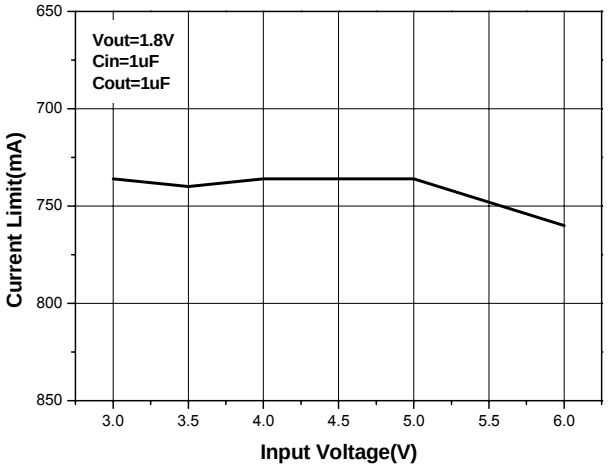


Figure 6. Current limit vs. Input Voltage

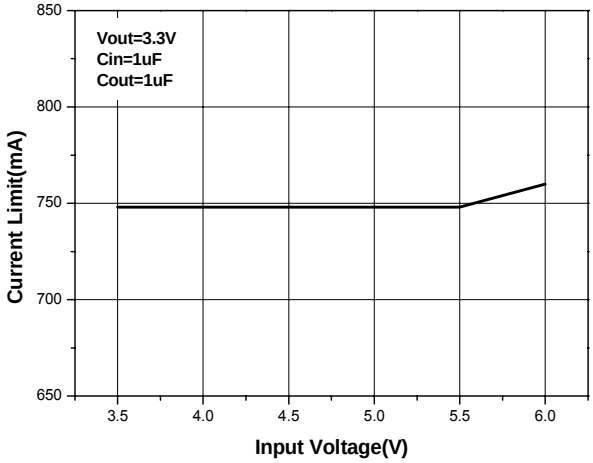


Figure 7. Current Limit vs. Input Voltage

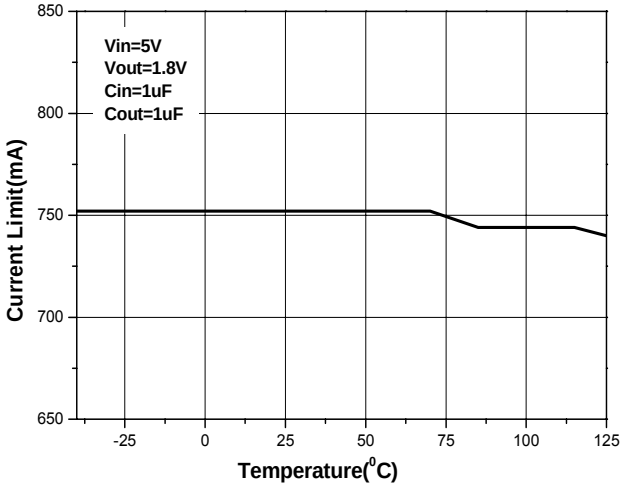


Figure 8. Current limit vs. Temperature

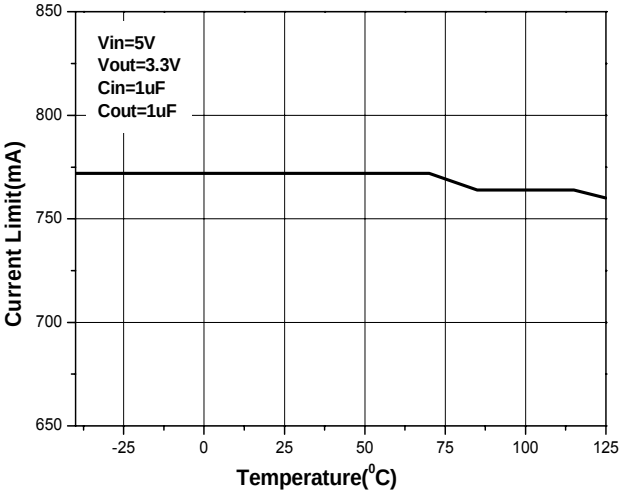


Figure 9. Current limit vs. Temperature

TYPICAL PERFORMANCE CURVE (Continued)

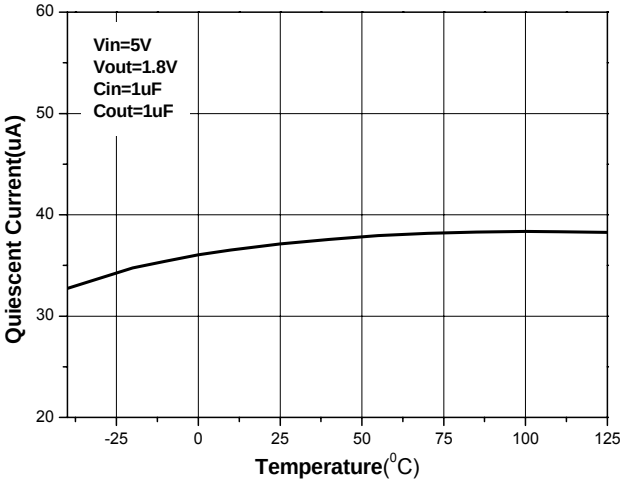


Figure 10. Quiescent Current vs. Temperature

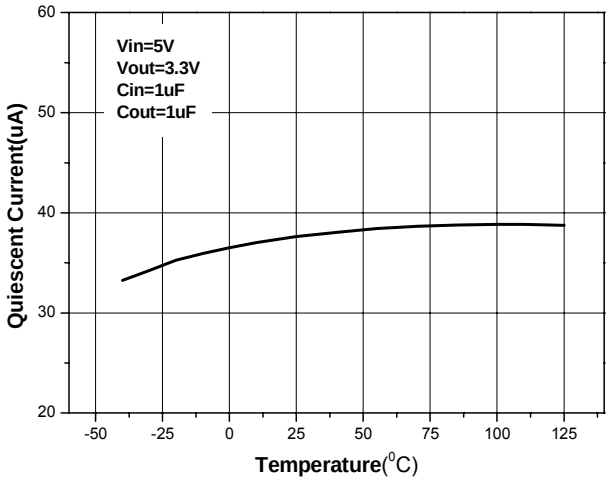


Figure 11. Quiescent Current vs. Temperature

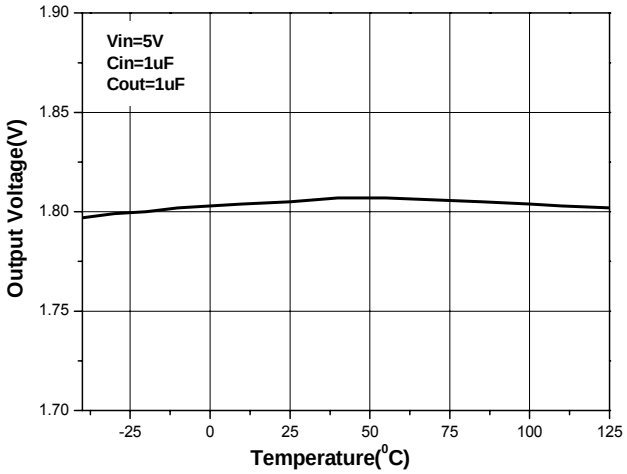


Figure 12. Temperature Stability

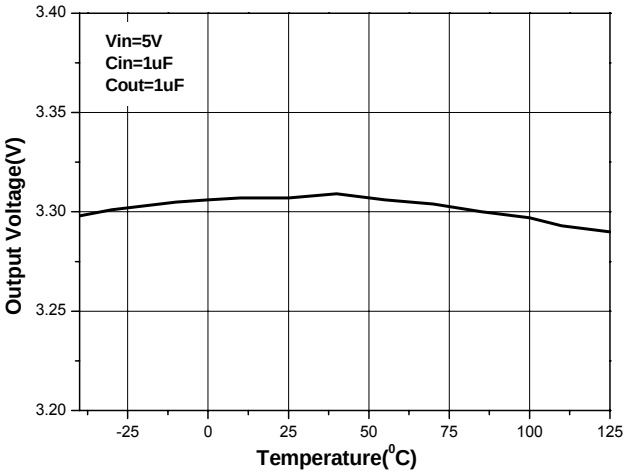


Figure 13. Temperature Stability

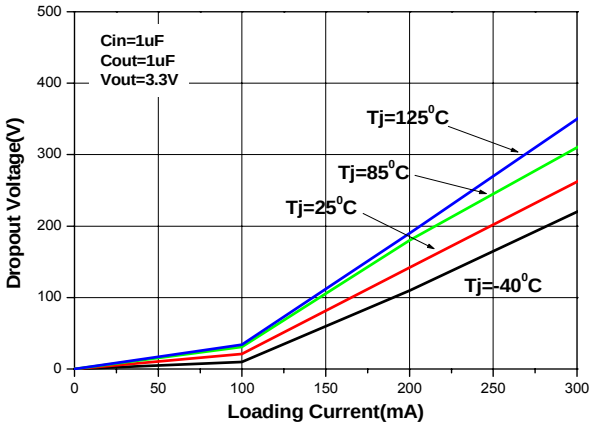


Figure 14. Dropout Voltage vs. Loading Current

TYPICAL PERFORMANCE CURVE (Continued)

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

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

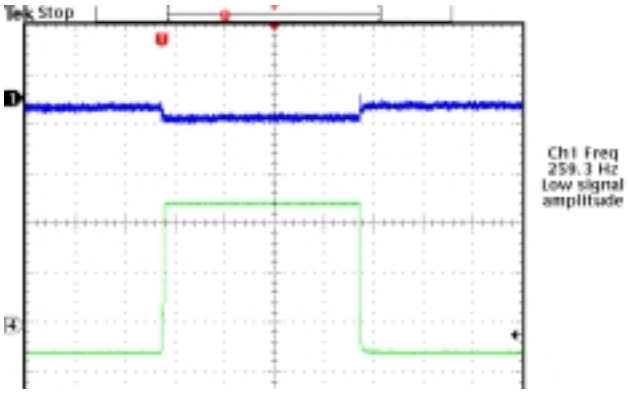


Figure 15. Load Transition Response

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

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

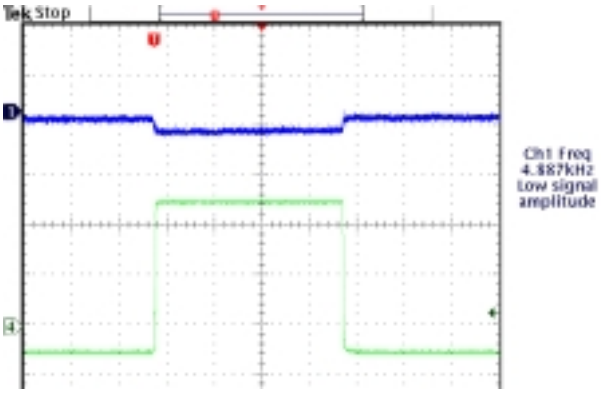


Figure 16. Load Transition Response

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

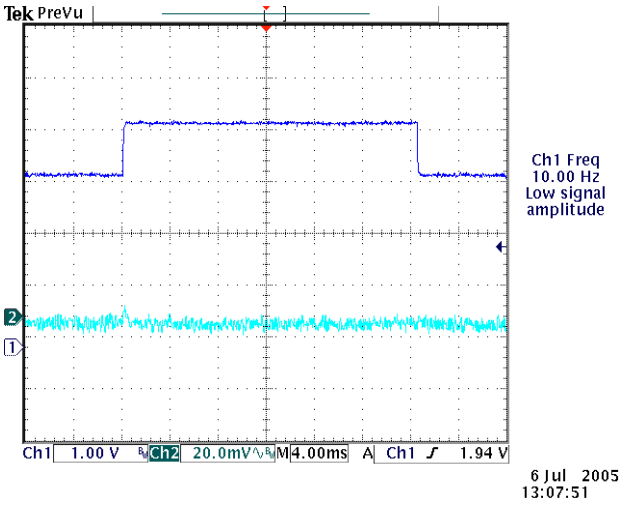


Figure 17. Line Transition Response

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

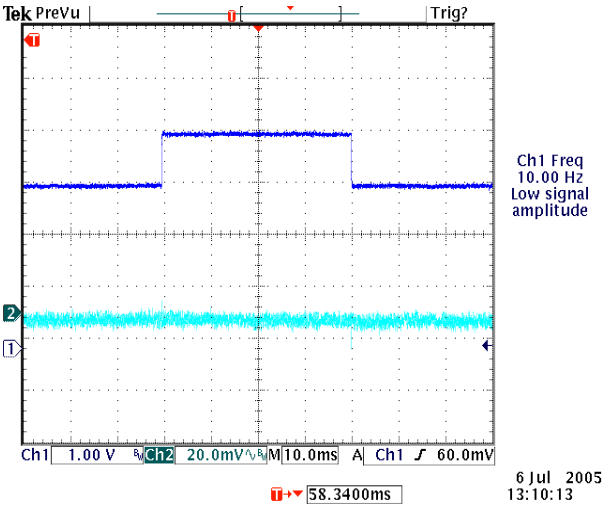
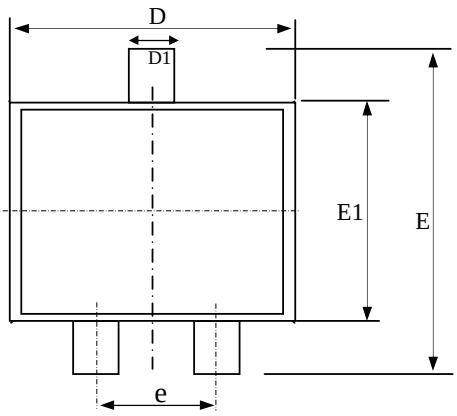
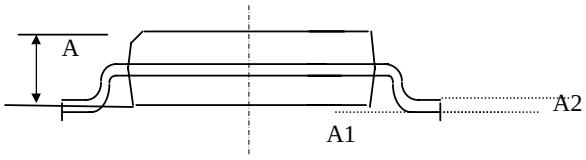


Figure 18. Line Transition Response

Package Outline : SOT-23



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	1.00	1.15	1.30
A1	0.00	--	0.10
A2	0.10	0.15	0.25
D1	0.30	0.40	0.50
e	1.70	2.00	2.30
D	2.70	2.90	3.10
E	2.40	2.65	3.00
E1	1.40	1.50	1.60

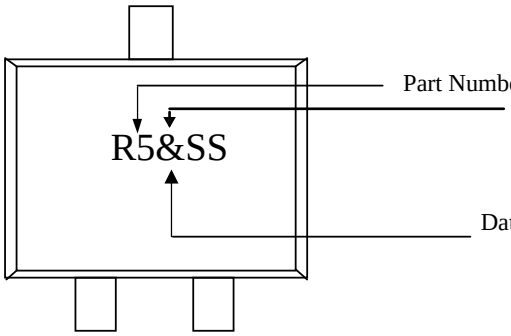


1.All Dimension Are In Millimeters.

2.Dimension Does Not Include Mold Protrusions.

Part Marking Information & Packing : SOT-23

Laser Marking



Part Number : R5

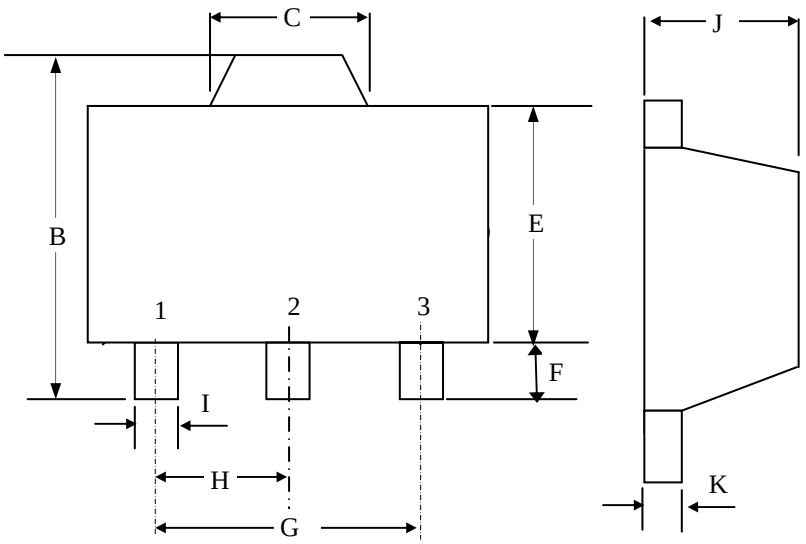
VOUT : A : 1.5V D : 2.8V
B : 1.8V E : 3.0V
C : 2.5V F : 3.3V
H : 3.6V

Date Code :

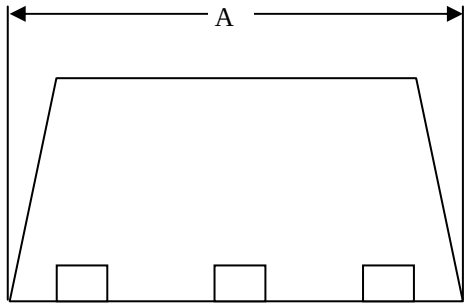
SS:2004,2008,2012…
SS:2003,2007,2011…
SS:2002,2006,2010…
SS:2001,2005,2009…

"A~Z" showed on 3rd position --> week 1 ~ week 26,
"A~Z" showed on 4th position --> week 27 ~ week 52.

Package Outline & Packing : SOT-89



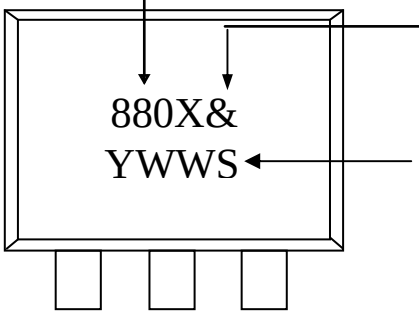
	Millimeters		
SYMBOLS	MIN	NOM	MAX
A	4.40	-	4.60
B	4.05	-	4.25
C	1.40	-	1.75
E	2.40	-	2.60
F	0.89	-	1.20
I	0.35	-	0.55
H	----	1.50	----
G	----	3.00	----
J	1.40	-	1.60
K	0.35	-	0.43



1.All Dimensions Are in Millimeters.

2.Dimension Does Not Include Mold Protrusions.

Part Marking Information : SOT-89



Part Number
8800 : APE8800G
880R : APE8800GR

VOUT : A : 1.5V D : 2.8V H : 3.6V
B : 1.8V E : 3.0V
C : 2.5V F : 3.3V

Date Code (YWWS)
Y:Year
WW：Week
S：Sequence
If second letter has underline : HF & Rohs product
If second letter has not underline : Rohs product