Low Dropout Regulator

EC1086

General Description

The EC1086 is a series of low dropout positive voltage regulators with a maximum dropout of 1.5V at 1.5A of load current.

The EC1086 is available in 1.5V, 1.8V, 2.5V, 3V, 3.3V, and 5.0V versions. The fixed versions integrate the adjust resistors. It is also available in an adjustable version, which can set the output voltage with only two external resistors.

The series features on-chip thermal shutdown. It also includes a bandgap reference and a current limiting circuit.

The EC1086 series is available in standard packages of TO-263-3L, TO-220, SOT-223 and TO-252.

Features

Available in 1.5V, 1.8V, 2.5V, 3V, 3.3V, 5.0V and adjustable versions
Low dropout voltage: typical 1.3V at 1.5A
Current limiting and thermal protection
Low dropout voltage
Output current: 1.5A
Current limit: 2.3A
Operating junction temperature range: 0 ~ 125^{o}C
Line regulation: 0.015% (typ.)
Load regulation: 0.1% (typ.)

Applications

High efficiency linear regulators
Battery charger
Post regulation for switching supply
Microprocessor supply
Motherboard power supply
Cable and ADSL modem
DVD-Video player
Telecom equipment
Set top boxes and web boxes modules' supply

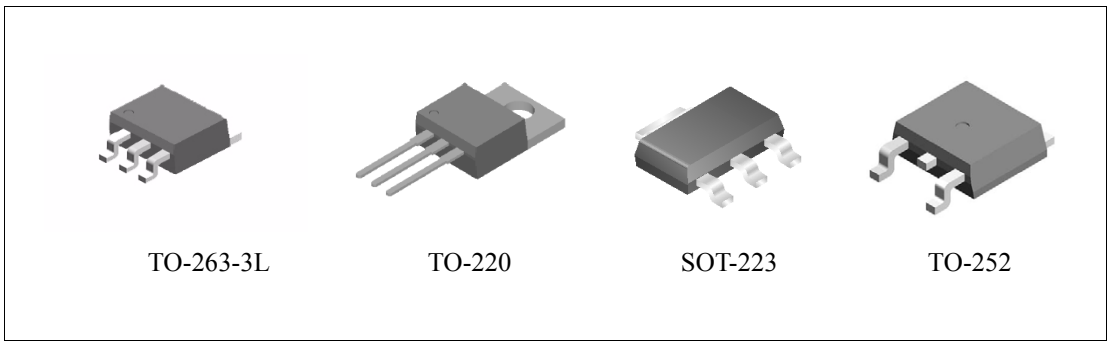
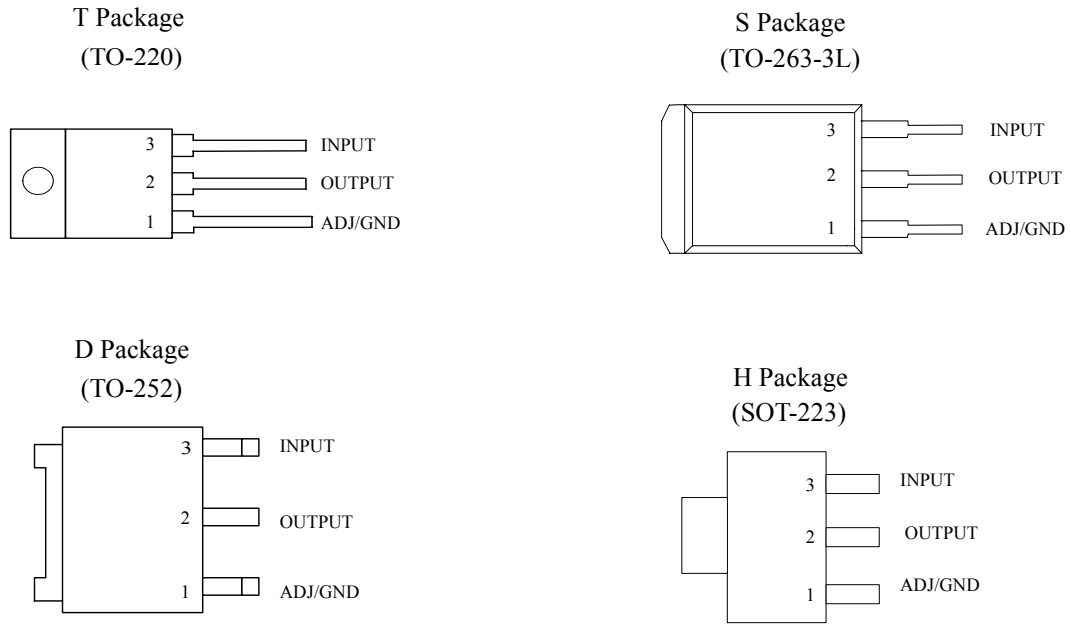


Figure 1. Package Types of EC1086

Pin Configuration



Top View

Figure 2. Pin Configuration of EC1086

Functional Block Diagram

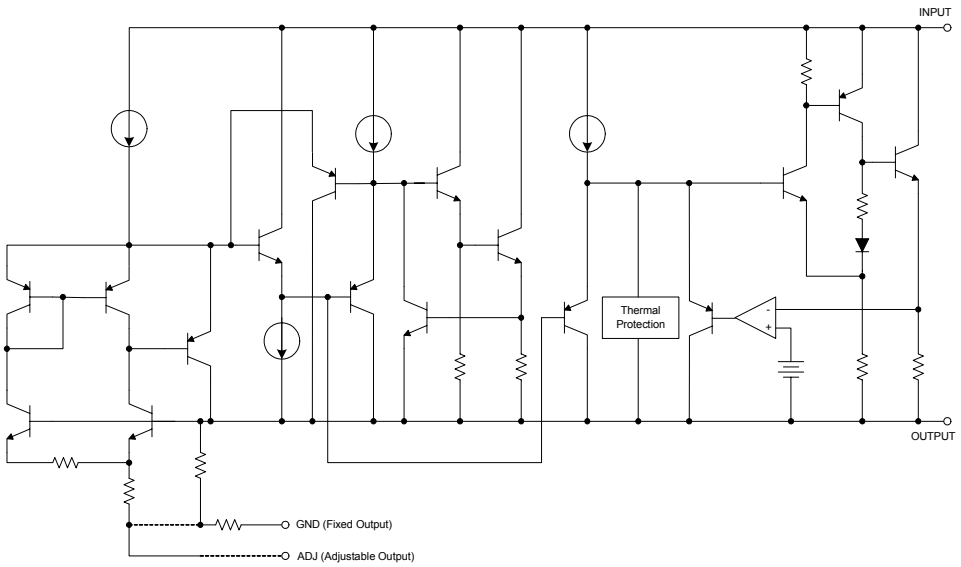


Figure 3. Functional Block Diagram of EC1086

Ordering Information

Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-223	0°C ~ 125°C	EC1086H-ADJ	H86A	Tape/Reel
		EC1086H-1.5	H86B	
		EC1086H-1.8	H86E	
		EC1086H-2.5	H86C	
		EC1086H-3.0	H86G	
		EC1086H-3.3	H86D	
		EC1086H-5.0	H86F	
TO-220	0°C ~ 125°C	EC1086T-ADJ	EC1086T-ADJ	Tube
		EC1086T-1.5	EC1086T-1.5	
		EC1086T-1.8	EC1086T-1.8	
		EC1086T-2.5	EC1086T-2.5	
		EC1086T-3.0	EC1086T-3.0	
		EC1086T-3.3	EC1086T-3.3	
		EC1086T-5.0	EC1086T-5.0	
TO-263-3L	0°C ~ 125°C	EC1086S-ADJ	EC1086S-ADJ	Tube/ Tape/Reel
		EC1086S-1.5	EC1086S-1.5	
		EC1086S-1.8	EC1086S-1.8	
		EC1086S-2.5	EC1086S-2.5	
		EC1086S-3.0	EC1086S-3.0	
		EC1086S-3.3	EC1086S-3.3	
		EC1086S-5.0	EC1086S-5.0	
TO-252	0°C ~ 125°C	EC1086D-ADJ	EC1086D-ADJ	Tube/ Tape/Reel
		EC1086D-1.5	EC1086D-1.5	
		EC1086D-1.8	EC1086D-1.8	
		EC1086D-2.5	EC1086D-2.5	
		EC1086D-3.0	EC1086D-3.0	
		EC1086D-3.3	EC1086D-3.3	
		EC1086D-5.0	EC1086D-5.0	

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Min	Max	Unit
Operating Junction Temperature Range	T_J		150	°C
Storage Temperature Range	T_S	-65	150	°C
Lead Temperature (Soldering, 10 sec.)	T_{LEAD}		300	°C
ESD (Human Body Mode)	ESD		2000	V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under"Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}		15	V
Operating Junction Temperature Range	T_J	0	125	°C

Electrical Characteristics

Typicals and limits appearing in normal type apply for $T_J = 25^oC$. Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, 0^oC to 125^oC. ($P_D \le$ maximum power dissipation , see Note 2.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reference Voltage	V_{REF}	EC1086-ADJ, I_{OUT} = 10mA, V_{IN} -V_{OUT} = 2V, $T_J = 25^oC$, 10mA ≤ I_{OUT} ≤ 1.5A, 1.4V ≤ V_{IN} - V_{OUT} ≤ 6V	1.238 **1.225**	1.250 **1.250**	1.262 **1.270**	V
Output Voltage	V_{OUT}	EC1086-1.5, I_{OUT} =10mA, V_{IN} = 3.5V, $T_J = 25^oC$, 10mA ≤ I_{OUT} ≤ 1.5A, 3V ≤ V_{IN} ≤ 10V	1.485 **1.47**	1.5 **1.5**	1.515 **1.53**	V
		EC1086-1.8, I_{OUT} = 10mA, V_{IN} = 3.8V, $T_J = 25^oC$, 10mA ≤ I_{OUT} ≤ 1. 5A, 3.2V ≤ V_{IN} ≤ 10V	1.782 **1.746**	1.8 **1.8**	1.818 **1.854**	V
		EC1086-2.5, I_{OUT} = 10mA, V_{IN} = 4.5V, $T_J = 25^oC$, 10mA ≤ I_{OUT} ≤ 1.5A, 3.9V ≤ V_{IN} ≤ 10V	2.475 **2.45**	2.5 **2.5**	2.525 **2.55**	V
		EC1086-3.0, I_{OUT} = 10mA, V_{IN} = 4.5V, $T_J = 25^oC$, 10mA ≤ I_{OUT} ≤ 1.5A, 4.9V ≤ V_{IN} ≤ 10V	2.97 **2.94**	3.0 **3.0**	3.03 **3.06**	V
		EC1086-3.3, I_{OUT} = 10mA, V_{IN} = 5V, $T_J = 25^oC$, 10mA ≤ I_{OUT} ≤ 1.5A, 4.75V ≤ V_{IN} ≤ 10V	3.267 **3.235**	3.3 **3.3**	3.333 **3.365**	V
		EC1086-5.0, I_{OUT} = 10mA, V_{IN} = 7V, $T_J = 25^oC$, 10mA ≤ I_{OUT} ≤ 1.5A, 6.5V ≤ V_{IN} ≤ 10V	4.95 **4.9**	5 **5**	5.05 **5.1**	V
Line Regulation	ΔV_{OUT}	EC1086-ADJ, I_{OUT} = 10mA, 1.5V ≤ V_{IN} ≤ 10V		0.015 **0.035**	0.2 **0.2**	%
		EC1086-1.5, I_{OUT} = 10mA, 1.5V ≤ V_{IN} - V_{OUT} ≤ 10V		0.3 **0.6**	6 **6**	mV
		EC1086-1.8, I_{OUT} = 10mA, 1.5V ≤ V_{IN} - V_{OUT} ≤ 10V		0.3 **0.6**	6 **6**	mV
		EC1086-2.5, I_{OUT} = 10mA, 1.5V ≤ V_{IN} - V_{OUT} ≤ 10V		0.3 **0.6**	6 **6**	mV
		EC1086-3.0, I_{OUT} = 10mA, 1.5V ≤ V_{IN} - V_{OUT} ≤ 10V		0.3 **0.6**	6 **6**	mV
		EC1086-3.3, I_{OUT} = 10mA, 1.5V ≤ V_{IN} - V_{OUT} ≤ 10V		0.5 **1**	10 **10**	mV
		EC1086-5.0, I_{OUT} = 10mA, 1.5V ≤ V_{IN} - V_{OUT} ≤ 10V		0.5 **1**	10 **10**	mV

Electrical Characteristics (Continued)

Typicals and limits appearing in normal type apply for $T_J = 25^oC$. Limits appearing in Boldface type apply over the entire junction temperature range for operation, 0^oC to 125^oC. ($P_D \leq$ maximum power dissipation , see Note 2.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Load Regulation	ΔV_{OUT}	EC1086-ADJ, 10mA ≤ I_{OUT} ≤ 1.5A, V_{IN} - V_{OUT} = 2V		0.1 **0.2**	0.3 **0.4**	%
		EC1086-1.5, 10mA ≤ I_{OUT} ≤ 1.5A, V_{IN} - V_{OUT} = 2V		3 **6**	12 **20**	mV
		EC1086-1.8, 10mA ≤ I_{OUT} ≤ 1.5A, V_{IN} - V_{OUT} = 2V		3 **6**	12 **20**	mV
		EC1086-2.5, 10mA ≤ I_{OUT} ≤ 1.5A, V_{IN} - V_{OUT} = 2V		3 **6**	12 **20**	mV
		EC1086-3.3, 10mA ≤ I_{OUT} ≤ 1.5A, V_{IN} - V_{OUT} = 2V		3 **7**	15 **20**	mV
		EC1086-5.0, 10mA ≤ I_{OUT} ≤ 1.5A, V_{IN} - V_{OUT} = 2V		5 **10**	20 **35**	mV
Dropout Voltage		I_O = 1.5A, ΔV_{REF} = 1%		1.3	1.5	V
Current Limit	I_{LIMIT}	V_{IN} - V_{OUT} = 2V,	1.5	2.3		A
Minimum Load Current		1.4V ≤ V_{IN} - V_{OUT} ≤ 10V (For ADJ)		**2**	**5**	mA
Quiescent Current		V_{IN} = V_{OUT} + 1.3V		**5**	**10**	mA
Ripple Rejection		f_{RIPPLE} = 120Hz, C_{OUT} = 25µF Tantalum, I_{OUT} = 1.5A, V_{IN} - V_{OUT} = 3V	**60**	**75**		dB
Adjust Pin Current				60	**120**	µA
Adjust Pin Current Change		10mA ≤ I_{OUT} ≤ 1.5A, 1.4V ≤ V_{IN} -V_{OUT} ≤ 10V		**0.2**	**5**	µA
Temperature Stability				**0.5**		%
RMS Noise (% of V_{OUT})		T_A = 25°C, 10Hz ≤ f ≤ 10kHz		0.003		%
Thermal Shutdown		Junction Temperature		165		°C
Thermal Shutdown Hysteresis				30		°C
Thermal Resistance Junction-to-Case	Q_{JC}	SOT - 223 TO - 263 TO - 220		20 4 4		°C/W

Note 2: Maximum power dissipation see Figure 5

Typical Performance Characteristics

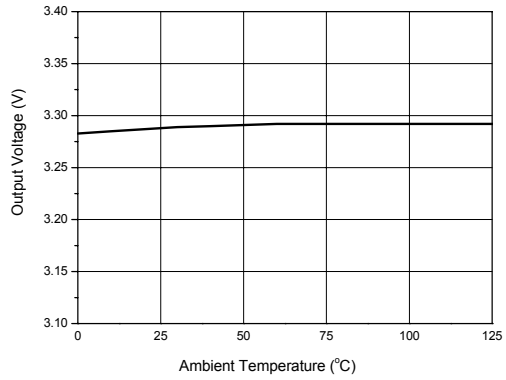


Figure 4. Output Voltage vs. Temperature

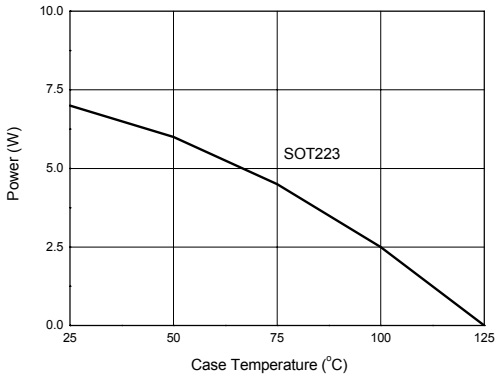


Figure 5. Maximum Power Dissipation

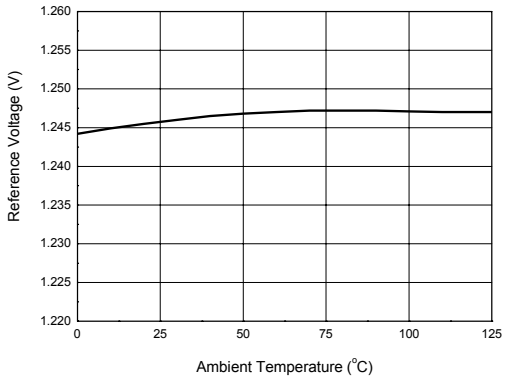


Figure 6. Reference voltage vs. Temperature

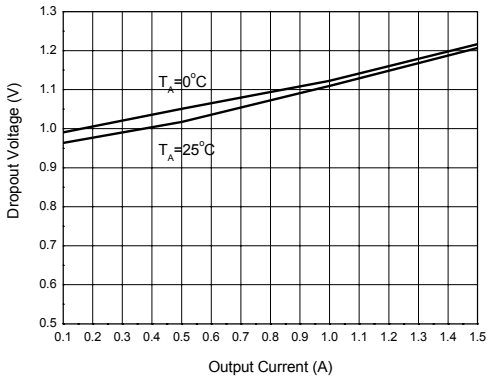


Figure 7. Dropout Voltage vs. Output Current

Typical Performance Characteristics (Continued)

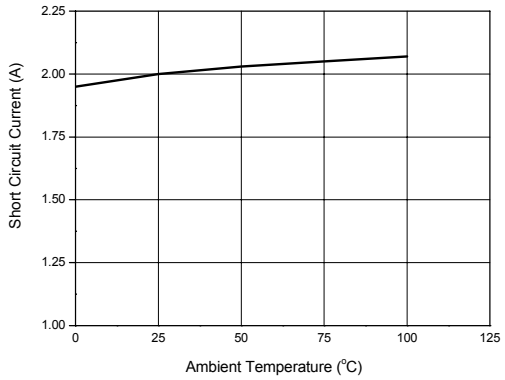


Figure 8. Short Circuit Current vs. Temperature

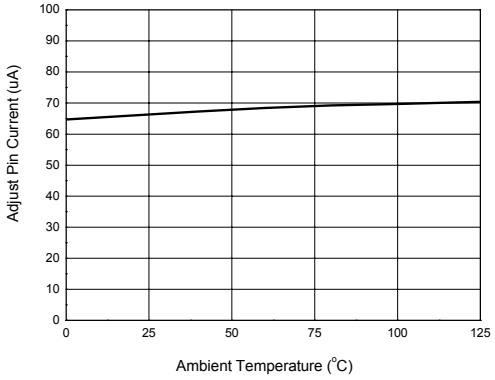


Figure 9. Adjust Pin Current vs. Temperature

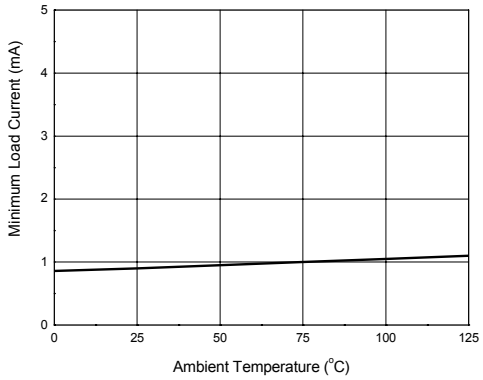


Figure 10. Minimum Load Current vs. Temperature

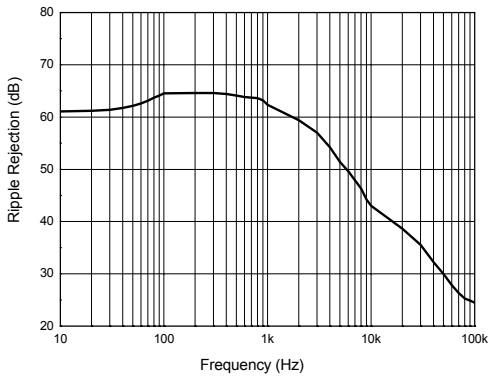


Figure 11. Ripple Rejection vs. Frequency

Typical Performance Characteristics (Continued)

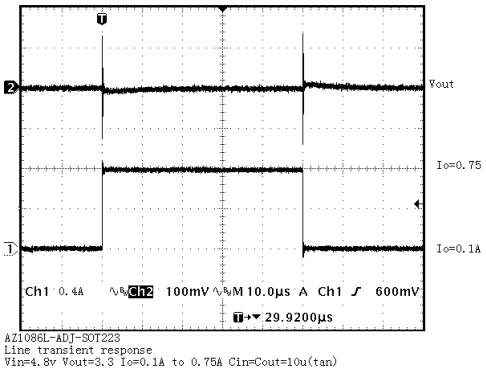


Figure 12. Load Transient Response

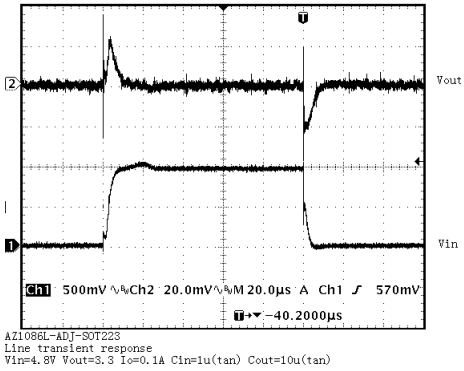


Figure 13. Line Transient Response

Typical Applications

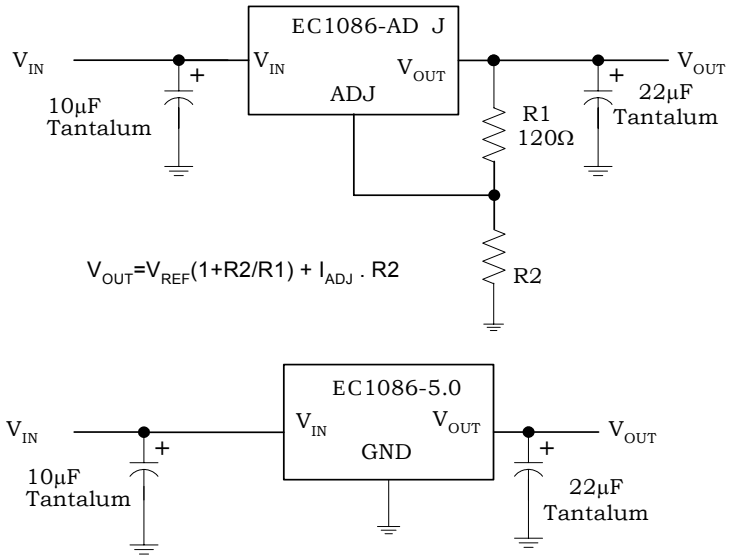
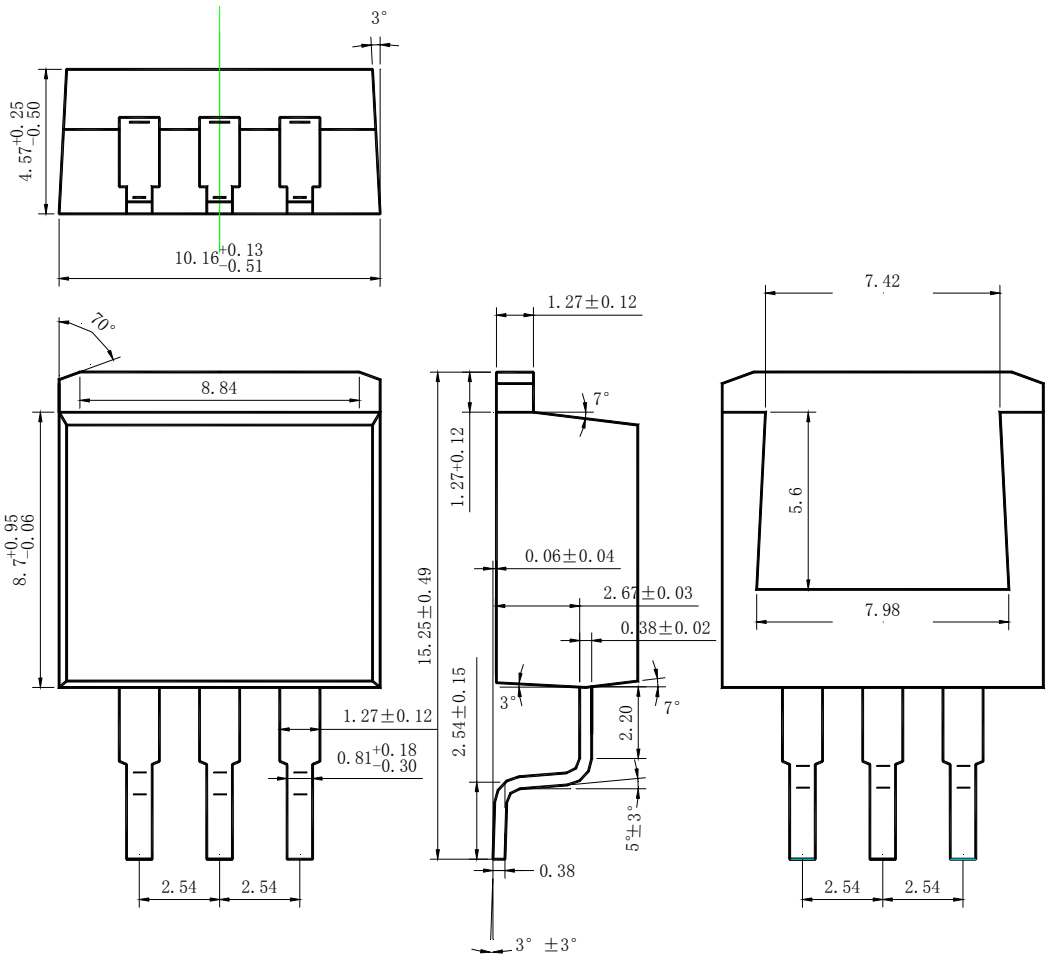


Figure 14. Typical Applications of EC1086

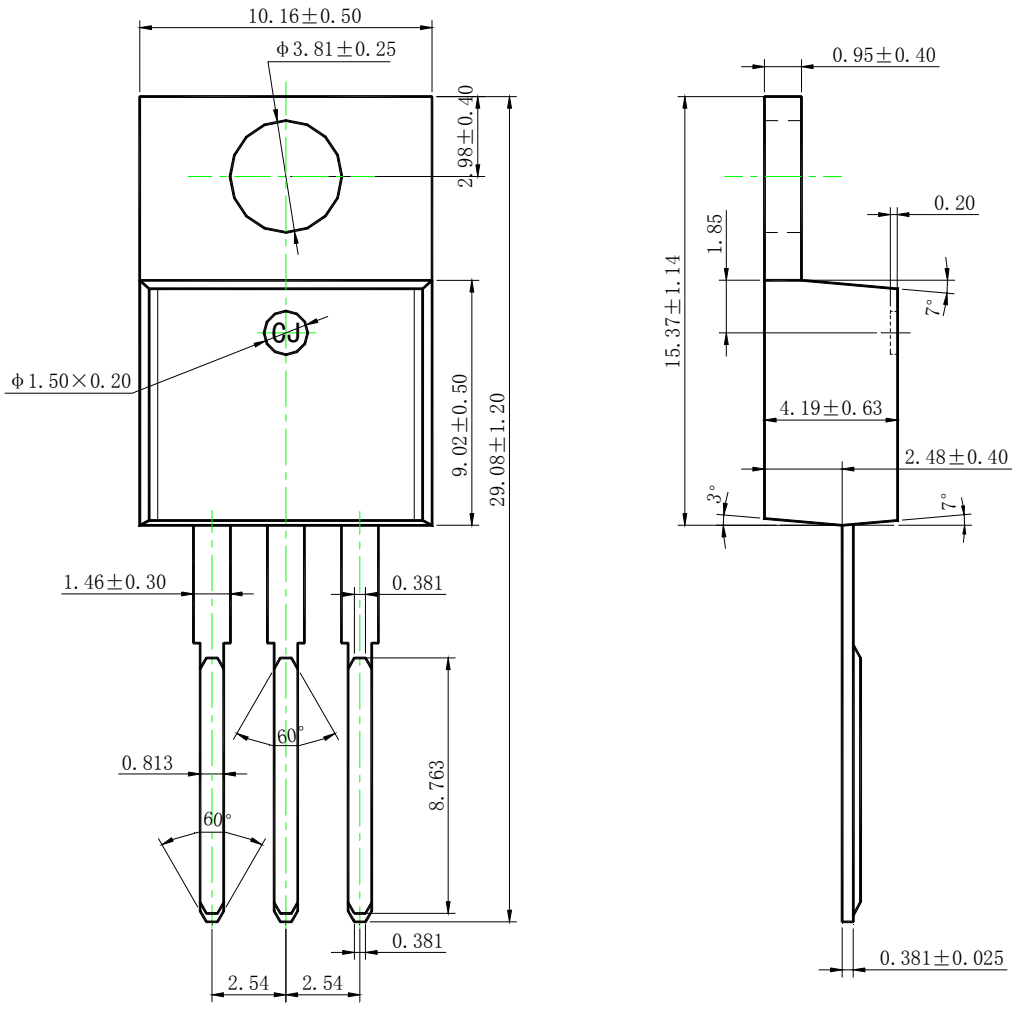
Mechanical Dimensions

TO-263-3L **Unit: mm**



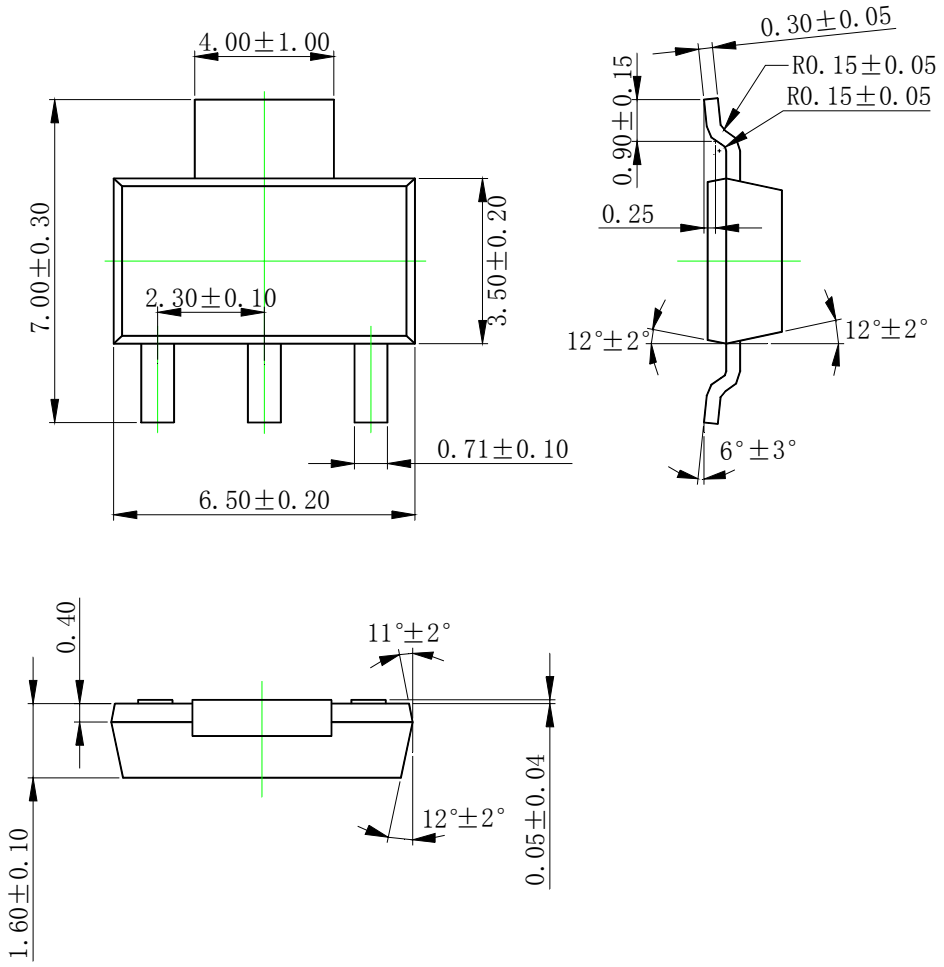
Mechanical Dimensions (Continued)

TO-220 **Unit: mm**



Mechanical Dimensions (Continued)

SOT-223 **Unit: mm**



Mechanical Dimensions (Continued)

TO-252 **Unit: mm**