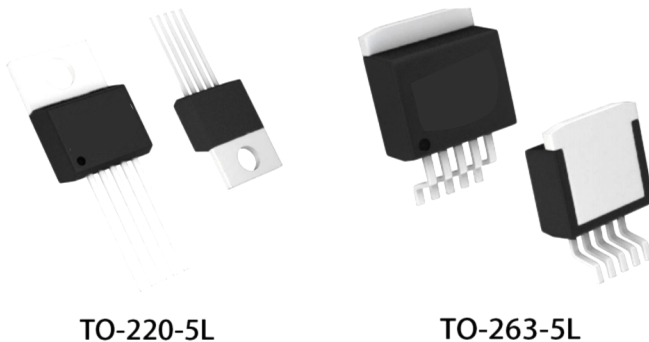


Descriptions

The MIC29302 is high current, high accuracy, low dropout voltage regulators. These regulators feature 370mV (full load 3A) typical dropout voltages and very low ground current (37mA TYP). Designed for high current loads, these devices also find applications in lower current, extremely low dropout-critical systems.

This device is fully protected against overcurrent faults, reversed input polarity, reversed lead insertion, overtemperature operation, and positive and negative transient voltage spikes. By setting the logic potential of the enabling end, the device can be controlled to work or flag state. In the flag state, the power consumption of the device is very low. The enabling end can also be directly connected with the power supply of the input end to make the device in working state.

It is available in TO-263-5 and TO-220-5 package.



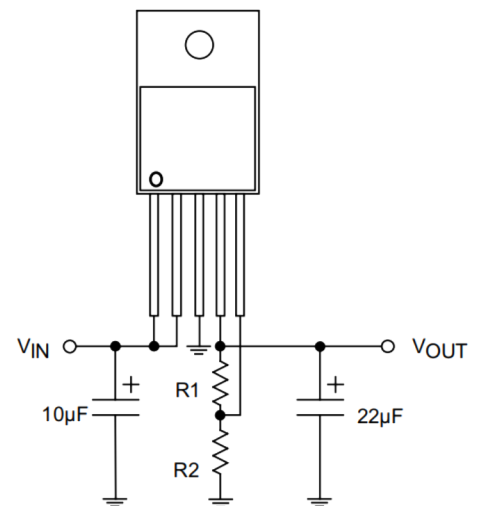
Feature

- High Current Capability
- Low Dropout Voltage
- Low Ground Current
- High Accuracy
- Extremely Fast Transient Response
- Reverse-Battery and “Load Dump” Protection
- Zero-Current Shutdown Mode

Applications

- Battery-Powered Equipment
- High-Efficiency Computer Systems
- High-Efficiency Linear Power Supplies
- High-Efficiency Post-Regulator for Switching Supply
- Automotive Electronics

Typical Application

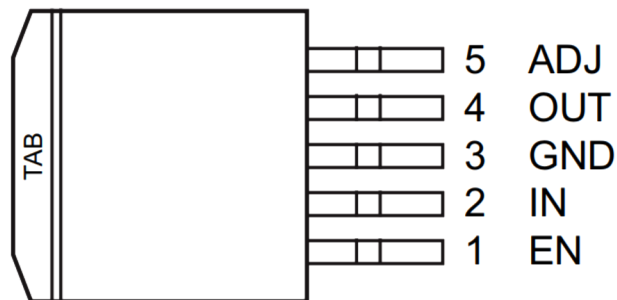


$$R1 = R2 \times \left(\frac{V_{OUT}}{1.240} - 1 \right)$$

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW MIC29302N	TO-220-5L	MIC29302N	Tube	1000pcs/Box
XBLW MIC29302DTR	TO-263-5L	MIC29302	Tape	750pcs/Reel

Pins Configuration



(TOP VIEW)

Pin Function

No.	Name	Description
1	EN	Enabling end, compatible with CMOS logic level. When EN=H, the device works; When EN=L, the device flags.
2	IN	Input voltage
3	GND	Ground
4	OUT	Output
5	ADJ	Adjust the feedback terminal, connected to the output terminal and the ground terminal resistance voltage divider network, to set the output voltage value

Absolute Maximum Ratings Note 1

- Input Supply Voltage (V_{IN}) (Note 1). : -20V~+60V
- Enable Input Voltage (V_{EN}) : -0.3V~ V_{IN}
- Welding Temperature (5S): 260°C
- Power Dissipation: Internally Limited
- Storage Temperature: -65°C~ 150°C
- ESD Rating: See Note 2

Operation Extreme Ratings Note 2

- Operation Junction Temperature: -40°C~ 125°C
- Maximum Operating Input Voltage: 26V
- Thermal Resistor: 2°C/W

Electrical Characteristics Note 4

$V_{IN} = V_{OUT} + 1V$, $T_J = 25^\circ C$, Values in bold indicate $-40^\circ C \leq T_J \leq +125^\circ C$, unless otherwise specified.

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Total Device					
Output Voltage	$I_{OUT} = 10mA$	-1		1	%
	$10mA \leq I_{OUT} \leq I_{FL}$, $(V_{OUT} + 1V) \leq V_{IN} \leq 26V$	-2		2	
Line Regulation	$I_{OUT} = 10mA$, $(V_{OUT} + 1V) \leq V_{IN} \leq 26V$		0.06	0.5	%
Load Regulation	$V_{IN} = V_{OUT} + 1V$, $10mA \leq I_{OUT} \leq 1.5A$		0.2	1	%
Output Voltage Temperature Coefficient	Note 5		20	100	ppm/°C
Dropout Voltage	$\Delta V_{OUT} = -1\%$ Note 6	$I_{OUT} = 100mA$	80	175	mV
		$I_{OUT} = 1.5A$	250		mV
		$I_{OUT} = 3A$	370	600	mV
Ground Current	$V_{IN} = V_{OUT} + 1V$, $I_{OUT} = 1.5A$		10	35	mA
	$V_{IN} = V_{OUT} + 1V$, $I_{OUT} = 3A$		37		mA
Output Current Limit	$V_{OUT} = 0V$	Note 7	4.5	5	A
Output Noise Voltage	$I_{OUT} = 100mA$, $C_L = 10\mu F$		400		$\mu V(rms)$
	$I_{OUT} = 100mA$, $C_L = 33\mu F$		260		$\mu V(rms)$
Reference					
Reference Voltage		1.228 1.215	1.240	1.252 1.265	V
Adjust Pin Bias Current			40	80 120	nA
Reference Voltage Temperature Coefficient			20		ppm/°C
Adjust Pin Bias Current Temperature Coefficient			0.1		nA/°C
ENABLE Input -					
Input Logic Voltage Low (OFF)				0.8	
Input Logic Voltage High (ON)		2.4			
Enable Pin Input Current	$V_{EN} = 26V$		100	600 750	μA
	$V_{EN} = 0.8V$	0.7		2 4	μA
Regulator Output Current in Shutdown	Note 8		10	500	μA

Note 1: Maximum positive supply voltage of 60V must be of limited duration (<100 ms) and duty cycle ($\leq 1\%$). The maximum continuous supply voltage is 26V. Exceeding the absolute maximum rating may damage the device.

Note 2: Devices are ESD sensitive. Handling precautions recommended.

Note 3: The device is not guaranteed to function outside its operating ratings.

Note 4 : Specification for packaged product only.: When used in dual supply systems where the regulator load is returned to a negative supply, the output voltage must be diode clamped to ground.

Note 5 : Output voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range.

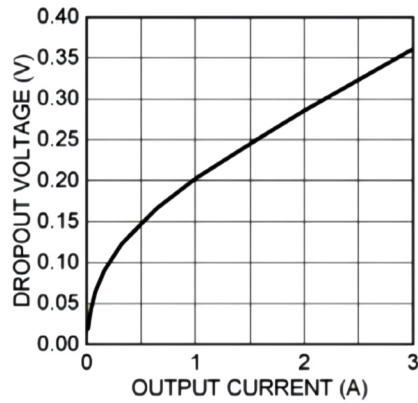
Note 6: Dropout voltage is defined as the input-to-output differential when the output voltage drops to 99% of its normal value with $V_{OUT} + 1V$ applied to V_{IN} .

Note 7 : $V_{IN} = V_{OUT} + 1V$, Employ pulse-testing procedures to pin current.

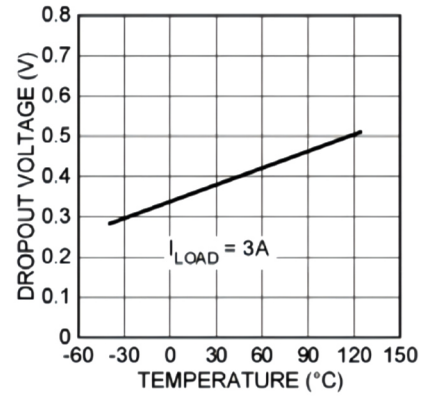
Note 8 : $V_{EN} \leq 0.8V$, and $V_{IN} \leq 26V$, $V_{OUT} = 0V$

Typical Performance

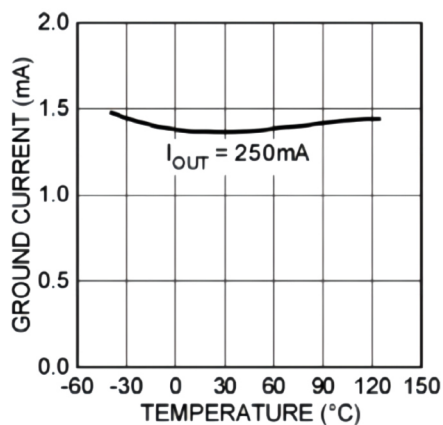
Dropout Voltage vs. Output Current



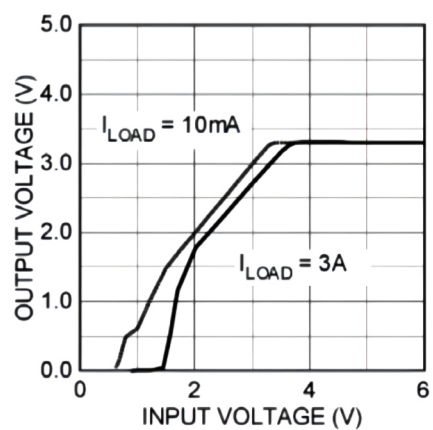
Dropout Voltage vs. Temperature.



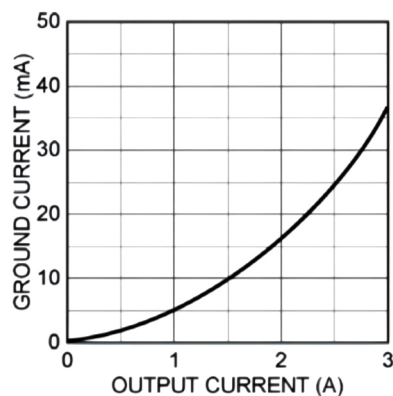
Ground Current vs. Temperature



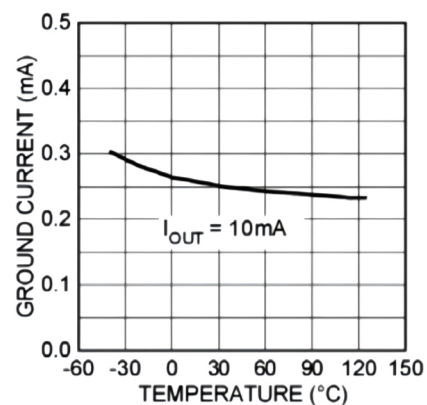
Dropout Characteristics



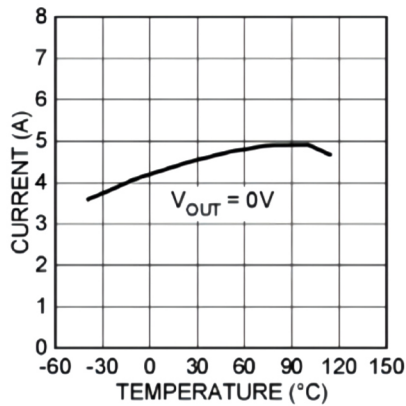
Ground Current vs. Output Current



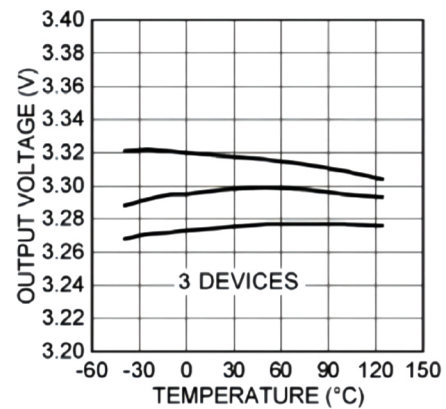
Ground Current vs. Temperature.



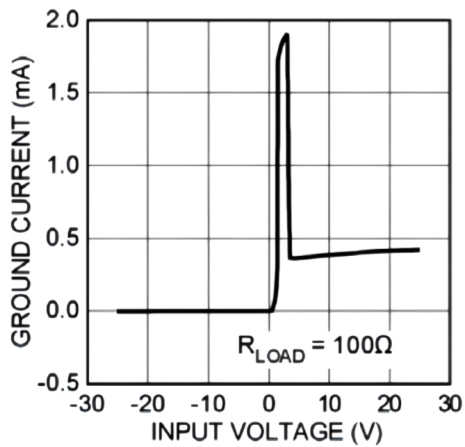
Short-Circuit Current vs. Temperature



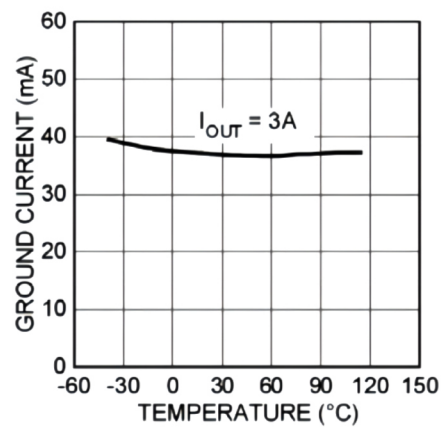
Output Voltage vs. Temperature



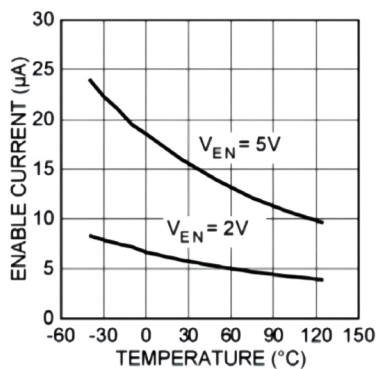
Ground Current vs. Input Voltage



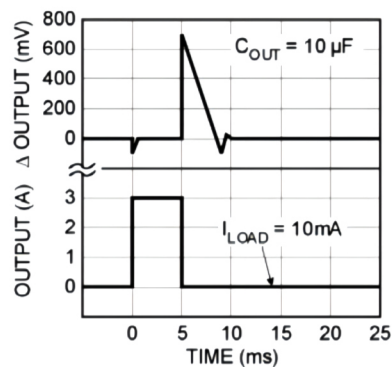
Ground Current vs. Temperature



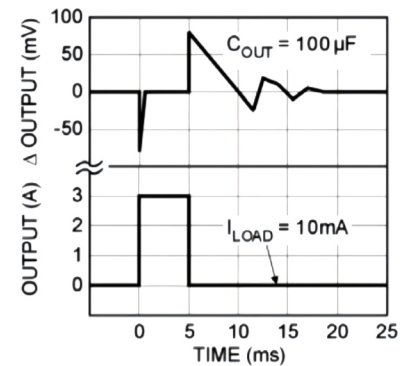
Output Voltage vs. Temperature



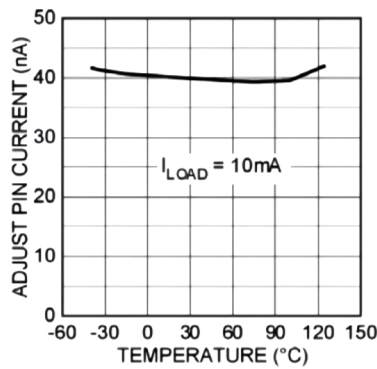
Enable Current vs. Temperature



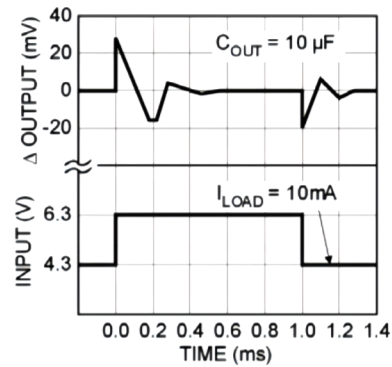
Load Transient



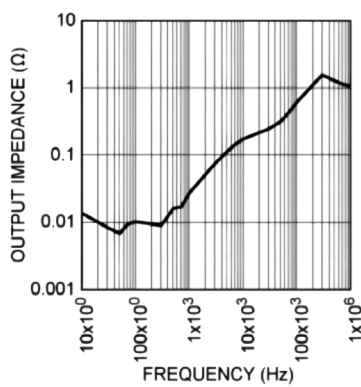
Adjust Pin Current vs. Temperature



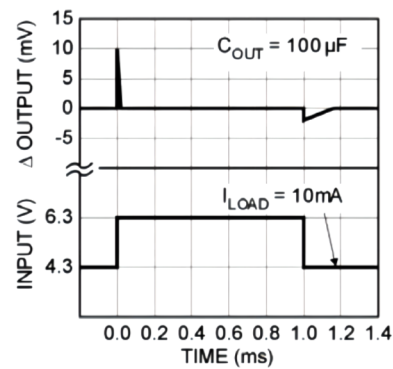
Line Transient



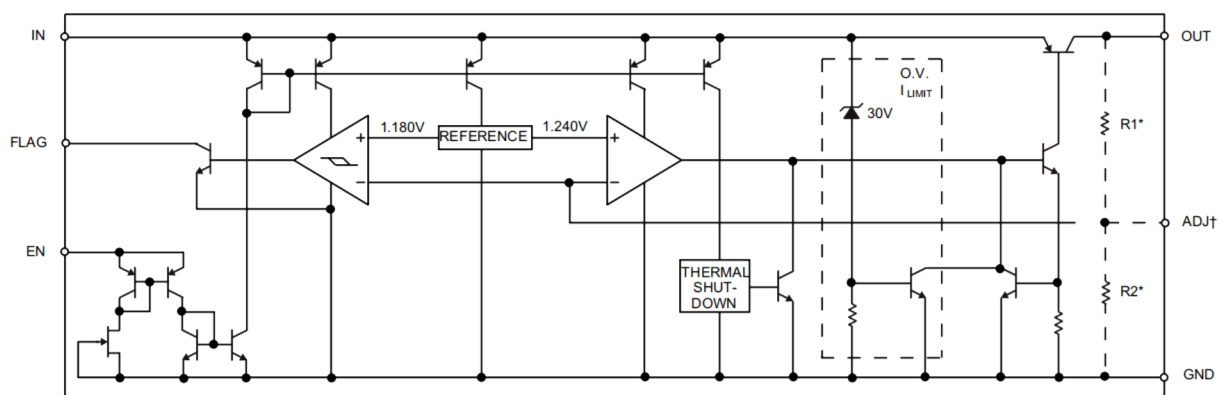
MOutput Impedance vs. Frequency



Line Transient



Schematic Diagram



Note: FLAG is the undervoltage terminal, which is not cited in the MIC29302; for the fixed-voltage version of the device, the ADJ is connected to the connecting pin of the partial resistor network R1, R2 within the device.

Application Information

Protection

Current limiting is provided in MIC29302. This limiting is linear; output current under overload conditions is constant. Thermal shutdown disables the device when the die temperature exceeds the +150° C maximum safe operating temperature. Line transient protection allows device and load survival even when the input voltage spikes between - 20V and +60V. When the input voltage exceeds approximately 32V, the overvoltage sensor disables the regulator. The output structure of these regulators allows voltages in excess of the desired output voltage to be applied without reverse current flow. MIC29xx1 and MIC29xx2 versions offer a logic-level ON/OFF control. When disabled, the devices draw nearly zero current.

Thermal Design Example

MIC 29302 is simple to use. The most complicated design parameters to consider are thermal characteristics. For example: when $T_A = 50^\circ \text{C}$, with $V_{IN} = 5\text{V}$, $V_{OUT} = 3.3\text{V}$, and $I_{OUT} = 1\text{A}$, $\theta_{JA} = 31.4^\circ \text{C/W}$, The ground current is about 0.01 of I_{OUT}

$$P_D = I_{OUT} \cdot (1.01 V_{IN} - V_{OUT}) = 1.75\text{W}$$

$$T_J = T_A + P_D \cdot \theta_{JA} = 50 + 1.75 \cdot 31.4 = 104.95^\circ \text{C}$$

It is less than the maximum junction temperature of 125°C, which can ensure the reliable operation of the device.

Capacitor Requirements

For stability and minimum output noise, a capacitor on the regulator output is necessary. The value of this capacitor is dependent upon the output current; lower currents allow smaller capacitors. In the full load range, the selection of 10uF aluminum electrolytic capacitor can meet the application, in the application field requiring fast transient response of the load, tantalum capacitor is recommended. A capacitance of 0.1uF is recommended for filtering between the input and the ground.

Minimum Load Current

If the load current is too small, the leakage current effect will increase the output voltage. Therefore, a minimum load current of 7mA is required to ensure the normal operation of MIC29302.

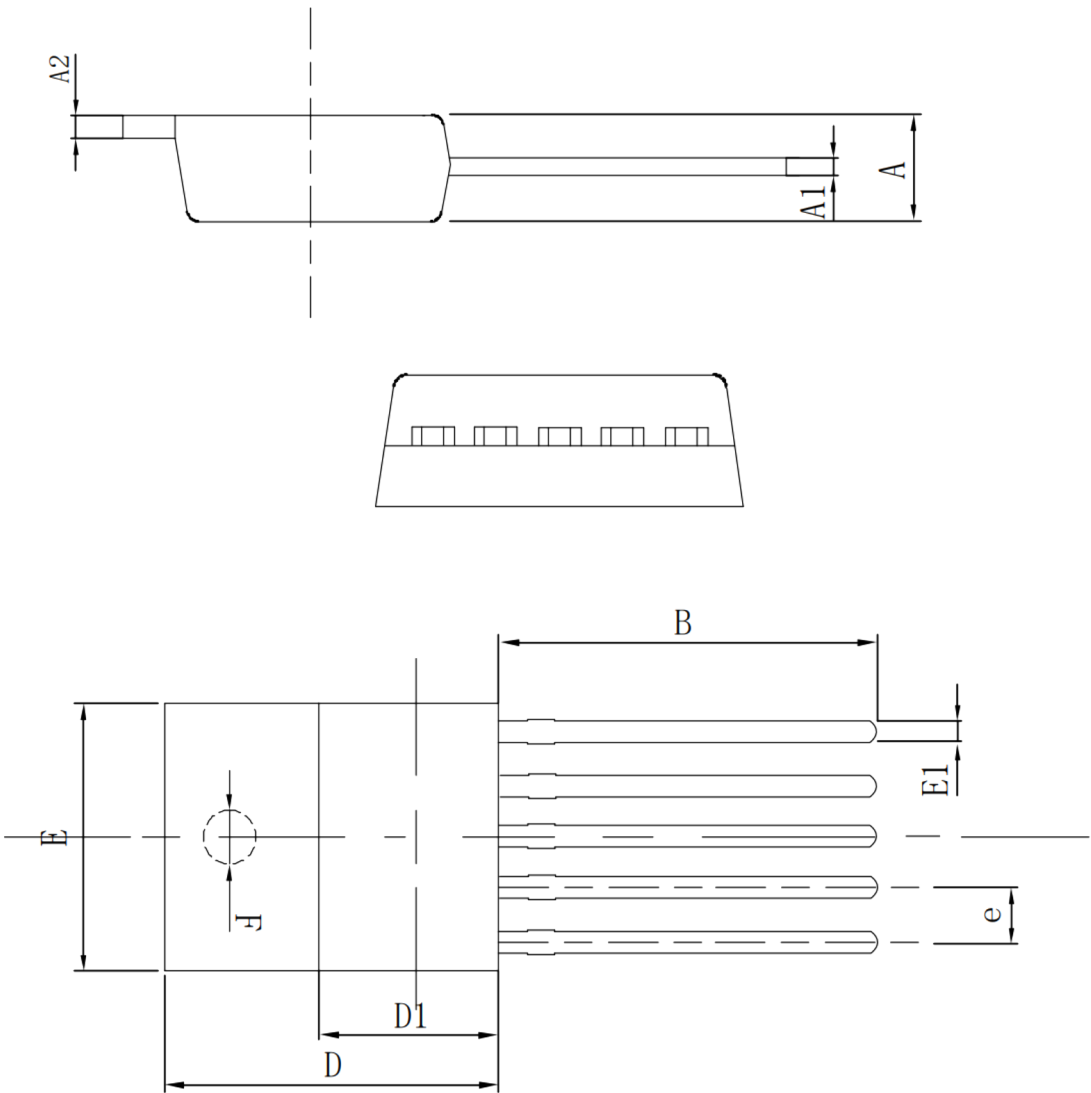
Enable Input

Enable the input potential to be compatible with TTL/CMOS level, and can be directly interfacing with logic devices, or directly connected to voltages below 30V. The enabling current of the device is about 20uA for normal operation.

Package Information

· T0-220-5L

Symbol	Size	Dimensions In Millimeters		Symbol	Size	Dimensions In Inches	
		Min (mm)	Max (mm)			Min (in)	Max (in)
A		4.300	4.700	A		0.169	0.185
A1		0.450	0.600	A1		0.017	0.023
A2		1.250	1.400	A2		0.049	0.055
B		12.88	13.38	B		0.507	0.527
D		15.50	15.90	D		0.610	0.626
D1		9.000	9.400	D1		0.354	0.370
E		9.700	10.10	E		0.381	0.398
E1		0.660	0.914	E1		0.025	0.036
e		1.702 (BSC)		e		0.670 (BSC)	
F		Φ3.500	Φ3.700	F		Φ0.137	Φ0.146



· T0-263-5L

Symbol \ Size	Dimensions In Millimeters		Symbol \ Size	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (in)	Max (in)
A	1.170	1.370	A	0.046	0.054
A1	4.470	4.670	A1	0.176	0.184
A2	0.310	0.530	A2	0.012	0.021
B1	2.340	2.740	B1	0.092	0.108
C	5.080 (REF)		C	0.200 (REF)	
D	1.170	1.370	D	0.046	0.054
D1	8.500	8.900	D1	0.335	0.350
D2	14.55	15.55	D2	0.572	0.612
E	0.660	0.860	E	0.025	0.034
E1	10.01	10.31	E1	0.394	0.406
e	1.700 (BSC)		e	0.067 (BSC)	

