DESCRIPTION

The A29xx2 series are high-current, high-accuracy, low-dropout (LDO) voltage regulator. These devices offer typical dropout voltages of 350 mV to 425 mV under full load, while maintaining very low ground current, making them ideal for high-current applications. They are also well-suited for lower-current systems where minimal dropout voltage and low quiescent current are critical.

The A29xx2 series provides comprehensive protection features, including Overcurrent protection, Reverse input polarity protection, Reverse lead insertion protection, Over-temperature shutdown, and Tolerance to both positive and negative transient voltage spikes.

Additionally, these regulators support logic-level ON/OFF control and ensure reliable performance even during undervoltage or fault conditions. Key features also include low input voltage operation, output current limiting, thermal protection, and the ability to withstand extremely high input voltage transients. The A29xx2 series is available in a 5-pin TO-263-5 package.

ORDERING INFORMATION

Package Type	Part Number	
TO-263-5 SPQ: 800/Reel	S5	A29152S5VR
		A29302S5VR
		A29502S5VR
		A29752S5VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

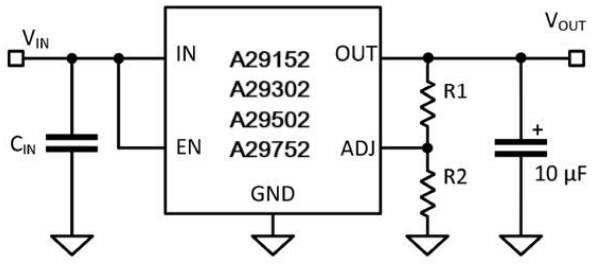
FEATURES

- High Current Output Capability
  - A29152:1.5A
  - A29302:3.0A
  - A29502:5.0A
  - A29752:7.5A
- Wide Input Voltage Range: 4~36V
- Low Dropout Voltage
- Low Ground Current
- Accurate 2% Tolerance
- Extremely Fast Transient Response
- Adjustable Output Voltage
- Extended Temperature Ranges From -40°C to +125°C
- Available in Green TO-263-5 Packages

APPLICATION

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

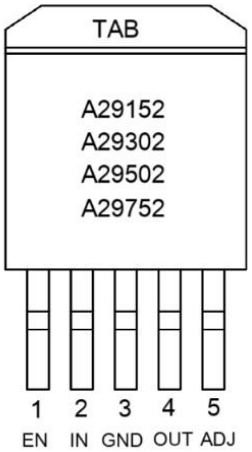
TYPICAL APPLICATION



V_{OUT} =1.24X $[\frac{R1}{R2}+1]$

Application hints:See the minimum load current section. On the A29xx2, the EN (ENABLE) pin may be tied to V_{IN} if it is not required for ON/OFF control.

PIN DESCIPTION



TO-263-5, S5

Top View

Pin #	Symbol	I/O	Functions
1	EN	I	ENABLE: Available for A29152, A29302, A29502, and A29752. CMOS-compatible control input. Logic-high=enable, logic-low=shutdown
2	IN	I	INPUT: Supplies the current to the output power device.
3	GND	-	GROUND
4	OUT	O	OUTPUT: The regulator output voltage.
5	ADJ	I	ADJUST: Adjustable regulator feedback input that connects to the resistor voltage divider that is placed from OUT to GND to set the output voltage.
-	TAB	-	The thermal tab is internally connected directly to device pin 3 (GND). For proper thermal performance, the thermal tab must be connected to a copper area on the PCB that is at the same potential as pin 3 (GND). Alternatively, the thermal tab can be left floating. Do not connect the thermal tab to any potential other than GND (the same potential as device pin 3).

ABSOLUTE MAXIMUM RATINGS

V_{IN}, Maximum Input Voltage		-0.3V~+40V
Enable Input Voltage		-0.3V~VI_N
Storage Temperature Range		-55℃~+150℃
Operating Junction Temperature Range		-40℃~+125℃
ESD Susceptibility, HBM		2000V
$R_{\theta JC}$, Package Thermal Resistance (Junction-to-case)	TO-263-5	2℃/W

Stresses above 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 in the Electrical Characteristics is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

	MIN.	MAX.	Units
Input Supply Voltage	4.5	26	V
Operating Ambient Temperature	-40	85	℃

ELECTRICAL CHARACTERISTICS

V_{IN}=V_{OUT} +1V, I_{OUT}=10mA, T_J=+25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	I_{OUT} =10mA	-1	-	+1	%
		10mA ≤ I_{OUT} ≤ I_{FL}, (V_{OUT} + 1V) ≤ V_{IN}≤26V	-2	-	+2	%
Line Regulation		I_{OUT}=10mA, (V_{OUT} + 1V) ≤ V_{IN}≤26V	-	0.3	0.6	%
Load Regulation		10mA≦I_{OUT}≦1.5A	-	0.2	3.0	%
Output Voltage Temperature Coefficient	ΔVo/ΔT		-	20	100	ppm/°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dropout Voltage ΔV_{OUT} = -1%		A29152, I_{OUT}=100mA	-	80	200	mV
		A29152, I_{OUT}=750mA	-	220	-	
		A29152, I_{OUT}=1.5A	-	310	600	
		A29302, I_{OUT}=100mA	-	80	175	
		A29302, I_{OUT}=1.5A	-	250	-	
		A29302, I_{OUT}=3A	-	370	600	
		A29502, I_{OUT}=250mA	-	125	250	
		A29502, I_{OUT}=2.5A	-	250	-	
		A29502, I_{OUT}=5A	-	370	600	
		A29752, I_{OUT}=250mA	-	50	-	
		A29752, I_{OUT}=4A	-	180	-	
		A29752, I_{OUT}=7.5A	-	300		
Ground Current (V_{IN} = V_{OUT} +1V)	I_{GND}	A29152, I_{OUT} =750 mA V_{IN} = V_{OUT} +1V	-	5.2	-	mA
		A29152, I_{OUT} =1.5A	-	28	-	
		A29302, I_{OUT} =1.5A V_{IN} = V_{OUT} +1V	-	5.2	-	
		A29302, I_{OUT} =3A	-	28	-	
		A29502, I_{OUT} =2.5A V_{IN} = V_{OUT} +1V	-	5.2	-	
		A29502, I_{OUT} =5A	-	28	-	
		A29752, I_{OUT} =4A V_{IN} = V_{OUT} +1V	-	5.2	-	
		A29752, I_{OUT} =7.5A	-	28	-	

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Ground Pin Current at Dropout (V_{IN} is 0.5V less than specified V_{OUT})	I_{GRNDDO}	A29152, I_{OUT} =10mA	-	1.9	-	mA
		A29302, I_{OUT} =10mA	-	1.9	-	
		A29502, I_{OUT} =10mA	-	1.9	-	
		A29752, I_{OUT} =10mA	-	1.9	-	
Current Limit	I_{LIM}	A29152, V_{OUT} =0V	-	2.0	2.5	A
		A29302, V_{OUT} =0V	-	4.0	4.8	
		A29502, V_{OUT} =0V	-	6.3	7.8	
		A29752, V_{OUT} =0V	-	9.5	11.7	
Ground Current in Shutdown			-	5	75	nA
Output Noise Voltage	e_n	C_L=10μF, I_L=100mA, 10Hz to 100kHz	-	390	-	μVrms
		C_L=33μF, I_L=100mA, 10Hz to 100kHz	-	211	-	μVrms
Reference						
Reference Voltage	V_{REF}		1.22	1.24	1.252	V
Reference Voltage Temperature Coefficient			-	20	-	ppm/°C
Adjust Pin Bias Current			-	-	100	pA
ENABLE Input						
Input Logic Voltage Low (OFF)			-	-	0.8	V
Input Logic Voltage High (ON)			2.4	-	-	V
Enable Pin Input Current		V_{EN}=0.8V	-	-	24	pA
		V_{EN}=26V	-	-	3	nA
Regulator Output Current in Shutdown		-40°C≤T_J≤ +125°C	-	-	18	μA

DETAILED INFORMATION

Application Notes

The A29152, A29302, A29502, and A29752 are high-performance low-dropout (LDO) voltage regulators designed for a wide range of moderate to high-current applications. With a typical dropout voltage of 350 mV to 425 mV at full load, these devices are particularly well-suited for battery-powered systems and for use as high-efficiency post-regulator noise filters.

Key Features:

- Comprehensive Protection:
  These regulators offer full protection against fault conditions, including:
  - Linear current limiting to maintain a constant output current during overload.
  - Thermal shutdown at die temperatures exceeding +125°C to prevent device damage.
  - Line transient protection capable of withstanding input voltage spikes from –0.3V to +40V.
- Over-Voltage Shutdown:
  When the input voltage exceeds approximately 36V, the internal over-voltage sensor automatically disables the regulator to protect both the device and the load.
- Reverse Voltage Tolerance:
  The regulator's output structure allows external voltages higher than the set output to be applied without causing reverse current flow.
- Logic-Level ON/OFF Control:
  The A29xx2 series includes a logic-level enable pin. When disabled, the regulator consumes nearly zero quiescent current, making it highly efficient for standby operation.
- Common Pinout Across the Series:
  All devices in this family share the same pin configuration, allowing for flexible system design. This enables easy scalability to meet different current requirements without changing the PCB layout.

Capacitor Requirements

For stability and minimal output noise, an output capacitor is required when using the A29152, A29302, A29502, and A29752 regulators. The recommended capacitor value depends on the output current; lower load currents allow the use of smaller capacitors. The minimum capacitor requirements at full load are provided in Table 1.

It is not necessary to use expensive low-ESR capacitors. Standard aluminum electrolytic capacitors are sufficient for stable operation. Using capacitors with extremely low ESR may lead to instability.
For applications requiring fast load transient response, tantalum capacitors are recommended. Additionally, if the regulator is powered from a source with high AC impedance, it is advisable to place a 0.1 μF capacitor between the input and ground. This capacitor should maintain good performance at frequencies up to 250 kHz or higher to effectively filter high-frequency noise.

Device	Full-Load Capacitor
A29152	10μF
A29302	10μF
A29502	10μF
A29752	22μF

Table 1. Minimum capacitor values at full load

Minimum Load Current

The A29xx2 series regulators are specified for finite loads. If the output current is too small, leakage currents dominate and the output voltage rises. The following minimum load current swamps any expected leakage current across the operating temperature range, as shown in Table 2.

Device	Minimum Load
A29152	5mA
A29302	7mA
A29502	10mA
A29752	10mA

Table 2. Minimum Load Currents

Adjustable Regulator Design

The A29xx2 series allows the output voltage to be programmed to any value between 1.25V and 25V using an external resistor divider. The output voltage is set by selecting two resistors according to the following equation: $R1 = R2 \times (V_{OUT}/V_{REF} - 1)$

In the equation above, V_{OUT} represents the desired output voltage. The typical application circuit provided in the "TYPICAL APPLICATION" section illustrates the component configuration and placement.

For stable operation, the resistor connected between V_{OUT} and the Adjust pin should not exceed 10kΩ. Using larger resistor values may lead to instability.

In applications with widely varying load currents, the resistor values can be scaled to ensure the circuit draws the minimum required load current for proper regulation. For additional details, refer to the "Table 2 Minimum Load Current" subsection.

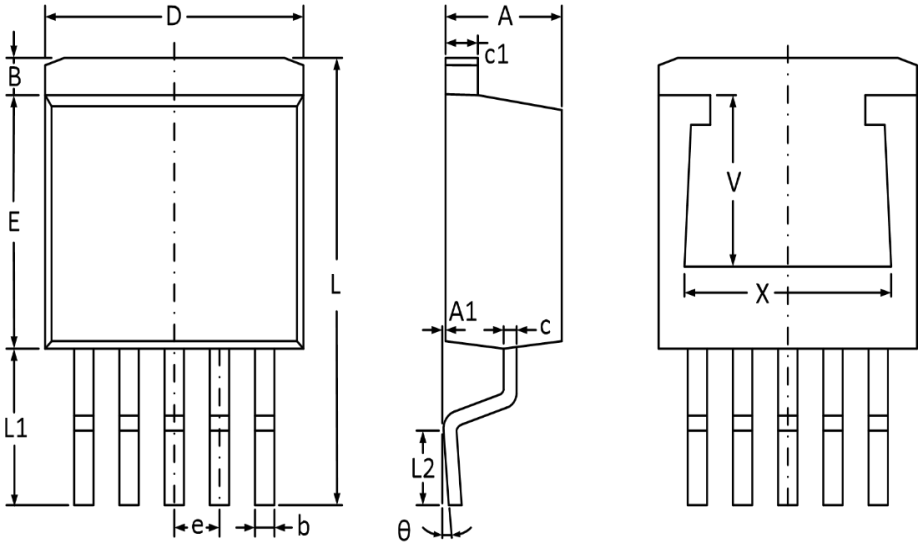
Enable Input

The A29xx2 series includes an Enable (EN) input that provides ON/OFF control of the device. The regulator is specially designed to draw virtually zero supply current when disabled, with only microamperes of leakage current present in this state.

The EN input features TTL/CMOS-compatible thresholds, making it easy to interface with logic-level signals. Additionally, the EN pin can be directly connected to voltage levels up to 36V.

PACKAGE INFORMATION

Dimension in TO-263-5 (Unit: mm)



SYMBOL	MIN.	MAX.
A	4.470	4.670
A1	0.000	0.150
B	1.120	1.420
b	0.710	0.910
c	0.310	0.530
c1	1.170	1.370
D	9.880	10.180
E	8.200	8.600
e	1.700TYP	
L	15.140	15.540
L1	5.080	5.480
L2	2.340	2.740
Θ	0◦	8◦
V	5.600 REF	
X	7.800 REF	

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