

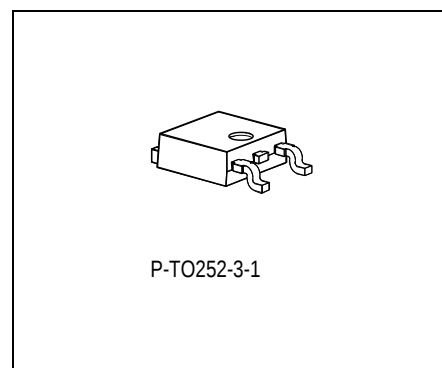
Voltage Regulator

TLE 4284

Target Data Sheet

Features

- Fixed output voltage regulator 2.5 V, 3.3 V or 5 V
- Adjustable output down to 1.25 V
- 800 mA output current
- 80 dB ripple rejection
- No output capacitor necessary
- Suitable for automotive application
- Short circuit protected
- Overtemperature protected



Type	Ordering Code	Package
▼ TLE 4284 DV	Q67000-A9480	P-TO252-3-1
▼ TLE 4284 DV33	Q67000-A9482	P-TO252-3-1
▼ TLE 4284 DV50	Q67000-A9481	P-TO252-3-1

▼ New device

Functional Description

The TLE 4284 is a monolithic integrated fixed or adjustable NPN type voltage regulator that can supply loads up to 800 mA. The device is housed in the surface mounted P-TO252-3-1 package (D-Pak). It is designed to supply microprocessor systems under the severe conditions of automotive applications and therefore it is equipped with additional protection against over load, short circuit and overtemperature.

An input voltage V_i in the range of $(V_Q + 2 \text{ V}) < V_i < 45 \text{ V}$ is regulated to V_Q .

The device operates in the temperature range of $T_j = -40$ to $150 \text{ }^\circ\text{C}$.

The device is available for adjustable output voltage as well as in fixed voltage versions for 3.3 V and 5.0 V (2.5 V on demand).

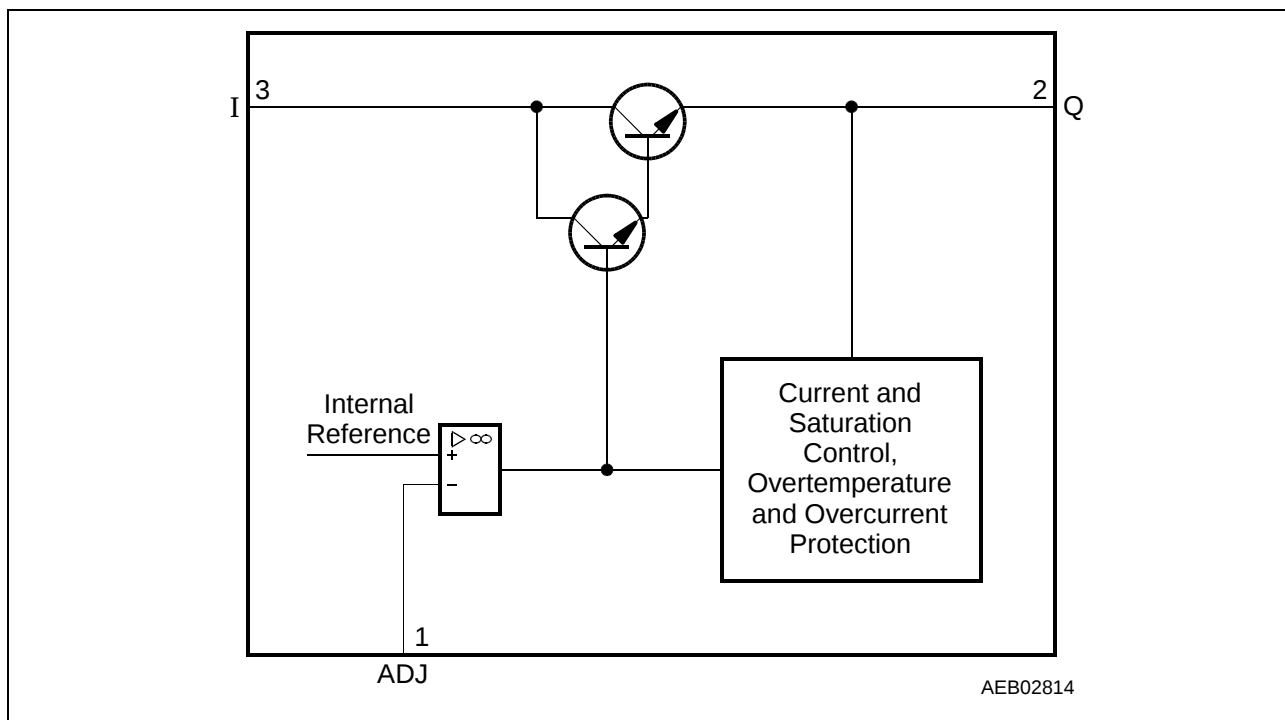


Figure 1 Block Diagram for Adjustable Output Voltage TLE 4284 DV

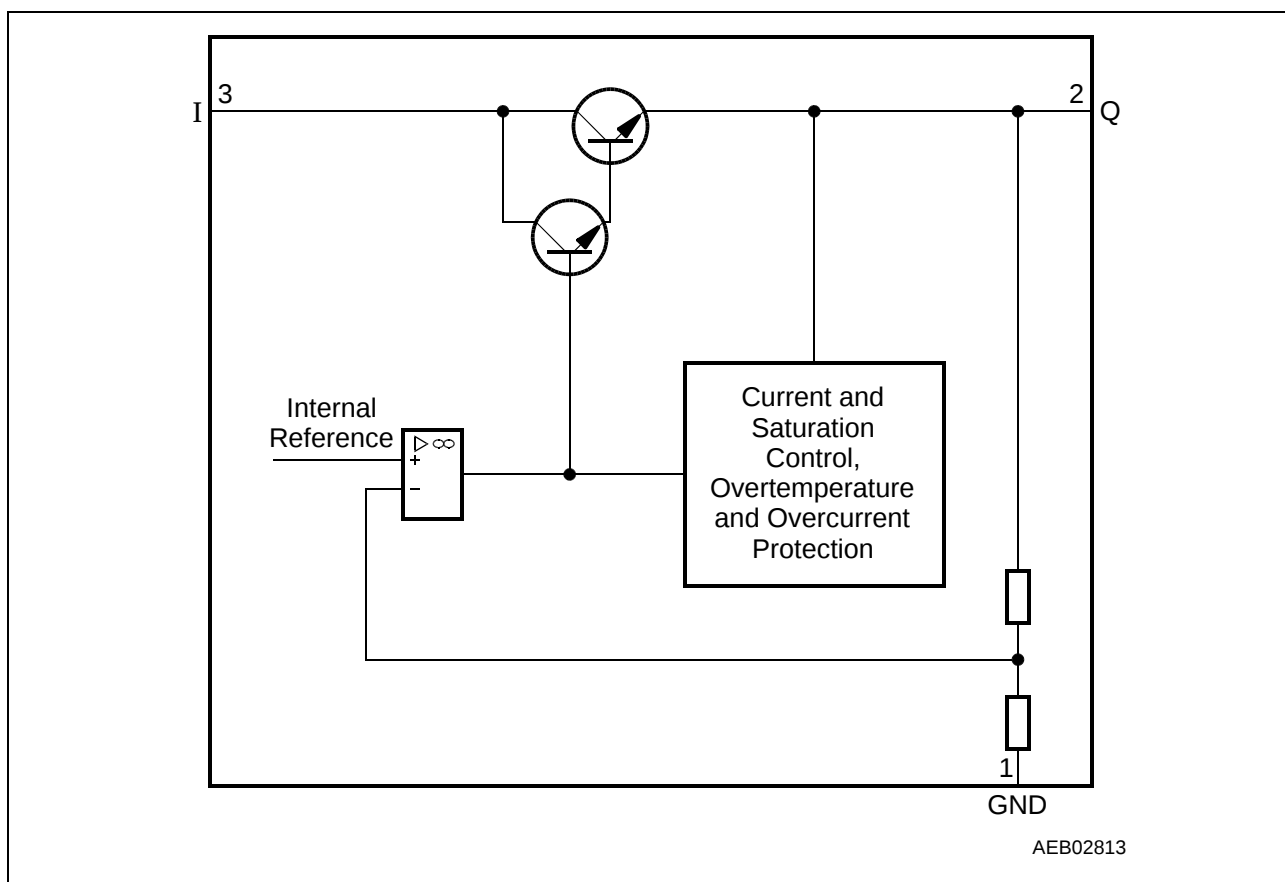


Figure 2 Block Diagram for Fixed Output Voltage TLE 4284 DV33, 50

P-TO252-3-1

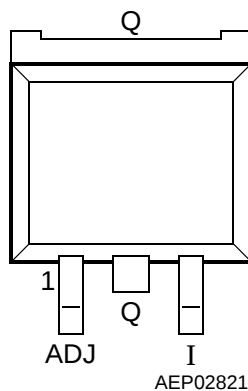


Figure 3 Pin Configuration (top view)

Pin Definitions and Functions for Adjustable Output Voltage TLE 4284 DV

Pin No.	Symbol	Function
1	ADJ	Adjust ; defines output voltage by external voltage divider between Q, ADJ and GND.
2	Q	Output ; the output voltage is defined by the external voltage divider between Q, Adjust and Ground.
3	I	Input

P-TO252-3-1

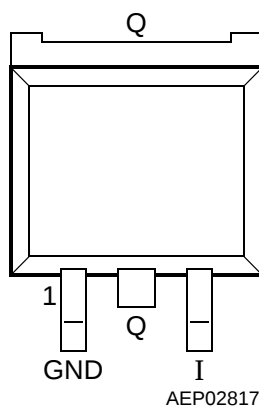


Figure 4 Pin Configuration (top view) (cont'd)

Pin Definitions and Functions for Fixed Voltage TLE 4284 DVxx

Pin No.	Symbol	Function
1	GND	Ground
2	Q	Output; Output voltage is 3.3 V or 5 V
3	I	Input

Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit	Test Condition
		min.	max.		

Voltage Regulator

Input - Output Voltage Difference (variable device only)

Voltage	$V_I - V_Q$	- 0.3	40	V	—
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Input Voltage (fixed voltage version only)

Voltage	V_I	- 0.3	40	V	—
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Output (fixed voltage version only)

Voltage	V_Q	- 0.3	40	V	—
Current	I_Q	—	—	—	Internally limited

Adjust (variable version only)

Voltage	V_{ADJ}	- 0.3	40	V	—
Current	I_{ADJ}	—	—	—	Internally limited

Ground (fixed voltage version only)

Current	I_{GND}	—	2	mA	—
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Temperature

Storage temperature	T_{stg}	- 50	150	°C	—
Junction temperature	T_j	- 40	150	°C	—

Note: Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Operating Range

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Input Voltage	V_I	6.3	40	V	TLE 4284 DV33
Input Voltage	V_I	8.0	40	V	TLE 4284 DV50
Input - Output Voltage Difference	$V_I - V_Q$	3	40	V	TLE 4284 DV
Load Current Range	I_Q	10	Internally limited	mA	–
Junction temperature	T_j	– 40	150	°C	–

Thermal Resistance

Junction ambient	R_{thja}	–	144	K/W	P-TO252-3-1 zero airflow, zero heat sink area
Junction case	R_{thjc}	–	4	K/W	–

Note: In the operating range, the functions given in the circuit description are fulfilled.

Characteristics Adjustable Output Voltage Device TLE 4284 DV

– 40 °C < T_j < 150 °C; $V_I - V_Q = 5\text{ V}$, $I_Q = 10\text{ mA}$; unless otherwise specified

Parameter	Sym- bol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Reference voltage	$V_{REF}^{1)}$	1.20	1.25	1.30	V	–
Line regulation	ΔV_Q	–	0.3	1.0	%	$3\text{ V} \leq (V_I - V_Q) \leq 40\text{ V}$
Load regulation	ΔV_Q	–	0.3	1.5	%	$10\text{ mA} \leq I_Q \leq 800\text{ mA}$; $V_I = 4.25\text{ V}$; $V_Q = V_{REF}$
Drop voltage	V_{DR}	–	2.1	–	V	$I_Q = 100\text{ mA}^{2)}$
Drop voltage	V_{DR}	–	2.15	–	V	$I_Q = 500\text{ mA}^{2)}$
Drop voltage	V_{DR}	–	2.2	–	V	$I_Q = 800\text{ mA}^{2)}$
Current consumption; $I_q = I_I - I_Q$	I_q	–	100	120	μA	$I_Q = 10\text{ mA}$
Adjust current	I_{ADJ}	–	100	120	μA	$I_Q = 10\text{ mA}$
Adjust current change	ΔI_{ADJ}	–	± 0.2	± 1	μA	$10\text{ mA} \leq I_Q \leq 800\text{ mA}$; $3\text{ V} \leq (V_I - V_Q) \leq 20\text{ V}$
Adjust current change	ΔI_{ADJ}	–	± 0.2	± 1	μA	$10\text{ mA} \leq I_Q \leq 200\text{ mA}$; $3\text{ V} \leq (V_I - V_Q) \leq 40\text{ V}$
Temperature stability	–	–	1	–	%	³⁾
Minimum load current	I_Q	–	3.5	10	mA	$V_I - V_Q = 40\text{ V}$
Current limit	I_{Qmax}	1000	–	2200	mA	$V_I = 13.5\text{ V}$
Current limit	I_{Qmax}	50	200	–	mA	$V_I - V_Q = 40\text{ V}$; $T_j = 25\text{ °C}$
RMS Output Noise	–	–	3	–	ppm	ppm of V_Q ; $10\text{ Hz} \leq f \leq 10\text{ kHz}$; $T_j = 25\text{ °C}^{1)}$
Power Supply Ripple Rejection	$PSRR$	–	65	–	dB	$V_Q = 10\text{ V}$, $f_r = 120\text{ Hz}$, $V_r = 0.5 V_{PP}$, $C_{ADJ} = 0\text{ μF}^{1)}$
Power Supply Ripple Rejection	$PSRR$	65	80	–	dB	$V_Q = 10\text{ V}$, $f_r = 120\text{ Hz}$, $V_r = 0.5 V_{PP}$, $C_{ADJ} = 10\text{ μF}^{1)}$
Long Term Stability	ΔV_Q	–	0.3	1	%	$T_j = 125\text{ °C}$, $1000\text{ h}^{1)}$

¹⁾ $V_{REF} = V_Q - V_{ADJ}$

²⁾ Drop voltage measured when the output voltage has dropped 100 mV from the nominal value obtained at $V_Q = V_{REF}$.

³⁾ Guaranteed by design.

Characteristics 3.3 V Fixed Output Voltage Device TLE 4284 DV33

– $40\text{ °C} < T_j < 150\text{ °C}$; $V_I = 8.5\text{ V}$, $I_Q = 10\text{ mA}$; unless otherwise specified.

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Output voltage	V_Q	3.23	3.3	3.37	V	$T_j = 25\text{ °C}$, $I_Q = 10\text{ mA}$
Output voltage	V_Q	3.20	3.3	3.40	V	$10\text{ mA} \leq I_Q \leq 800\text{ mA}$; $8\text{ V} \leq V_I \leq 14\text{ V}$
Output voltage	V_Q	–	3.3	–	V	$10\text{ mA} \leq I_Q \leq 800\text{ mA}$; $14\text{ V} \leq V_I \leq 40\text{ V}$
Line regulation	ΔV_Q	–	3	10	mV	$6.5\text{ V} \leq V_I \leq 40\text{ V}$
Load regulation	ΔV_Q	–	10	50	mV	$10\text{ mA} \leq I_Q \leq 800\text{ mA}$; $T_j = 25\text{ °C}$
Drop voltage	V_{DR}	–	2.10	–	V	$I_Q = 100\text{ mA}^{1)}$
Drop voltage	V_{DR}	–	2.15	–	V	$I_Q = 500\text{ mA}^{1)}$
Drop voltage	V_{DR}	–	2.20	–	V	$I_Q = 800\text{ mA}^{1)}$
Current consumption; $I_q = I_I - I_Q$	I_q	–	1.1	2.0	mA	$I_Q = 10\text{ mA}$
Temperature stability	–	–	3	–	mV	²⁾
Minimum load current	I_Q	–	3.5	10	mA	$V = 40\text{ V}$
Current limit	I_{Qmax}	1000	–	2200	mA	–
Current limit	I_{Qmax}	50	200	–	mA	$V_I = 40\text{ V}$, $T_j = 25\text{ °C}$
RMS Output Noise	–	–	3	–	ppm	ppm of V_Q , $T_j = 25\text{ °C}^{2)}$ $10\text{ Hz} \leq f \leq 10\text{ kHz}$
Supply Voltage Ripple Rejection	$PSRR$	–	65	–	dB	$f_r = 120\text{ Hz}$, $V_r = 0.5\text{ V}_{SS}$ $C_{ADJ} = 0\text{ }\mu\text{F}^{2)}$
Supply Voltage Ripple Rejection	$PSRR$	65	80	–	dB	$f_r = 120\text{ Hz}$, $V_r = 0.5\text{ V}_{SS}$ $C_{ADJ} = 10\text{ }\mu\text{F}^{2)}$
Long Term Stability	ΔV_Q	–	0.3	1	%	$T_j = 125\text{ °C}$, $1000\text{ h}^{2)}$

¹⁾ Drop voltage measured when the output voltage has dropped 100 mV from the nominal value obtained at $V_I = 8.5\text{ V}$.

²⁾ Guaranteed by design.

Characteristics 5.0 V Fixed Output Voltage Device TLE 4284 DV50

– $-40\text{ °C} < T_j < 150\text{ °C}$; $V_I = 10\text{ V}$, $I_Q = 10\text{ mA}$; unless otherwise specified

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Output voltage	V_Q	4.90	5.0	5.10	V	$T_j = 25\text{ °C}$, $I_Q = 10\text{ mA}$
Output voltage	V_Q	4.85	5.0	5.15	V	$10\text{ mA} \leq I_Q \leq 800\text{ mA}$; $8\text{ V} \leq V_I \leq 14\text{ V}$
Output voltage	V_Q	–	5.0	–	V	$10\text{ mA} \leq I_Q \leq 800\text{ mA}$; $14\text{ V} \leq V_I \leq 40\text{ V}$
Line regulation	ΔV_Q	–	3	10	mV	$8\text{ V} \leq V_I \leq 40\text{ V}$
Load regulation	ΔV_Q	–	10	75	mV	$10\text{ mA} \leq I_Q \leq 800\text{ mA}$; $T_j = 25\text{ °C}$
Drop voltage	V_{DR}	–	2.10	–	V	$I_Q = 100\text{ mA}^{1)}$
Drop voltage	V_{DR}	–	2.15	–	V	$I_Q = 500\text{ mA}^{1)}$
Drop voltage	V_{DR}	–	2.20	–	V	$I_Q = 800\text{ mA}^{1)}$
Thermal regulation	–	–	0.04	0.07	%/W	20 ms pulses
Current consumption; $I_q = I_I - I_Q$	I_q	–	1.1	2.0	mA	$I_Q = 10\text{ mA}$
Temperature stability	–	–	1	–	%	²⁾
Minimum load current	I_Q	–	3.5	10	mA	$V_I = 40\text{ V}$
Current limit	I_{Qmax}	1000	–	2200	mA	–
Current limit	I_{Qmax}	50	200	–	mA	$V_I = 40\text{ V}$, $T_j = 25\text{ °C}$
RMS Output Noise	–	–	3	–	ppm	ppm of V_Q , $T_j = 25\text{ °C}^{2)}$ $10\text{ Hz} \leq f \leq 10\text{ kHz}$
Supply Voltage Ripple Rejection	$PSRR$	–	65	–	dB	$f_r = 120\text{ Hz}$, $V_r = 0.5\text{ V}_{SS}$ $C_{ADJ} = 0\text{ }\mu\text{F}^{2)}$
Supply Voltage Ripple Rejection	$PSRR$	65	80	–	dB	$f_r = 120\text{ Hz}$, $V_r = 0.5\text{ V}_{SS}$ $C_{ADJ} = 10\text{ }\mu\text{F}^{2)}$
Long Term Stability	ΔV_Q	–	0.3	1	%	$T_j = 125\text{ °C}$, $1000\text{ h}^{2)}$

¹⁾ Drop voltage measured when the output voltage has dropped 100 mV from the nominal value obtained at $V_I = 10\text{ V}$.

²⁾ Guaranteed by design.

Note: The listed characteristics are ensured over the operating range of the integrated circuit. Typical characteristics specify mean values expected over the production spread. If not otherwise specified, typical characteristics apply at $T_A = 25\text{ °C}$ and the given supply voltage.

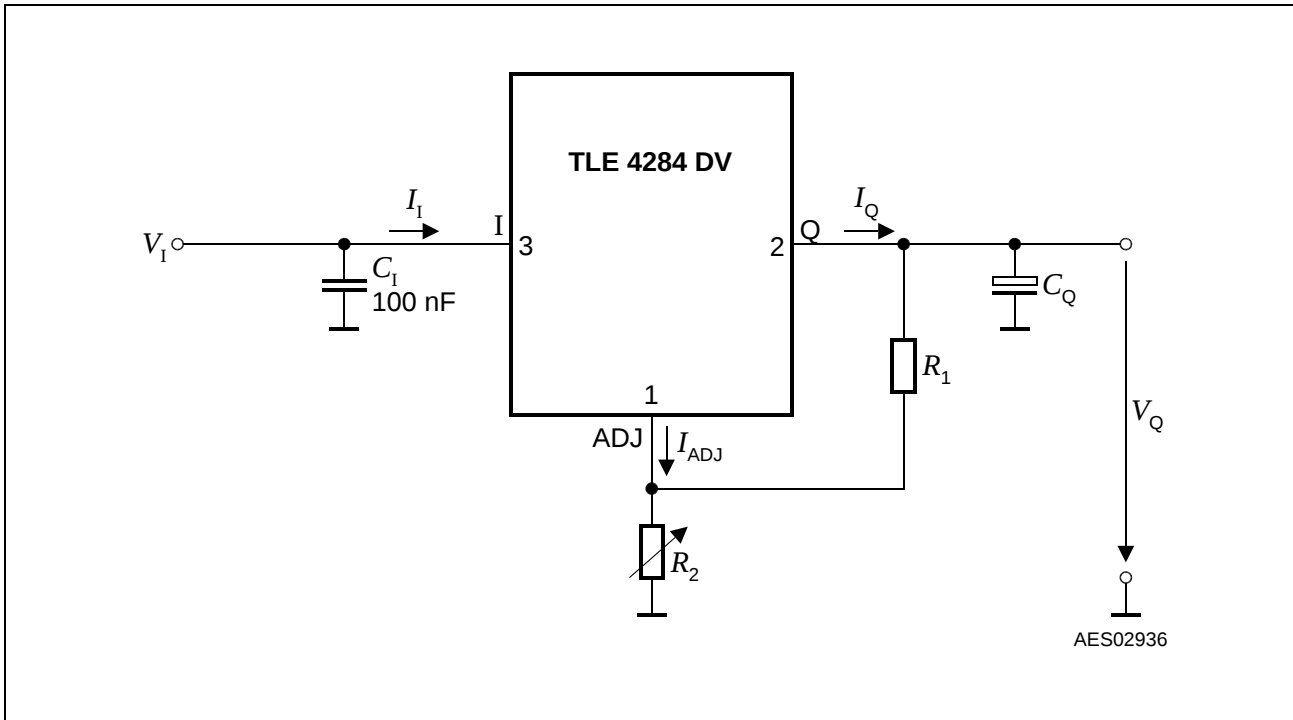


Figure 5 Measuring Circuit Variable Output Voltage TLE 4284 DV

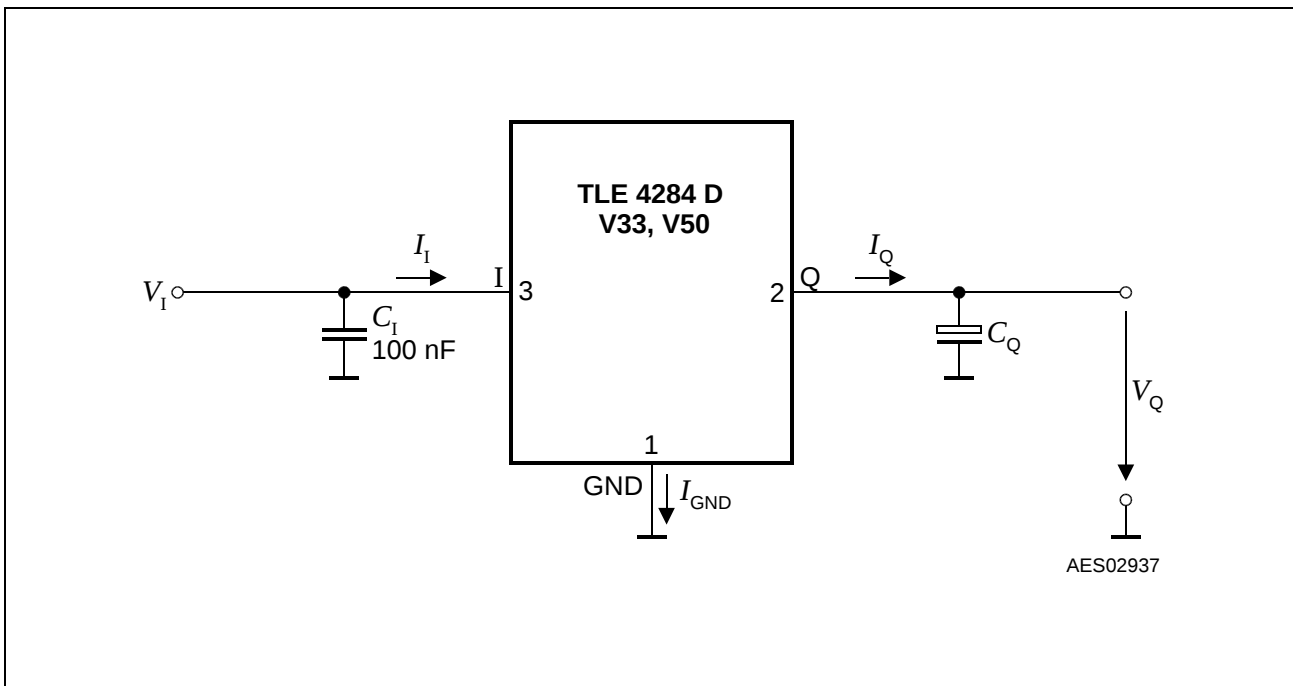


Figure 6 Measuring Circuit Fixed Output Voltage TLE 4284 DV33, 50

Application Information

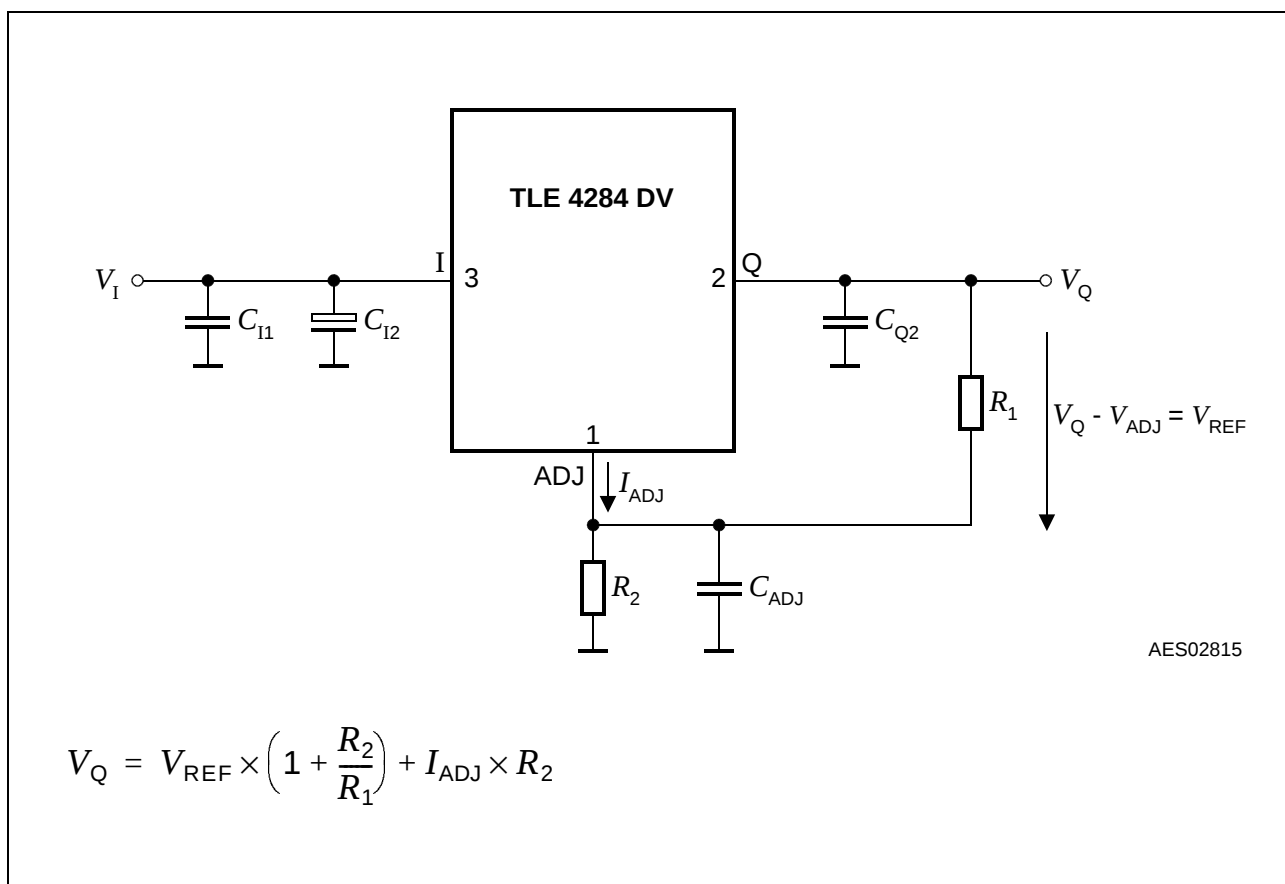


Figure 7 Application Circuit Variable Output Voltage TLE 4284 DV

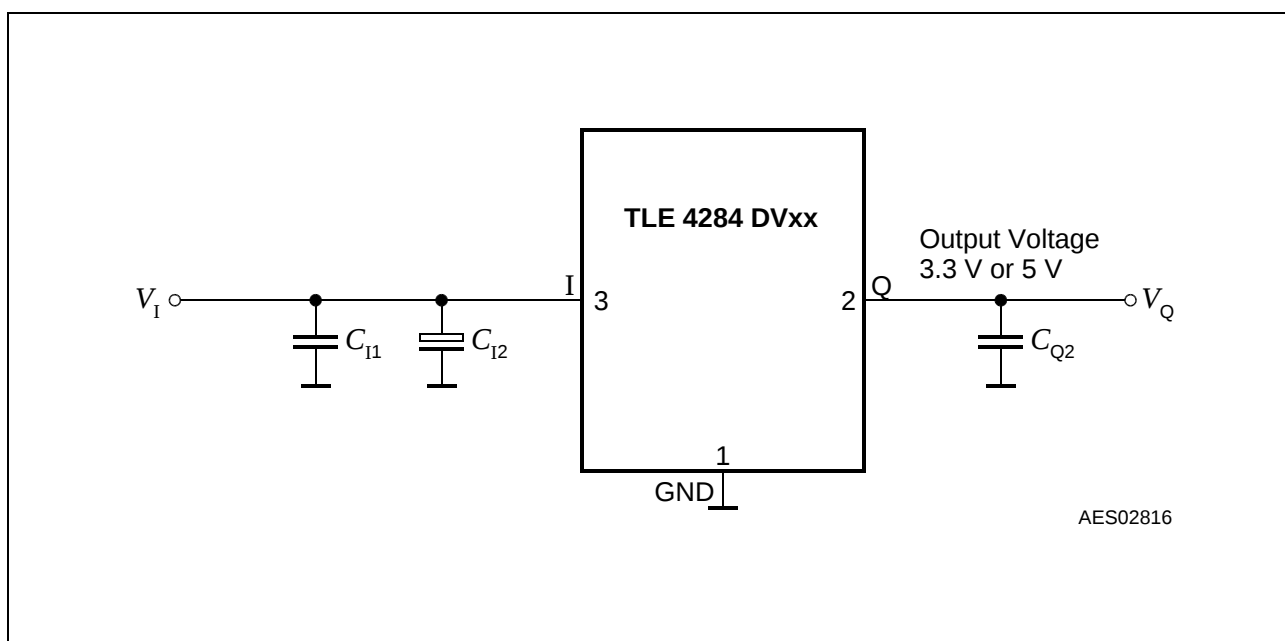


Figure 8 Application Circuit Fixed Output Voltage TLE 4284 DV33, 50

In the fixed voltage TLE 4284 devices the output voltage is divided internally and compared to an internal reference of 1.25 V typical. The regulation loop controls the output voltage to achieve the output voltage of 5 V, 3.3 V or 2.5 V. The variable device compares the voltage difference between the adjust pin ADJ and the output pin Q to the internal reference of 1.25 V; the output voltage is adjusted by an external voltage divider between Q, ADJ and GND (see equation in **Figure 7**).

Output

The output current limitation is reduced as a function of the input voltage for high input voltages above 25 V.

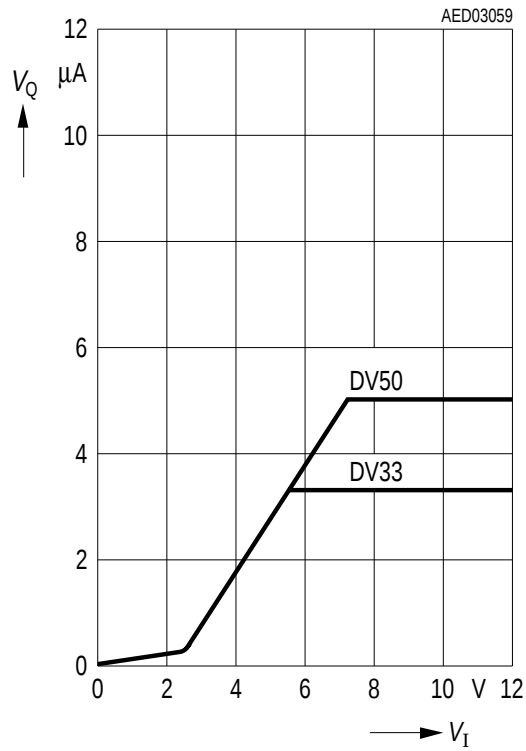
The TLE 4284 requires no output capacitor for stability, however we recommend to use a ceramic capacitor to filter any noise and improve the transient response.

At the input of the regulator a capacitor is necessary for compensation of line influences. A resistor of approx. $1\ \Omega$ in series with C_i can damp the LC of the input inductivity and the input capacitor. A serial diode should be used to eliminate negative voltages from the input.

For the variable voltage type an additional decoupling a capacitor C_{ADJ} at the adjust pin can improve the ripple rejection ratios.

Typical Performance Characteristics

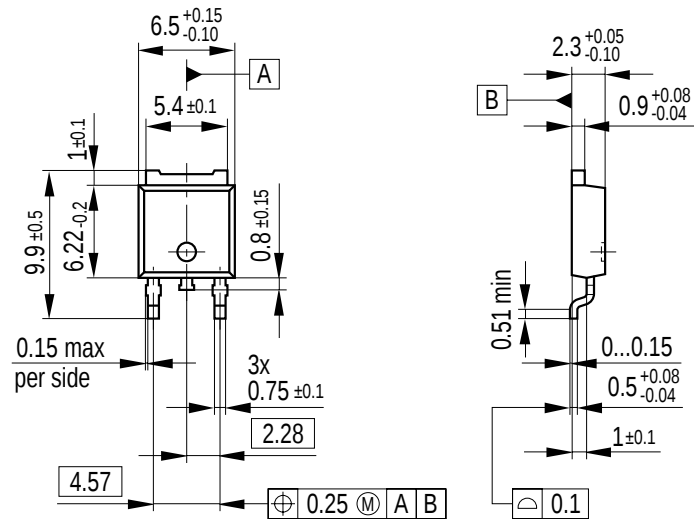
Output Voltage V_Q versus Input Voltage V_I



Package Outlines

P-TO252-3-1

(Plastic Transistor Single Outline Package)



GPT09051

All metal surfaces tin plated, except area of cut.

Sorts of Packing

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information"

SMD = Surface Mounted Device

Dimensions in mm

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