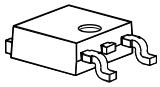
Voltage Regulator

TLE 4117

Target Data Sheet

Features

- Fixed output voltage regulator 1.8 V, 2.5 V, 3.3 V or 5 V
- Adjustable Output down to 1.25 V
- Low Drop typical 1 V
- 800 mA output current
- Short circuit protected
- Overtemperature protected



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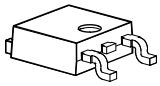

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	Type	Ordering Code	Package
▼	TLE 4117 D V	Q67006-A9477	P-TO252-3-1
▼	TLE 4117 D V18	Q67006-A9479	P-TO252-3-1
▼	TLE 4117 D V25	Q67006-A9474	P-TO252-3-11
▼	TLE 4117 D V33	Q67006-A9461	P-TO252-3-11
▼	TLE 4117 D V50	Q67006-A9478	P-TO252-3-1

▼ New device

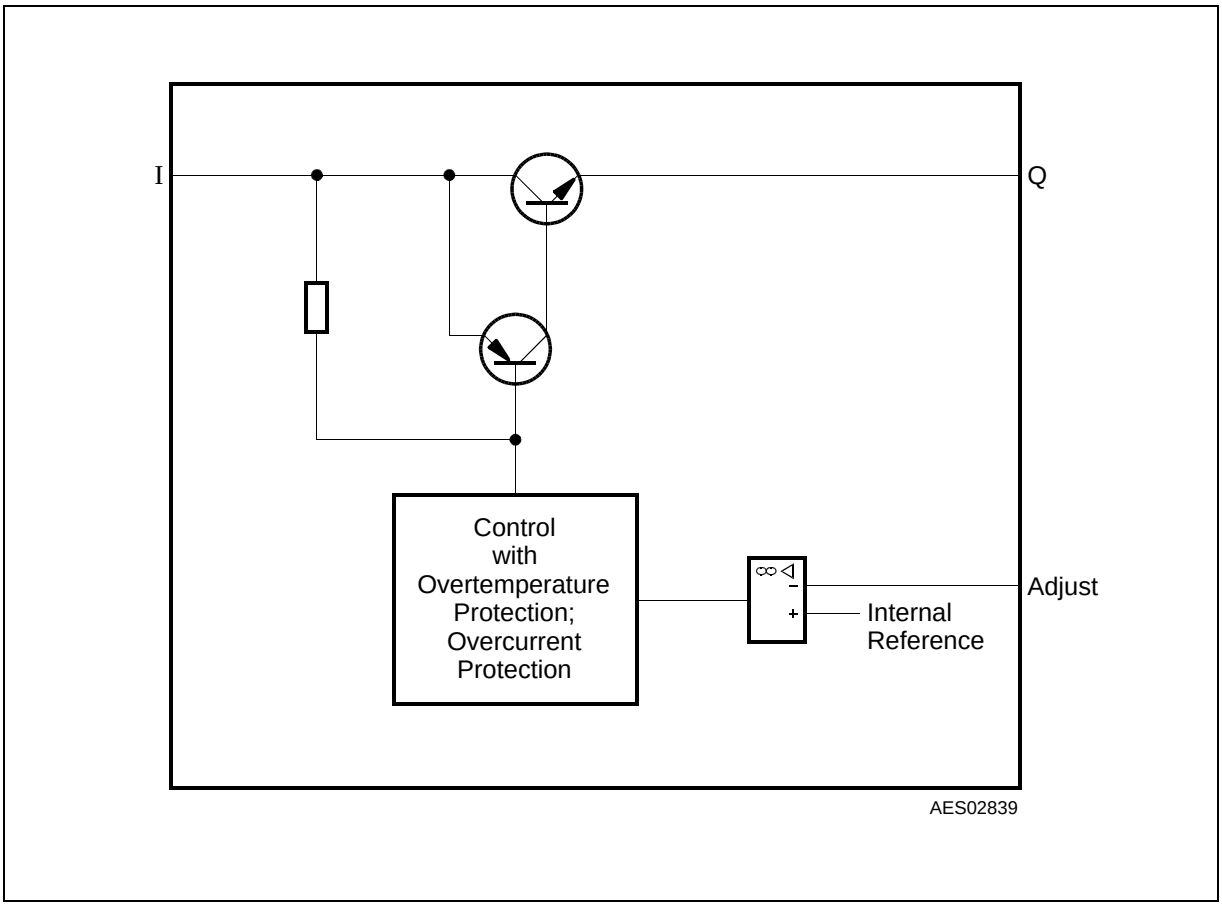

Figure 1 Block Diagram for Adjustable Output Voltage TLE 4117 D V

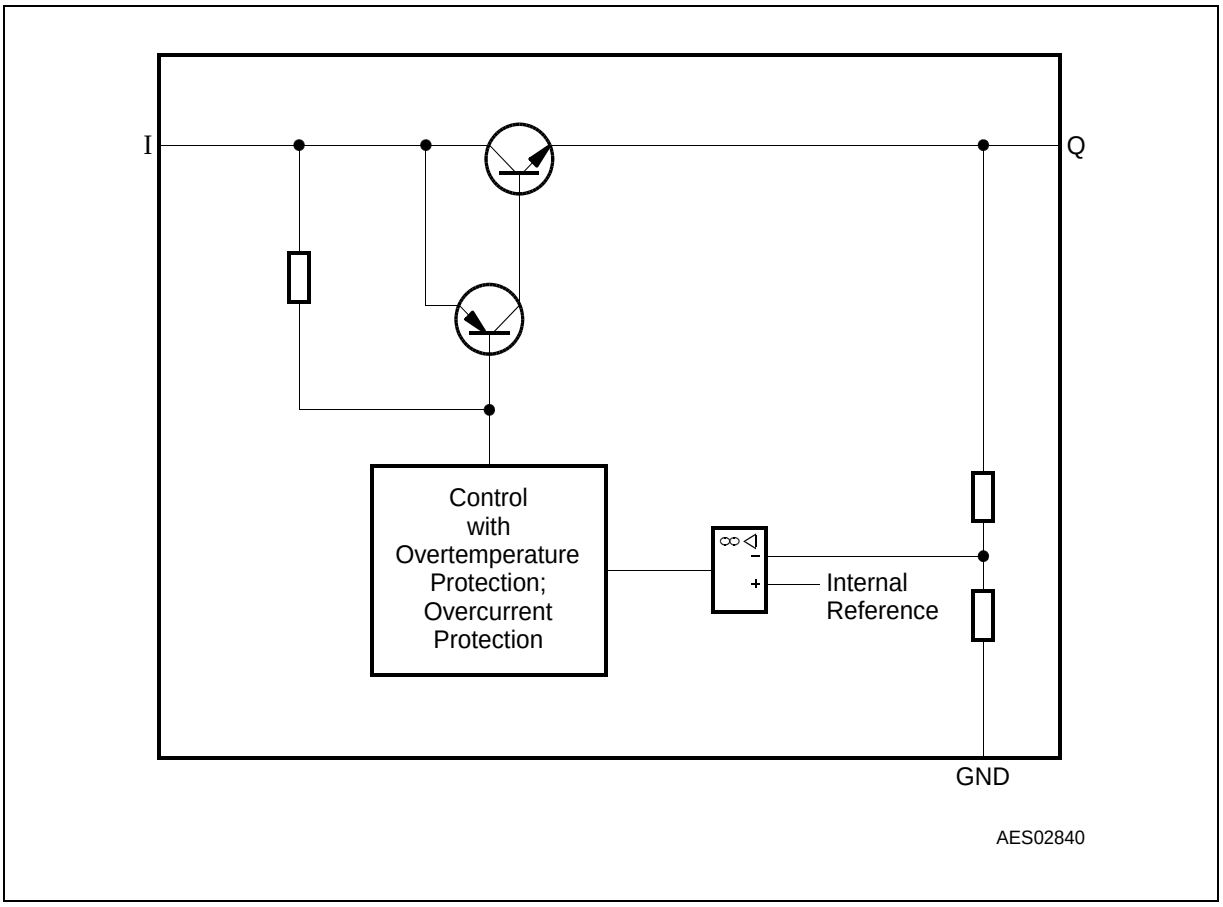

Figure 2 Block Diagram for Fixed Output Voltage TLE 4117 D V18, 25, 33, 50

Functional Description

The TLE 4117 is a 3 terminal positive adjustable or fixed voltage regulator. It is capable to supply 800 mA output current. The fixed voltage devices are available for 1.8 V, 2.5 V, 3.3 V and 5 V output voltage. The adjustable device requires 2 external resistors to define an output voltage between 1.25 V and 40 V. The TLE 4117 is packaged in surface mounted D-Pak package.

The TLE 4117 voltage regulator family offers full overload protection, current limitation, thermal protection and save operation area protection (SOA).

An output capacitor of 10 µF, ESR < 3 Ω is necessary for stability of the regulator loop. The input capacitor is necessary for compensating line influences e.g. to filter glitches. Using a resistor of approx. 1Ω in series with C_I , the oscillating circuit consisting of input inductance and input capacitance can be damped. De-coupling of the adjust pin at variable voltage regulator can improve the ripple rejection ratios.

Pin Configuration
(top view)

P-TO252-3-1

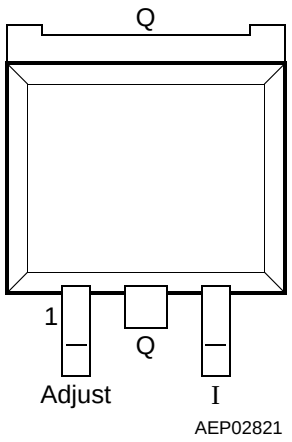

Figure 3

Pin Definitions and Functions TLE 4117 D V

Pin No.	Symbol	Function
1	Adjust	**ADJUST**
2	Q	**Output**; the output voltage is defined by the external voltage divider between Q, Adjust and Ground. A 10 µF output capacitor with ESR < 3 Ω is required.
3	I	**Input**

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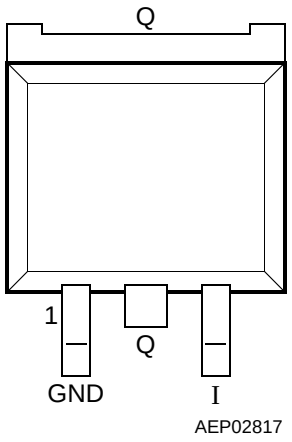


Figure 4

Pin Definitions and Functions TLE 4117 D Vx Fixed Voltage Devices

Pin No.	Symbol	Function
1	GND	**Ground**
2	Q	**Output**; Output voltage is 1.8 V, 2.5 V, 3.3 V or 5 V. A 10 µF output capacitor with ESR < 3 Ω is required.
3	I	**Input**

Absolute Maximum Ratings

T_j = 0 to 125 °C

Parameter	Symbol	Limit Values		Unit	Test Conditions
		min.	max.		
Voltage Regulator					
Input - Output Voltage Difference (variable device only)					
Voltage	V_I	– 0.3	40	V	–
Input Voltage (fixed voltage version only)					
Voltage	V_I	– 0.3	15	V	–
Output (fixed voltage version only)					
Voltage	V_Q	– 0.3	40	V	–
Current	I_Q	–	–	–	Internally limited
Ground (fixed voltage version only)					
Current	I_{GND}	–	1.2	mA	–
Temperature					
Storage temperature	T_{stg}	– 50	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 - Output voltage difference	$V_I - V_Q$	1.25	40	V	TLE 4117 D V
Input - Voltage	V_I	3.1	40	V	TLE 4117 D V18
Input - Voltage	V_I	3.8	40	V	TLE 4117 D V25
Input - Voltage	V_I	4.5	40	V	TLE 4117 D V33
Input - Voltage	V_I	6.3	40	V	TLE 4117 D V50
Junction temperature	T_j	0	125	°C	–

Thermal Resistance

Junction ambient	R_{thja}	–	70	K/W	TO-252[1)]
Junction case	R_{thjc}	–	4	K/W	–

1) Soldered in, min. footprint.

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

Characteristics Adjustable Output Voltage Device TLE 4117 D V

0 °C < T_j < 125 °C; C_Q = 10 µF, I_Q = 10 mA; unless otherwise specified.

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Reference voltage	V_{ADJ}	1.2	1.25	1.3	V	$V_I - V_Q$ = 2 V; I_Q = 10 mA; T_j = 25 °C
Adjust current	I_{ADJ}	–	100	–	µA	$V_I \leq$ 15 V
Adjust current change	ΔI_{ADJ}	–	1	5	µA	1 0 mA ≤ I_Q ≤ 800 mA; 1.4 V ≤ $V_I - V_Q$ ≤ 10 V
Line regulation	ΔV_Q	–	0.3	1.0	%	1.5 V ≤ $V_I - V_Q$ ≤ 21 V I_Q = 10 mA
Load regulation	ΔV_Q	–	0.3	1.0	%	$V_I - V_Q$ = 3 V 10 mA ≤ I_Q ≤ 800 mA
Temperature Stability	ΔV_Q	–	1.0	–	%	[1]
Long Term Stability	ΔV_Q	–	0.3	–	%	1000 h; T_j = 125 °C[1]
Quiescent current	I_q	–	1	2	mA	$V_I - V_Q \leq$ 21 V
Output current	$I_{Q\,max}$	800	–	–	mA	T_j = 25 °C; $V_I - V_Q \leq$ 21 V
Minimum Load Current	$I_{Q\,min}$	–	–	0	mA	
Drop voltage	V_{Dr}	–	1	1.1	V	I_Q = 100 mA[2]
Drop voltage	V_{Dr}	–	1.05	1.15	V	I_Q = 500 mA[2]
Drop voltage	V_{Dr}	–	1.1	1.2	V	I_Q = 800 mA[2]
Power Supply Ripple Rejection	PSRR	60	65	–	dB	f_r = 120 Hz; T_j = 25 °C[1] V_r = 1 V_{PP}; $V_I - V_Q$ = 3 V

[1] Guaranteed by Design.

[2] Measured when output voltage dropped 100 mV below nominal voltage.

Characteristics 1.8 V Fixed Output Voltage Device TLE 4117 D V18

0 °C < T_j < 125 °C; C_Q = 10 µF, I_Q = 10 mA; unless otherwise specified.

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Output voltage	V_Q	1.76	1.8	1.84	V	V_I = 4 V, I_Q = 10 mA, T_j = 25 °C
Output voltage	V_Q	1.72	1.8	1.88	V	3.2 V ≤ V_I ≤ 10 V 0 ≤ I_Q ≤ 800 mA
Line regulation	ΔV_Q	–	10	30	mV	3.2 V ≤ V_I ≤ 15 V I_Q = 0 mA
Load regulation	ΔV_Q	–	10	30	mV	V_I = 3.2 V 1 mA ≤ I_Q ≤ 800 mA
Temperature Stability	ΔV_Q	–	0.5	–	%	[1]
Long Term Stability	ΔV_Q	–	0.3	–	%	1000 h, T_j = 125 °C[1]
Quiescent current	I_q	–	1	2	mA	V_I < 21 V
Output current	$I_{Q\ max}$	800	–	–	mA	T_j = 25 °C
Minimum Load Current	$I_{Q\ min}$	–	–	0	mA	
Drop voltage	V_{Dr}	–	1	1.1	V	I_Q = 100 mA[2]
Drop voltage	V_{Dr}	–	1.05	1.15	V	I_Q = 500 mA[2]
Drop voltage	V_{Dr}	–	1.1	1.2	V	I_Q = 800 mA[2]
Power Supply Ripple Rejection	PSRR	60	65	–	dB	f_r = 120 Hz, T_j = 25 °C[1] V_r = 0.5 V_{PP}, V_I = 5.5 V

[1] Guaranteed by Design.

[2] Measured when output voltage dropped 100 mV below nominal voltage.

Characteristics 2.5 V Fixed Output Voltage Device TLE 4117 D V25

0 °C < T_j < 125 °C; C_Q = 10 µF, I_Q = 10 mA; unless otherwise specified.

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Output voltage	V_Q	2.45	2.5	2.55	V	V_I = 4.5 V, I_Q = 10 mA, T_j = 25 °C
Output voltage	V_Q	2.4	2.5	2.6	V	3.9 V ≤ V_I ≤ 10 V 0 ≤ I_Q ≤ 800 mA
Line regulation	ΔV_Q	–	10	30	mV	3.9 V ≤ V_I ≤ 10 V I_Q = 0 mA
Load regulation	ΔV_Q	–	10	30	mV	V_I = 3.9 V 1 mA ≤ I_Q ≤ 800 mA
Temperature Stability	ΔV_Q	–	1.0	–	%	[1]
Long Term Stability	ΔV_Q	–	0.3	–	%	1000 h, T_j = 125 °C[1]
Quiescent current	I_q	–	1	2	mA	V_I < 10 V
Output current	$I_{Q\ max}$	800	–	–	mA	T_j = 25 °C, V_I < 23 V
Minimum Load Current	$I_{Q\ min}$	–	–	0	mA	
Drop voltage	V_{Dr}	–	1	1.1	V	I_Q = 100 mA[2]
Drop voltage	V_{Dr}	–	1.05	1.15	V	I_Q = 500 mA[2]
Drop voltage	V_{Dr}	–	1.1	1.2	V	I_Q = 800 mA[2]
Power Supply Ripple Rejection	PSRR	60	65	–	dB	f_r = 120 Hz, T_j = 25 °C[1] V_r = 1 V_{PP}, V_I = 5.5 V

[1] Guaranteed by Design.

[2] Measured when output voltage dropped 100 mV below nominal voltage.

Characteristics 3.3 V Fixed Output Voltage Device TLE 4117 D V33

0 °C < T_j < 125 °C; C_Q = 10 µF, I_Q = 10 mA; unless otherwise specified.

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Output voltage	V_Q	3.24	3.3	3.36	V	V_I = 5.3 V, I_Q = 10 mA, T_j = 25 °C
Output voltage	V_Q	3.16	3.3	3.44	V	4.75 V ≤ V_I ≤ 10 V 0 ≤ I_Q ≤ 800 mA
Line regulation	ΔV_Q	–	10	30	mV	4.75 V ≤ V_I ≤ 15 V I_Q = 0 mA
Load regulation	ΔV_Q	–	10	30	mV	V_I = 4.75 V 1 mA ≤ I_Q ≤ 800 mA
Temperature Stability	ΔV_Q	–	1.0	–	%	[1]
Long Term Stability	ΔV_Q	–	0.3	–	%	1000 h, T_j = 125 °C[1]
Quiescent current	I_q	–	1	2	mA	V_I < 15 V
Output current	$I_{Q\ max}$	800	–	–	mA	T_j = 25 °C; V_I < 24 V
Minimum Load Current	$I_{Q\ min}$	–	–	0	mA	
Drop voltage	V_{Dr}	–	1	1.1	V	I_Q = 100 mA[2]
Drop voltage	V_{Dr}	–	1.05	1.15	V	I_Q = 500 mA[2]
Drop voltage	V_{Dr}	–	1.1	1.2	V	I_Q = 800 mA[2]
Power Supply Ripple Rejection	PSRR	60	65	–	dB	f_r = 120 Hz, T_j = 25 °C[1] V_r = 0.5 V_{PP}, V_I = 5 V

[1] Guaranteed by Design.

[2] Measured when output voltage dropped 100 mV below nominal voltage.

Characteristics 5 V Fixed Output Voltage Device TLE 4117 D V50

0 °C < T_j < 125 °C; C_Q = 10 µF, I_Q = 10 mA; unless otherwise specified.

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Output voltage	V_Q	4.9	5.0	5.1	V	V_I = 7 V, I_Q = 10 mA, T_j = 25 °C
Output voltage	V_Q	4.8	5.0	5.2	V	6.5 V ≤ V_I ≤ 10 V 0 ≤ I_Q ≤ 800 mA
Line regulation	ΔV_Q	–	10	50	mV	6.5 V ≤ V_I ≤ 15 V I_Q = 0 mA
Load regulation	ΔV_Q	–	10	50	mV	V_I = 6.5 V 1 mA ≤ I_Q ≤ 800 mA
Temperature Stability	ΔV_Q	–	1.0	–	%	[1]
Long Term Stability	ΔV_Q	–	0.3	–	%	1000 h, T_j = 125 °C[1]
Quiescent current	I_q	–	1	2	mA	V_I < 15 V
Output current	$I_{Q\ max}$	800	–	–	mA	T_j = 25 °C; V_I < 26 V
Minimum Load Current	$I_{Q\ min}$	–	–	0	mA	
Drop voltage	V_{Dr}	–	1	1.1	V	I_Q = 100 mA[2]
Drop voltage	V_{Dr}	–	1.05	1.15	V	I_Q = 500 mA[2]
Drop voltage	V_{Dr}	–	1.1	1.2	V	I_Q = 800 mA[2]
Power Supply Ripple Rejection	PSRR	60	65	–	dB	f_r = 120 Hz, T_j = 25 °C V_r = 0.5 V_{PP}, V_I = 5 V

[1] Guaranteed by Design.

[2] Measured when output voltage dropped 100 mV below nominal voltage.

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 °C and the given supply voltage.

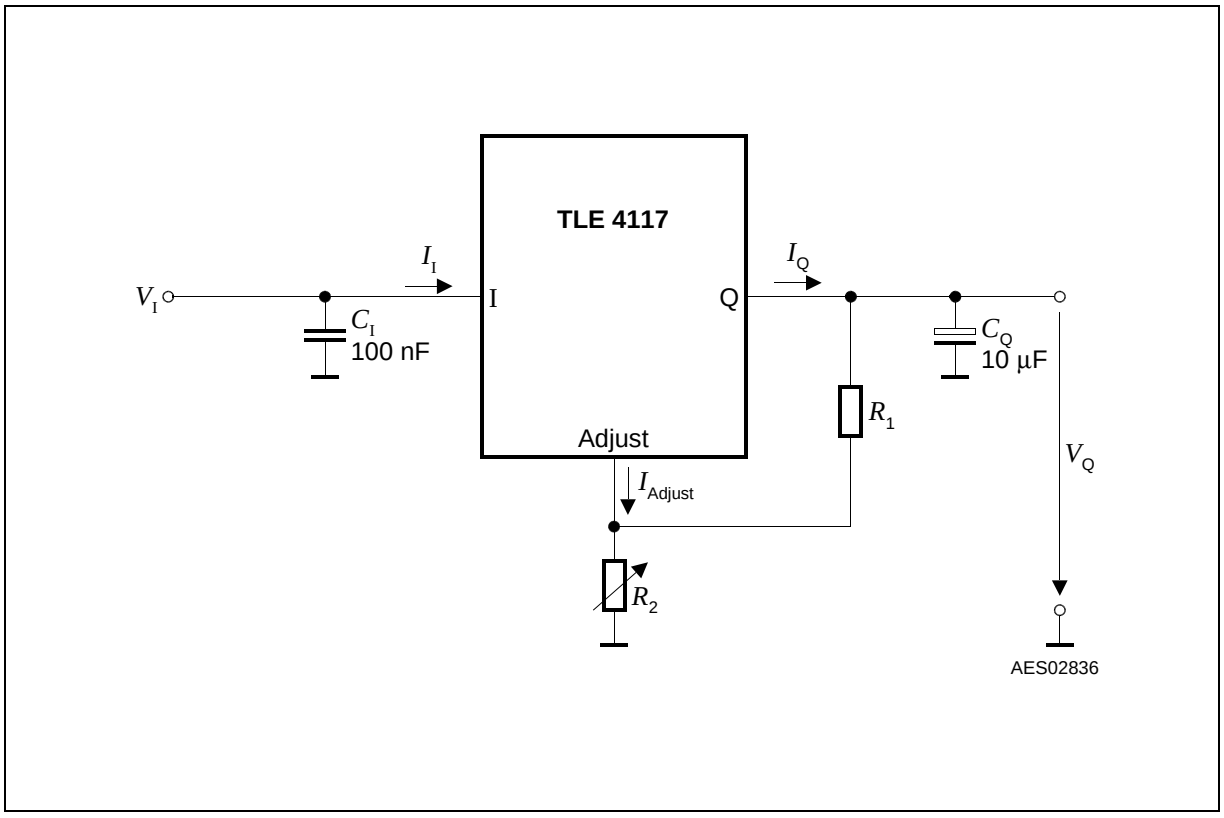


Figure 5 Measuring Circuit Variable Output Voltage TLE 4117 V

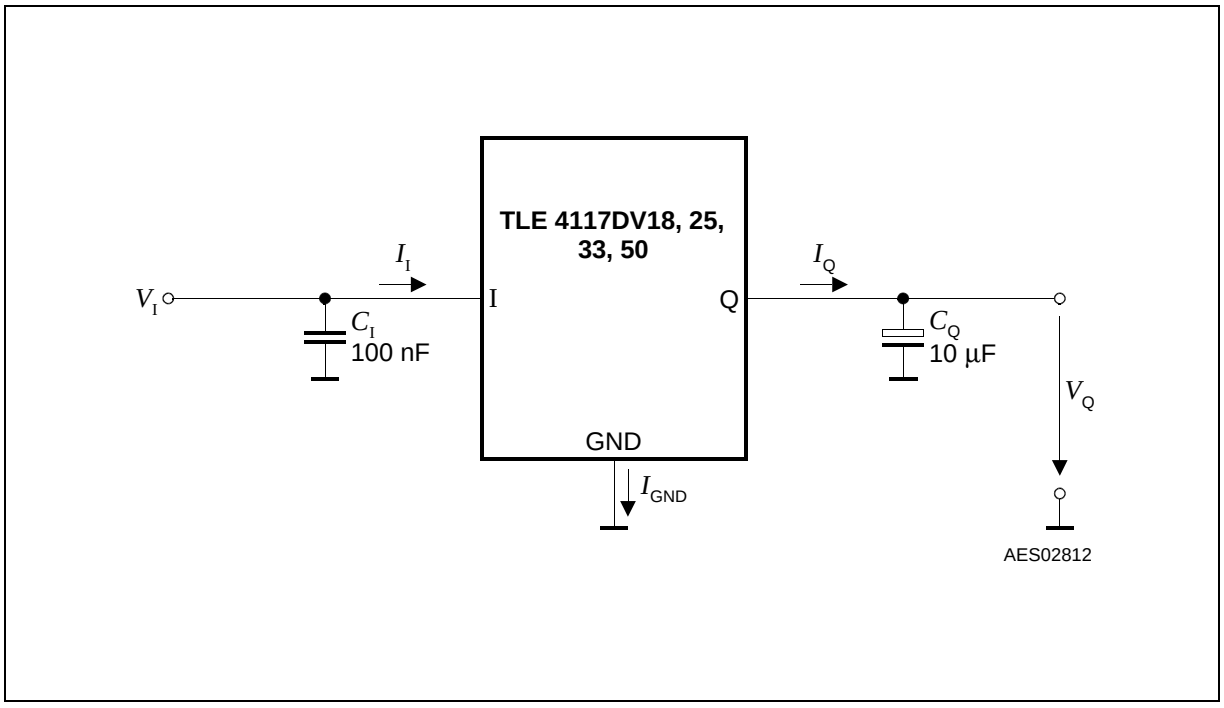
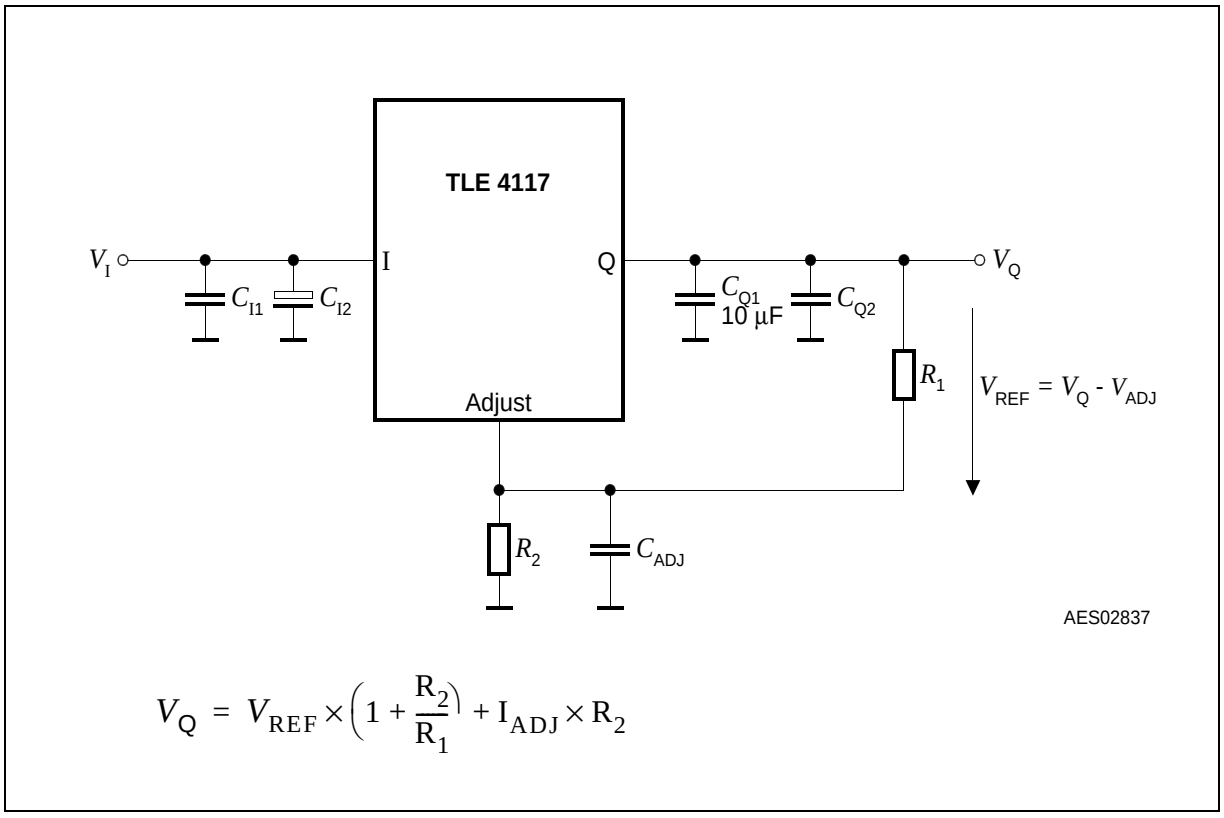


Figure 6 Measuring Circuit Fixed Output Voltage TLE 4117 D V18, 25, 33, 50



$$V_Q = V_{REF} \times \left(1 + \frac{R_2}{R_1}\right) + I_{ADJ} \times R_2$$

Figure 7 Appliation Circuit Variable Output Voltage TLE 4117 V

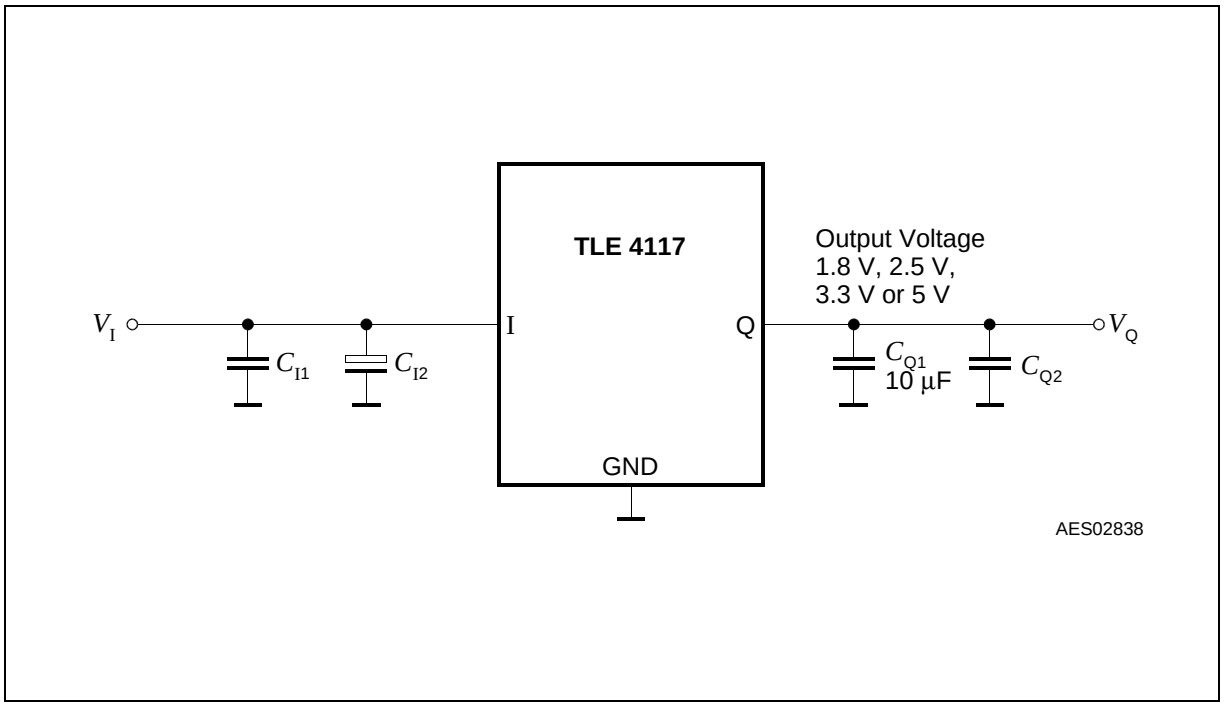
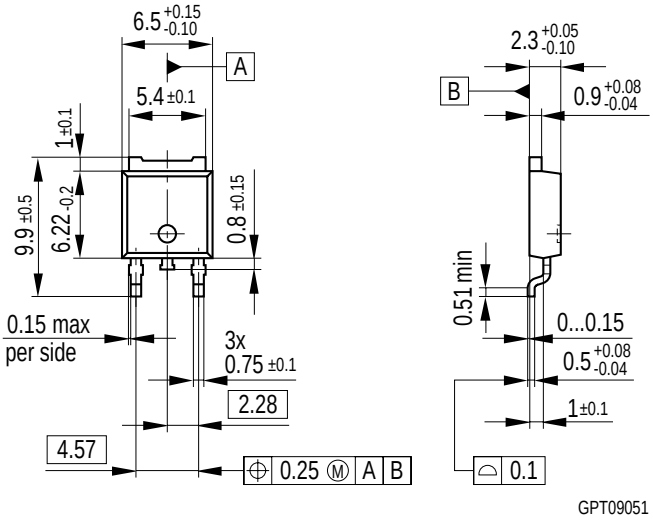


Figure 8 Application Circuit Fixed Output Voltage TLE 4117 D V18, 25, 33, 50

Package Outlines

P-TO252-3-1
(Plastic Transistor Single Outline)

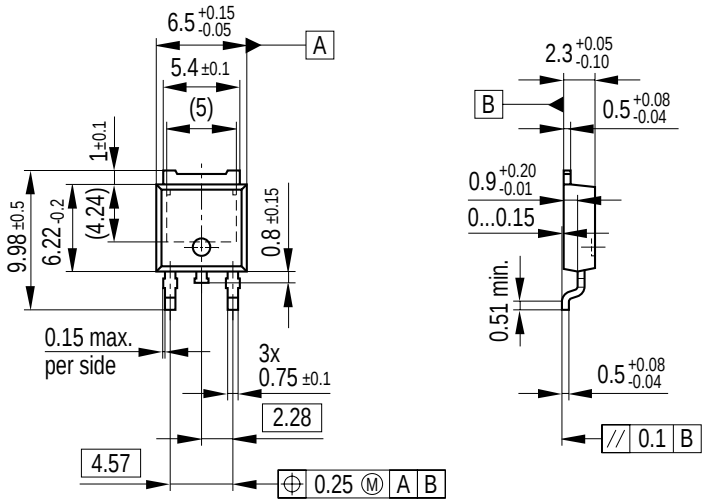


All metal surfaces tin plated, except area of cut.

Sorts of Packing
Package outlines for tubes, trays etc. are contained in our Data Book “Package Information”.
SMD = Surface Mounted Device

Dimensions in mm

P-TO252-3-11
(Plastic Transistor Single Outline)



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GPT09277

Sorts of Packing
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SMD = Surface Mounted Device

Dimensions in mm

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