

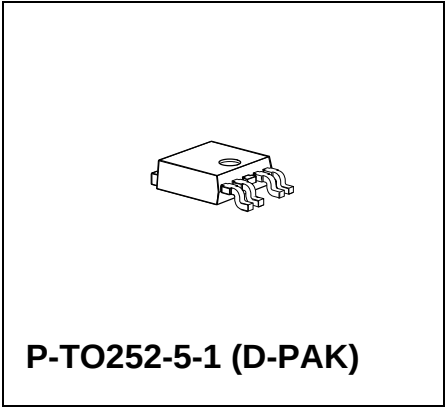
Dual Low-Drop Voltage Regulator

TLE 4476 GM

Target Data

Features

- Output 1: 250 mA; 3.3 V $\pm$ 4 %
- Output 2: 330 mA; 5.0 V $\pm$ 4 %
- Enable input for output 2
- Low quiescent current in OFF state
- Wide operation range: up to 42 V
- Reverse battery protection: up to 42V
- Output protected against short circuit
- Wide temperature range: – 40 °C to 170 °C
- Over-voltage protection up to 65 V (< 400 ms)
- Over-temperature protection
- Over-load protection



Type	Ordering Code	Package
▼ TLE 4476 GM	Q67006-A9362	P-TO252-5-1 (D-PAK) (SMD)

▼ New type

Functional Description

The TLE 4476 is a monolithic integrated voltage regulator providing two output voltages, output Q1 is a 3.3 V output for loads up to 250 mA and output Q2 is a 5 V output providing 330 mA. The device is available in the P-TO252-5-1 (D-PAK) package. Output 2 can be switched ON / OFF via the Enable input.

The TLE 4476 is designed to supply microprocessor systems under the severe conditions of automotive applications and is therefore equipped with additional protection functions against over load, short circuit and over temperature.

Pin Configuration

(top view)

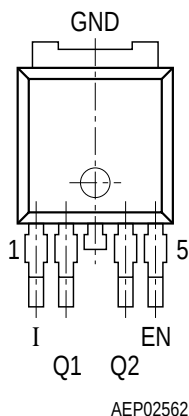


Figure 1

Pin Definitions and Functions

Pin No.	Symbol	Function
1	I	Input voltage ; block to GND directly at the IC with a ceramic capacitor
2	Q1	3.3 V output ; block to GND with a capacitor $C_{Q1} \geq 10 \mu\text{F}$, $\text{ESR} < 10 \Omega$ at 10 kHz
3	GND	Ground
4	Q2	5.0 V output ; block to GND with a capacitor $C_{Q2} \geq 10 \mu\text{F}$, $\text{ESR} < 5 \Omega$ at 10 kHz
5	EN	Enable input ; to switch ON and OFF Q2, ON with high signal

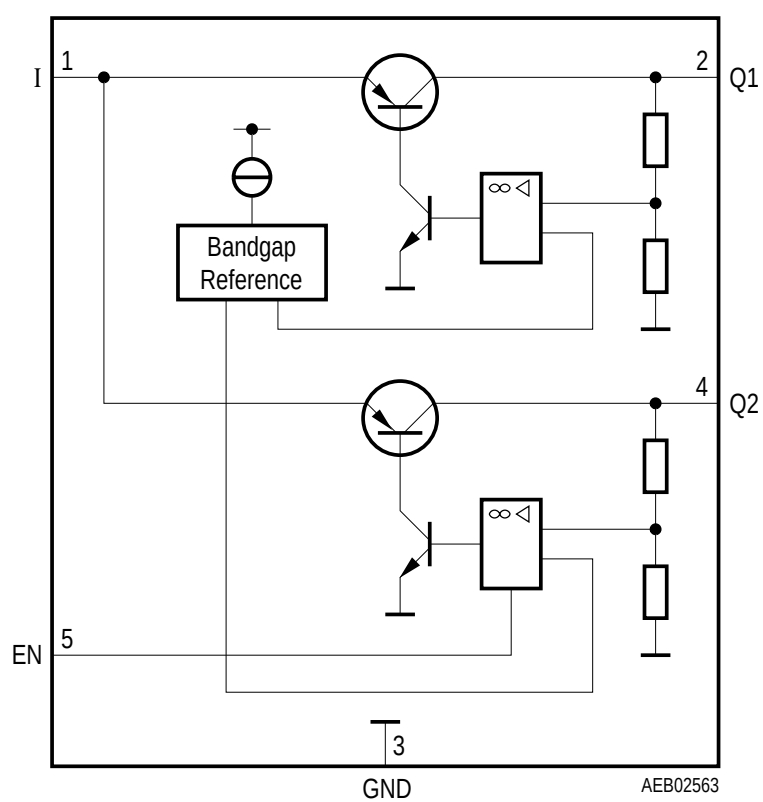


Figure 2
Block Diagram

Absolute Maximum Ratings– 40 °C < T_j < 170 °C

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		

Input I

Voltage	V_I	– 42 –	42 65	V V	– $t < 400 \text{ ms}$
Current	I_I	–	–	mA	Internally limited

3.3 V Output Q1

Voltage	V_{Q1}	– 1	36	V	–
Current	I_{Q1}	–	–	mA	Internally limited

5.5 V Output Q2

Voltage	V_{Q2}	– 1	36	V	–
Current	I_{Q2}	–	–	mA	Internally limited

Inhibit EN

Voltage	V_{EN}	– 42 –	42 65	V V	– $t < 400 \text{ ms}$
Current	I_{EN}	–	–	mA	Internally limited

Temperatures

Junction temperature	T_j	– 50	170	°C	–
Storage temperature	T_{stg}	– 50	150	°C	–

Note: ESD-Protection according to MIL Std. 883: $\pm 2 \text{ kV}$.

Maximum ratings are absolute ratings; exceeding any one of these values may cause irreversible damage to the integrated circuit.

Operating Range

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Output 1 input voltage	V_{I1}	4.5	42	V	—
Output 2 input voltage	V_{I1}	5.7	42	V	—
3.3 V regulator output current	I_{O1}	0	250	mA	—
5.5 V regulator output current	I_{O2}	0	330	mA	—
Junction temperature	T_j	– 40	170	°C	—

Thermal Resistances

Junction case	$R_{th,j-case}$	—	5	K/W	—
Junction ambient	$R_{th,j-a}$	—	65	K/W	—

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

Electrical Characteristics

$V_I = 13.5 \text{ V}$; $V_{EN} > V_{ENH}$; $-40 \text{ }^\circ\text{C} < T_j < 150 \text{ }^\circ\text{C}$; unless otherwise specified

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		

3.3 V Output Q1

Output voltage	V_{Q1}	3.17	3.3	3.43	V	$1 \text{ mA} < I_{Q1} < 250 \text{ mA}$
Output current limitation	I_{Q1}	250	–	–	mA	see note 1
Output drop voltage; $V_{DRQ1} = V_I - V_{Q1}$	V_{DRQ1}	–	0.7	1.2	V	$I_{Q1} = 250 \text{ mA}$; see note 1

Load regulation	ΔV_{Q1}	–	–	30	mV	$1 \text{ mA} < I_{Q1} < 250 \text{ mA}$
Line regulation	ΔV_{Q1}	–	–	30	mV	$I_{Q1} = 5 \text{ mA}$; $6 \text{ V} < V_I < 28 \text{ V}$
Power-Supply-Ripple-Rejection	$PSRR$	–	60	–	dB	$20 \text{ Hz} < f_r < 20 \text{ kHz}$; $V_r = 5 V_{SS}$
Value of output capacitance	C_{Q1}	10	–	–	μF	–
ESR of output capacitance	R_{ESRQ1}	–	–	10	Ω	at 10 kHz

5.0 V Output Q2

Output voltage	V_{Q2}	4.8	5.0	5.2	V	$1 \text{ mA} < I_{Q2} < 330 \text{ mA}$
Output current limitation	I_{Q2}	330	–	–	mA	see note 1
Output drop voltage; $V_{DRQ2} = V_I - V_{Q2}$	V_{DRQ2}	–	0.4	0.7	V	$I_{Q2} = 330 \text{ mA}$; see note 1

Load regulation	ΔV_{Q2}	–	–	50	mV	$5 \text{ mA} < I_{Q2} < 330 \text{ mA}$;
Line regulation	ΔV_{Q2}	–	–	50	mV	$I_{Q2} = 5 \text{ mA}$; $6 \text{ V} < V_I < 28 \text{ V}$
Power-Supply-Ripple-Rejection	$PSRR$	–	60	–	dB	$20 \text{ Hz} < f_r < 20 \text{ kHz}$; $V_r = 5 V_{SS}$

Electrical Characteristics (cont'd)

$V_I = 13.5 \text{ V}$; $V_{EN} > V_{ENH}$; $-40 \text{ }^{\circ}\text{C} < T_j < 150 \text{ }^{\circ}\text{C}$; unless otherwise specified

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Value of output capacitance	C_{Q2}	10	—	—	μF	—
ESR of output capacitance	R_{ESRQ2}	—	—	10	Ω	at 10 kHz

Current Consumption

Quiescent current; $I_q = I_I - I_{Q1}$	I_q	—	100	—	μA	$T_j < 85 \text{ }^{\circ}\text{C}$ $V_{EN} < V_{ENL}$
Quiescent current; $I_q = I_I - I_{Q1} - I_{Q2}$	I_q	—	150	—	μA	$I_{Q1} = I_{Q2} = 300 \text{ } \mu\text{A}$; $T_j < 85 \text{ }^{\circ}\text{C}$
Quiescent current $I_q = I_I - I_{Q1}$	I_q	—	—	10	mA	$I_{Q1} = 150 \text{ mA}$, $I_{Q2} = 300 \text{ } \mu\text{A}$
Quiescent current $I_q = I_I - I_{Q2}$	I_q	—	—	15	mA	$I_{Q1} = 300 \text{ } \mu\text{A}$, $I_{Q2} = 250 \text{ mA}$,

Enable input EN

ON voltage treshold	V_{ENH}	—	1.4	1.8	V	$V_{Q1 \text{ or } 2} > 4.9 \text{ V}$
OFF voltage treshold	V_{ENL}	1.0	1.3	—	V	$V_{Q1 \text{ or } 2} < 0.1 \text{ V}$
input current	V_{EN}	—	20	—	μA	$V_{EN} = 13.5 \text{ V}$

Note 1: Measured when the output voltage V_Q has dropped 100 mV from the nominal value.

Application Information

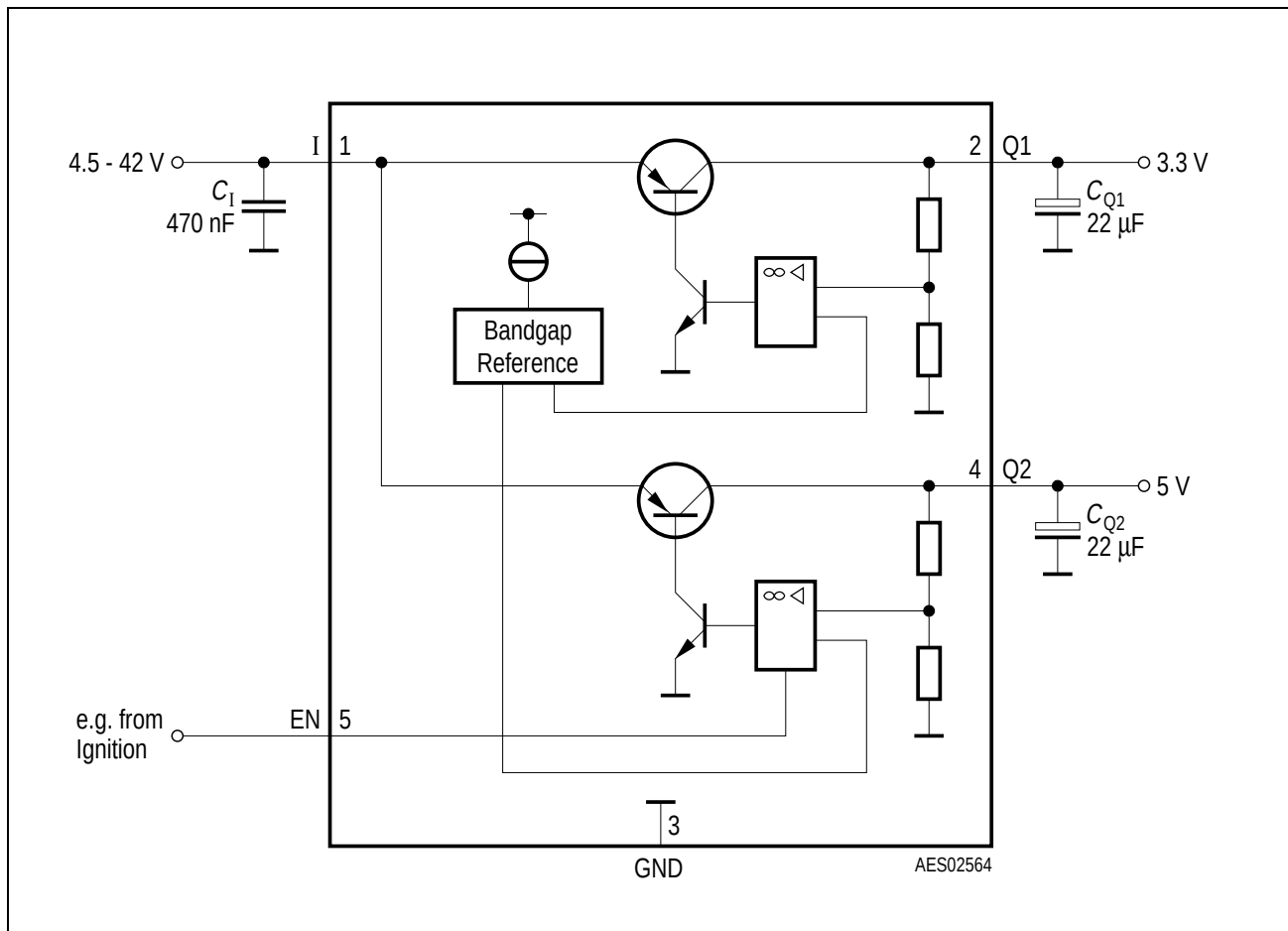


Figure 3
Application Circuit

Input, Output

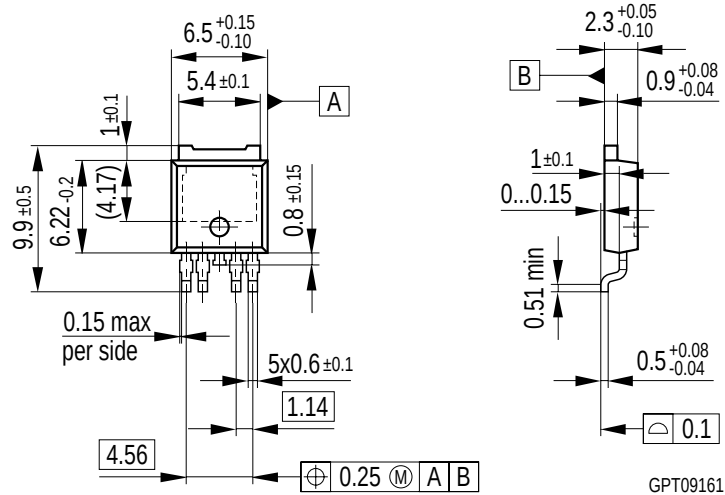
The input capacitor C_1 is necessary for compensating line influences. Using a resistor of approx. 1Ω in series with C_1 , the LC circuit of input inductivity and input capacitance can be damped. To stabilize the regulation circuits of the stand-by and main regulator, output capacitors C_{Q1} and C_{Q2} are necessary. Stability is guaranteed at values $C_{Q1} \geq 10 \mu\text{F}$ ($\text{ESR} \leq 10 \Omega$) and $C_{Q2} \geq 10 \mu\text{F}$ ($\text{ESR} \leq 10 \Omega$) within the operating temperature range.

Enable

By the enable feature the output 2 (5V output) can be switched ON or OFF. The enable input can be connected directly to terminal 30 (battery line) or 15 (ignition line). Of course it's also possible to control the output 2 via the microcontroller.

Package Outlines

P-TO252-5-1 (D-PAK) (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