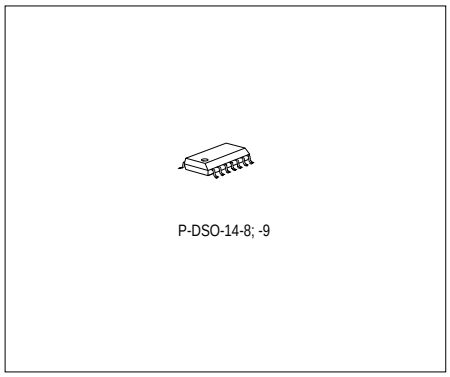
5-V Low-Drop Voltage Regulator

TLE 4263

Features



- Output voltage tolerance ≤ ± 2 %
- 200 mA output current capability
- Low-drop voltage
- Very low standby current consumption
- Overtemperature protection
- Reverse polarity protection
- Short-circuit proof
- Adjustable reset threshold
- Watchdog
- Wide temperature range
- Suitable for use in automotive electronics

Type	Ordering Code	Package
TLE 4263 GM	Q67006-A9357-A201K5	P-DSO-14-8

SMD type

Functional Description

TLE 4263 G is a 5-V low-drop voltage regulator in a P-DSO-14-8 SMD package. The maximum input voltage is 45 V. The maximum output current is more than 200 mA. The IC is short-circuit proof and incorporates temperature protection that disables the IC at overtemperature.

The IC regulates an input voltage V_I in the range of 6 V < V_I < 45 V to V_{Qrated} = 5.0 V. A reset signal is generated for an output voltage of V_Q < 4.5 V. This voltage threshold can be decreased to 3.5 V by external connection. The reset delay can be set externally by a capacitor. The integrated watchdog logic controls the connected microcontroller. The IC can be switched off via the inhibit input, which causes the current consumption to drop from 800 µA to typical 0 µA.

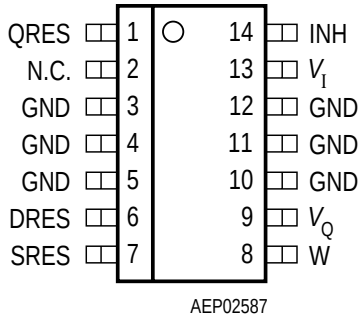
Dimensioning Information on External Components

The input capacitor C_I is necessary for compensating line influences. Using a resistor of approx. 1 Ω in series with C_I, the oscillating circuit consisting of input inductivity and input capacitance can be damped. The output capacitor is necessary for the stability of the regulating circuit. Stability is guaranteed at values ≥ 22 µF and an ESR of ≤ 3 Ω within the operating temperature range. For small tolerances of the reset delay the spread of the capacitance of the delay capacitor and its temperature coefficient should be noted.

Pin Configuration

(top view)

TLE 4263 GM



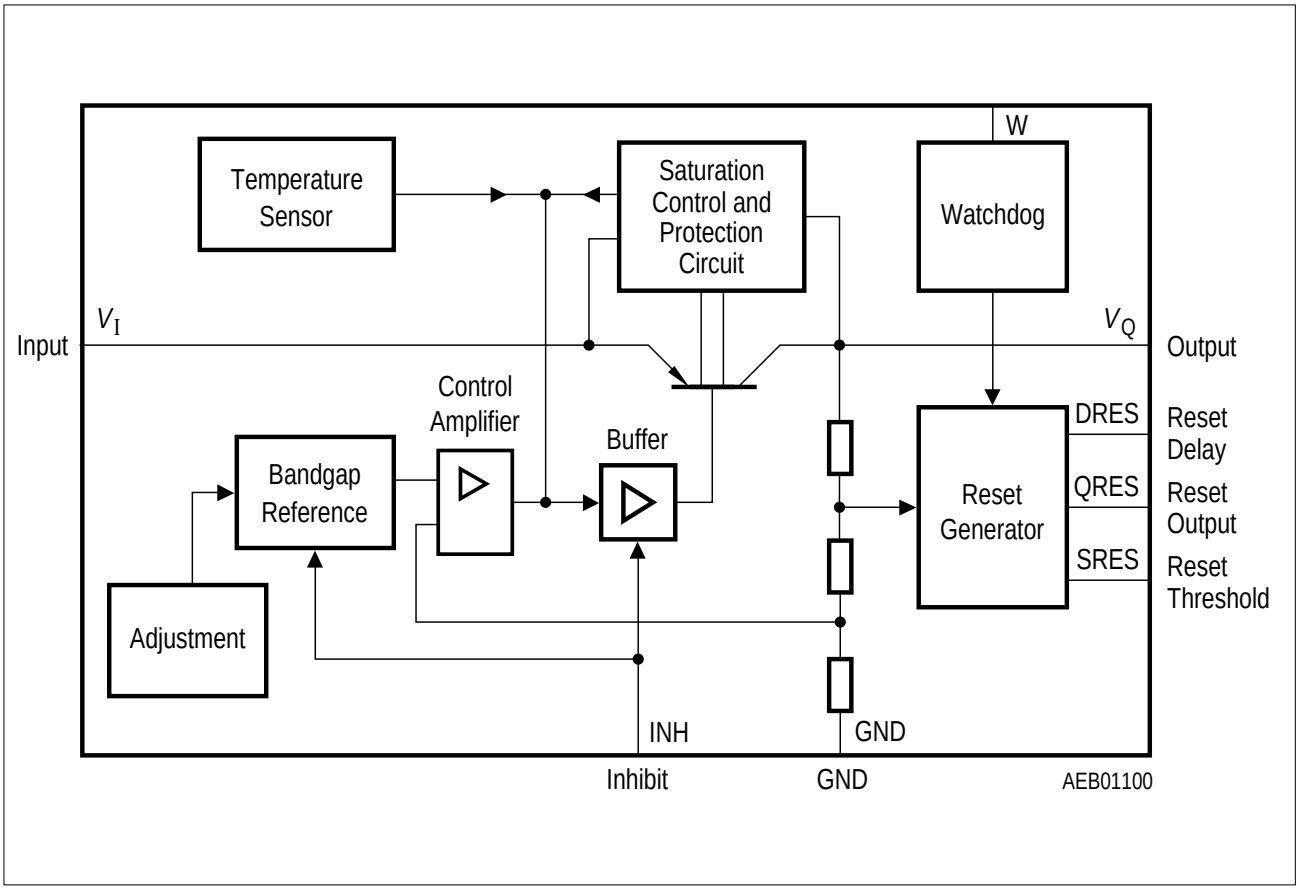
Pin Definitions and Functions

Pin (P-DSO-14-4)	Symbol	Function
2	N.C.	Not connected
1	QRES	**Reset output;** open-collector output connected to the output via a resistor of 30 kΩ.
3 - 5, 10 - 12	GND	**Ground**
6	DRES	**Reset delay;** connected to ground with a capacitor.
7	SRES	**Reset threshold;** for setting the switching threshold connect with a voltage divider from output to ground. If this input is connected to GND, reset is triggered at an output voltage of 4.5 V.
8	W	**Watchdog;** positive edge triggered input for monitoring a microcontroller.
9	V_Q	**5-V output voltage;** block to ground with a 22–µF capacitor.
13	V_I	**Input voltage;** block to ground directly at the IC with a ceramic capacitor.
14	INH	**Inhibit;** TTL-compatible, low-active input.

Circuit Description

The control amplifier compares a reference voltage, which is kept highly accurate by resistance adjustment, to a voltage that is proportional to the output voltage and drives the base of the series transistor via a buffer. Saturation control as a function of the load current prevents any over-saturation of the power element. If the externally scaled down output voltage at the reset threshold input drops below 1.35 V, the external reset delay capacitor is discharged by the reset generator. If the voltage on the capacitor reaches the lower threshold V_{ST}, a reset signal is issued on the reset output and not cancelled again until the upper threshold V_{dT} is exceeded. If the reset threshold input is connected to GND, reset is triggered at an output voltage of 4.5 V. A connected microcontroller is controlled by the watchdog logic. If pulses are missing, the reset output is set to low. The pulse sequence time can be set within a wide range with the reset delay capacitor. The IC can be switched at the TTL-compatible, low-active inhibit input. The IC also incorporates a number of internal circuits for protection against:

- Overload
- Overtemperature
- Reverse polarity



Block Diagram

Absolute Maximum Ratings

T_j = – 40 to 150 °C

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Input					
Input voltage Input current	V_I I_I	– 42 –	45 –	V –	– internally limited
Reset Output					
Voltage Current	V_R I_R	– 0.3 –	42 –	V –	– internally limited
Reset Input					
Reset threshold	V_{RE}	– 0.3	6	V	–
Reset Delay					
Voltage Current	V_d I_d	– 0.3 –	42 –	V –	– internally limited
Output					
Voltage Current	V_Q I_Q	– 0.3 –	7 –	V –	– internally limited
Inhibit					
Voltage	V_e	– 42	45	V	–
Watchdog					
Voltage	V_W	– 0.3	6	V	–
Ground					
Current	I_{GND}	– 0.5	–	A	–

Absolute Maximum Ratings (cont'd)
T_j = – 40 to 150 °C

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Temperature					
Junction temperature	T_j	–	150	°C	–
Storage temperature	T_{stg}	– 50	150	°C	–
Operating Range					
Input voltage	V_I	–	45	V	–
Junction temperature	T_j	– 40	150	°C	–
Thermal resistance					
junction-ambient	$R_{th\ JA}$	–	70	K/W	soldered
junction-case	$R_{th\ JC}$	–	25	K/W	–

Characteristics

V_I = 13.5 V; T_j = 25 °C; V_e > 3.5 V; (unless specified otherwise)

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Normal Operation						
Output voltage	V_Q	4.90	5.00	5.10	V	5 mA ≤ I_Q ≤ 150 mA; 6 V ≤ V_I ≤ 28 V; – 40 °C ≤ T_j ≤ 125 °C
Output voltage	V_Q	4.95	5.00	5.05	V	6 V ≤ V_I ≤ 32 V; I_Q = 100 mA; T_j = 100 °C
Output current	I_Q	200	250	–	mA	–
Current consumption; $I_q = I_i - I_Q$	I_q I_q I_q I_q	– – – –	0 800 10 15	– 1100 15 20	µA µA mA mA	V_{INH} = 0 I_Q = 0 mA I_Q = 150 mA I_Q = 150 mA; V_i = 4.5 V
Drop voltage	V_{Dr}	–	0.35	0.6	V	I_Q = 150 mA *)
Load regulation	ΔV_Q	–	–	25	mV	I_Q = 5 mA to 150 mA
Supply-voltage regulation	ΔV_Q	–	15	25	mV	V_I = 6 V to 28 V; I_Q = 150 mA
Ripple rejection	SVR	–	54	–	dB	f_r = 100 Hz; V_r = 0.5 V_{PP}
Reset Generator						
Switching threshold	V_{RT}	4.5	4.65	4.8	V	V_{RE} = 0 V
Switching voltage	V_{RE}	1.28	1.35	1.42	V	V_Q > 3.5 V
Reset low voltage	V_R	–	0.10	0.40	V	I_R = 1 mA

Note: The reset output is low within the range V_Q = 1 V to V_{RT}

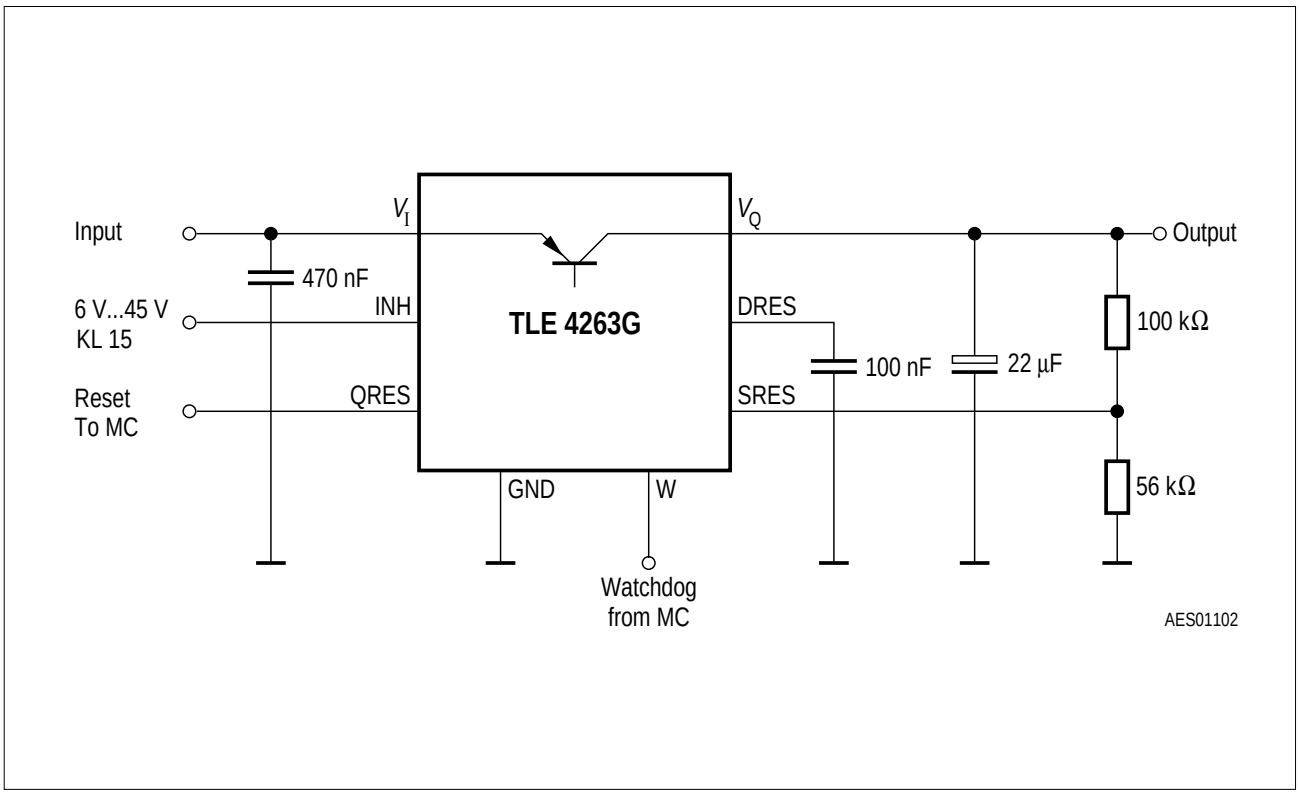
*) Drop voltage = $V_i - V_Q$ (measured when the output voltage has dropped 100 mV from the nominal value obtained at 13.5 V input)

Characteristics (cont'd)

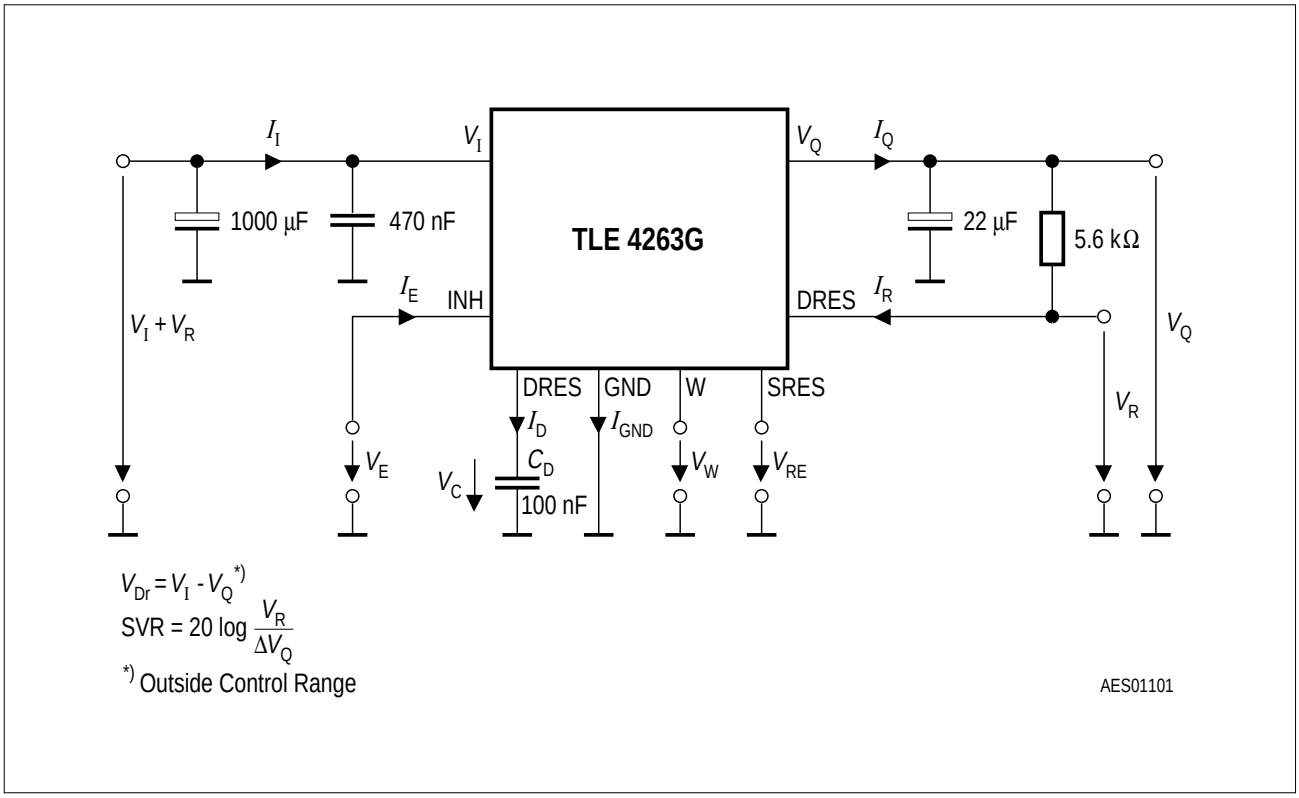
V_I = 13.5 V; T_j = 25 °C; V_e > 3.5 V; (unless specified otherwise)

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Saturation voltage	V_C	–	50	100	mV	$V_Q < V_{RT}$
Delay switching threshold	V_{dT}	1.5	1.7	2.1	V	–
Switching threshold	V_{ST}	0.2	0.35	0.55	V	–
Charge current	I_d	40	60	80	µA	–
Delay time	t_d	–	2.8	–	ms	C_d = 100 nF
Delay time	t_t	–	2	–	µs	C_d = 100 nF
Watchdog						
Discharge current	I_{Cd}	4.4	6.25	8.2	µA	V_C = 1.5 V
Switching voltage	V_{Cd}	1.5	1.7	2.1	V	–
Pulse time	T_W	–	22.5	–	ms	C_d = 100 nF
Inhibit						
Switching voltage	$V_{e\ ON}$	3.5	–	–	V	IC turned on
Turn-OFF voltage	$V_{e\ OFF}$	–	–	0.8	V	IC turned off
Input current	I_e	5	10	15	µA	V_e = 5 V

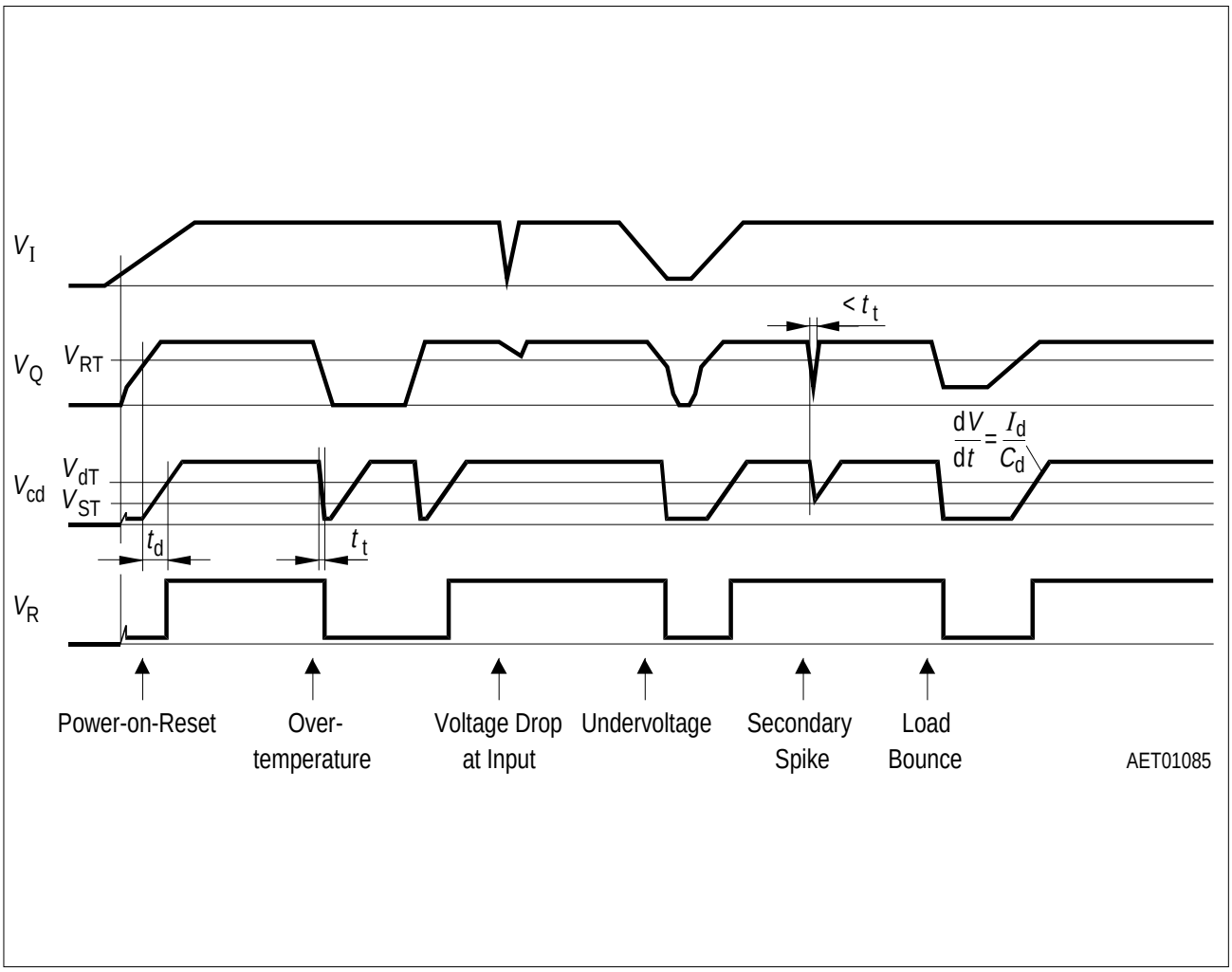
Note: The reset output is low within the range V_Q = 1 V to V_{RT}



Application Circuit

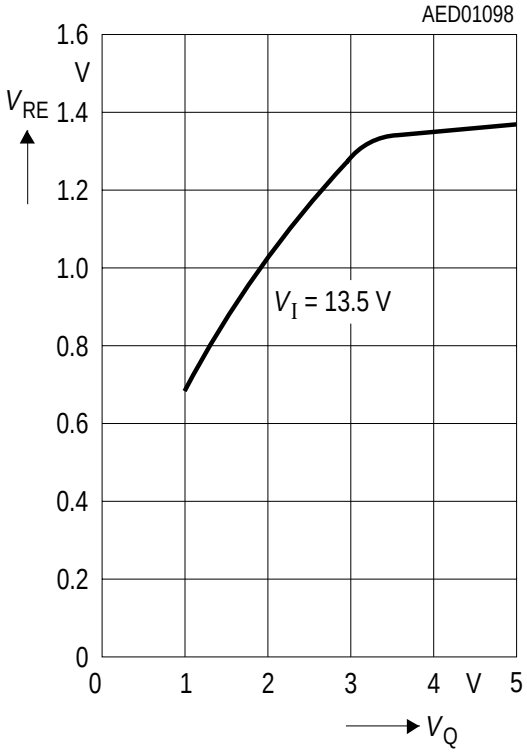


Test Circuit

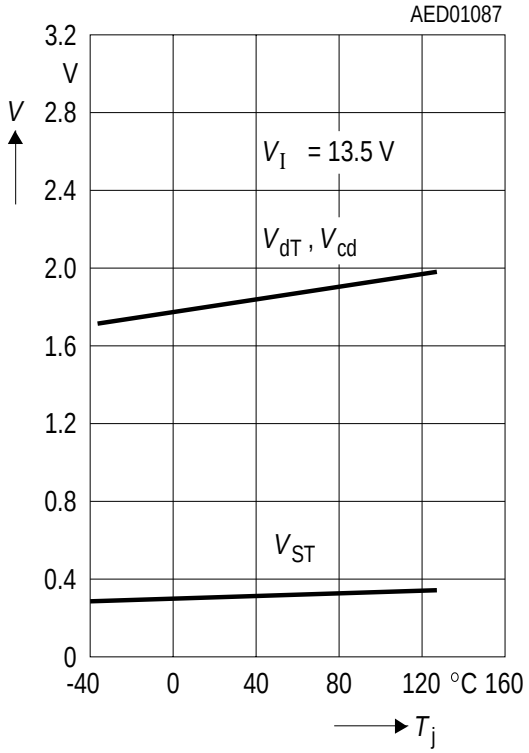


Time Response, Watchdog with High-Frequency Clock

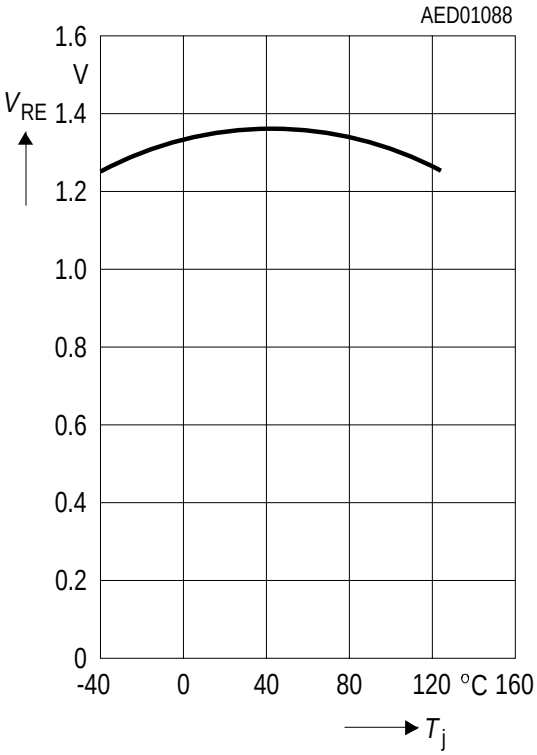
Reset Threshold versus Output Voltage



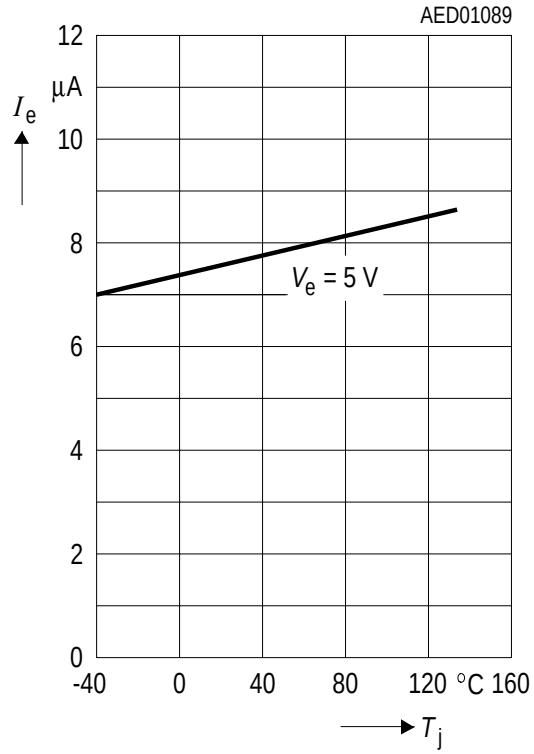
Switching Voltage V_{Cd}, V_{dT} and V_{ST} versus Temperature



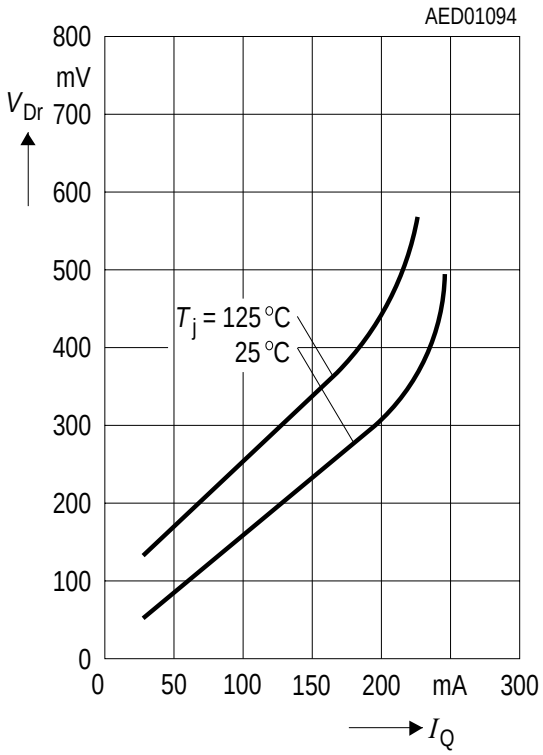
Reset Switching Threshold versus Temperature



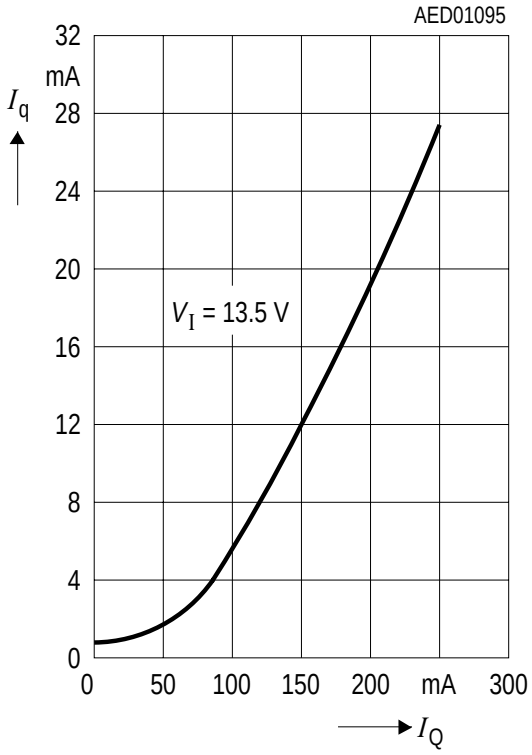
Current Consumption of Inhibit versus Temperature



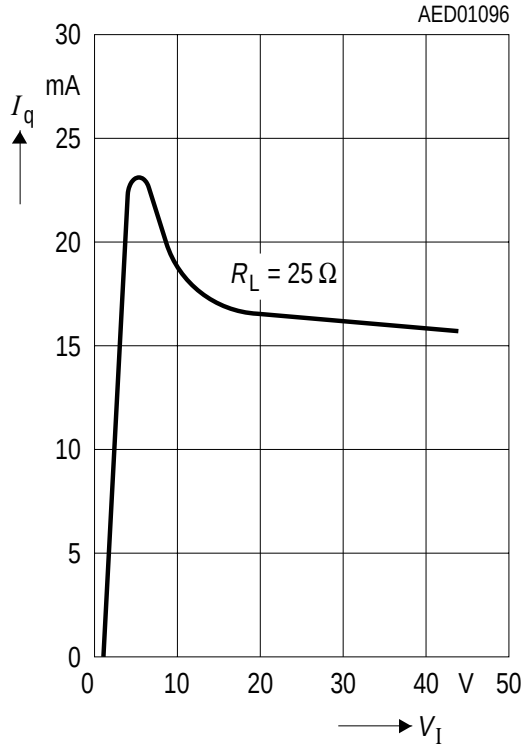
Drop Voltage versus OutputCurrent



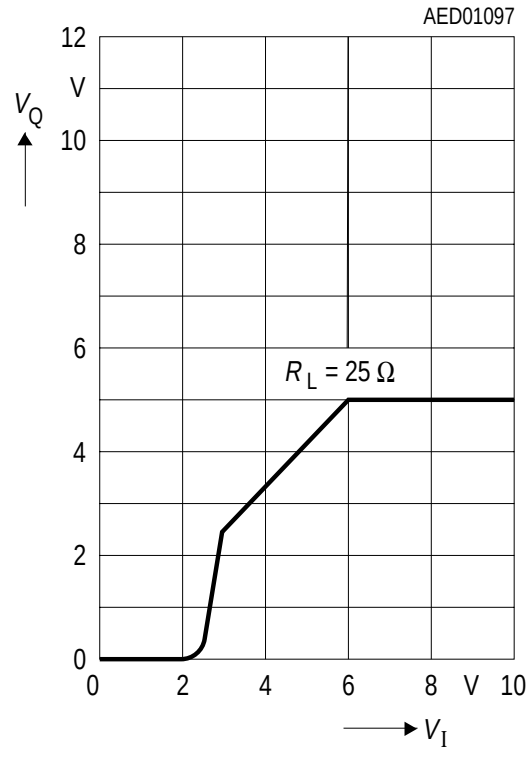
Current Consumption versus Output Current



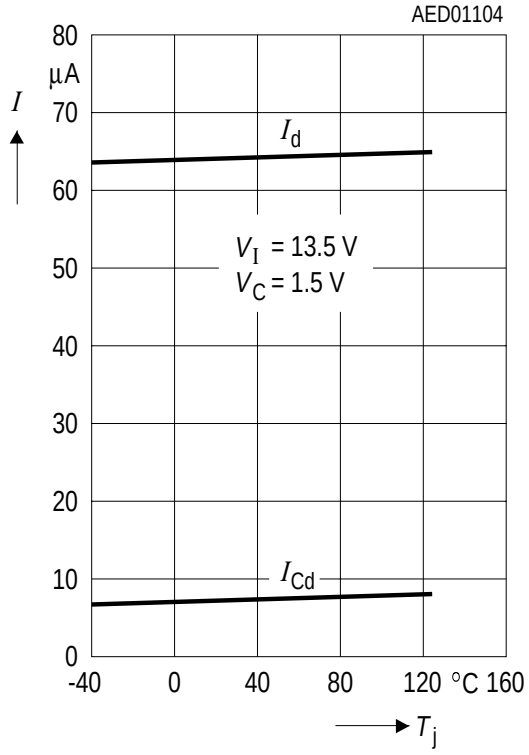
Current Consumption versus Input Voltage



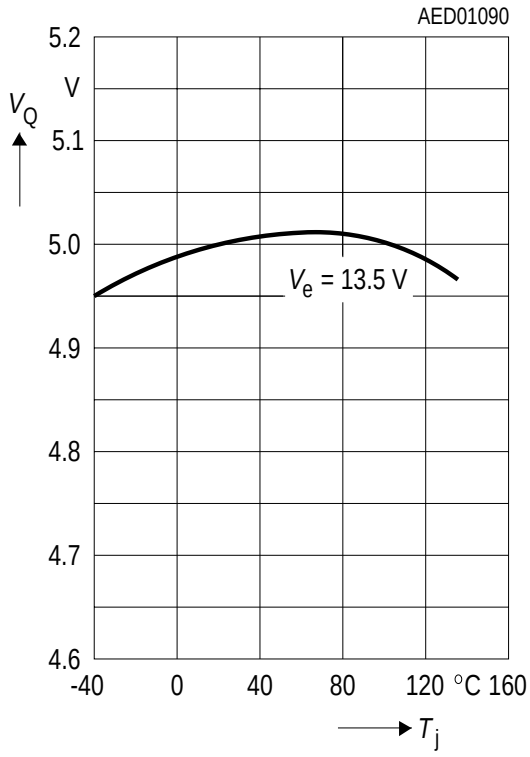
Output Voltage versus Input Voltage



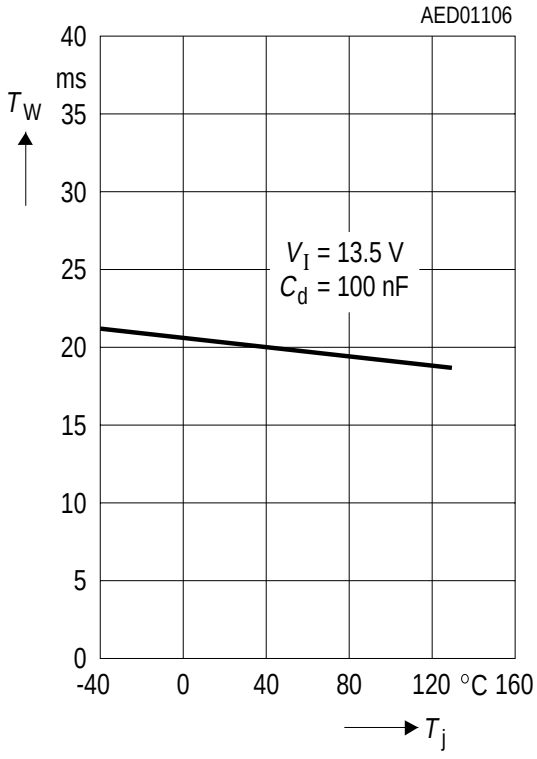
Charge Current and Discharge Current versus Temperature



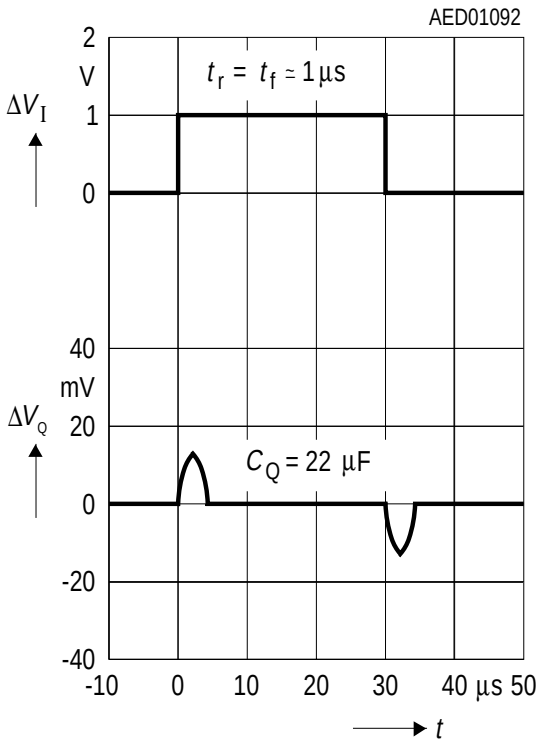
Output Voltage versus Temperature



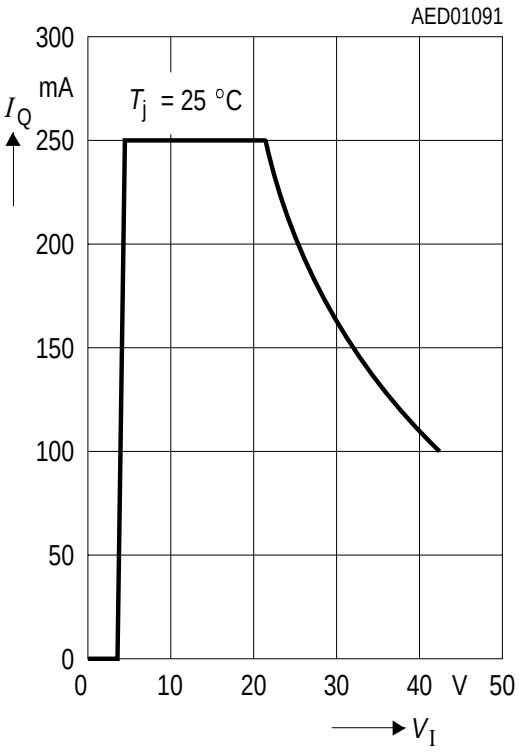
Pulse Time versus Temperature



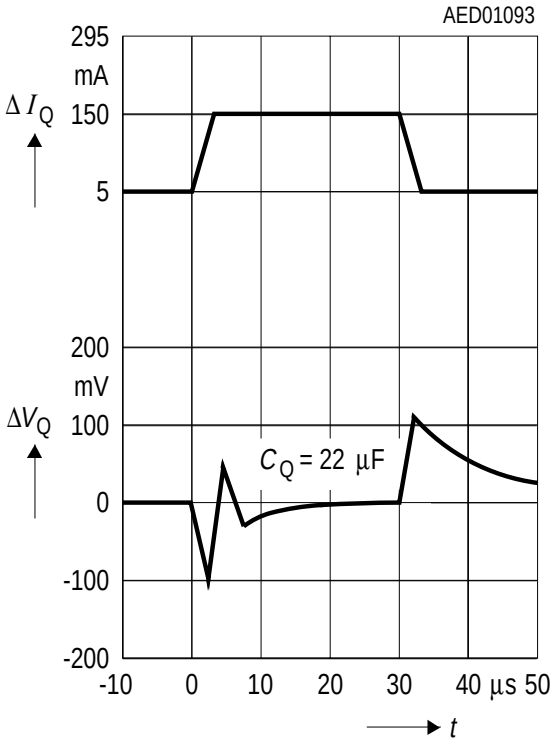
Input Response



Output Current versus Input Voltage

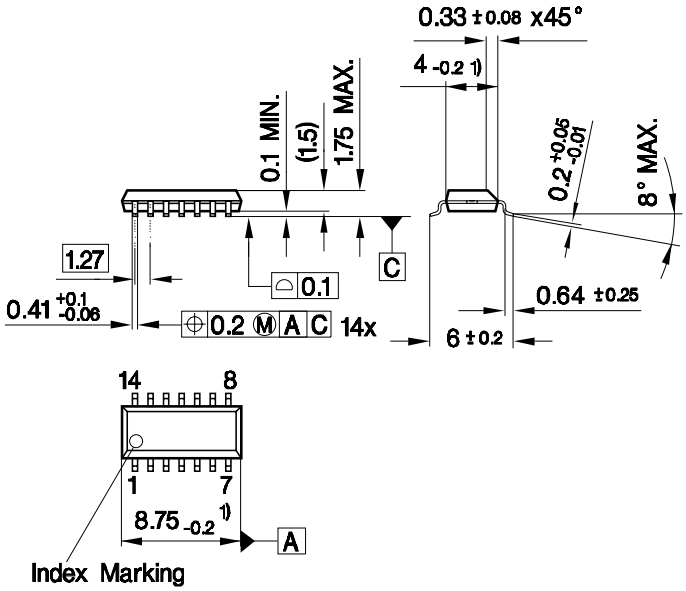


Load Response



Package Outlines

P-DSO-14-8
(Plastic Dual Small Outline)



1) Does not include plastic or metal protrusion of 0.15 max. per side

GPS09222

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

SMD = Surface Mounted Device

Dimensions in mm

Edition 1999-10-12

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