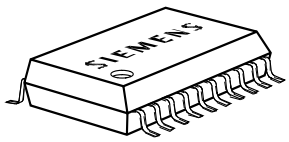
SIEMENS

5-V Low-Drop Fixed Voltage Regulator TLE 4268

Features

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

P-DSO-8-1



P-DSO-20-6

Type	Ordering Code	Package
TLE 4268 GS	Q67006-A9229	P-DSO-8-1 (SMD)
TLE 4268 G	Q67006-A9146	P-DSO-20-6 (SMD)

Functional Description

This device is a 5-V low-drop fixed-voltage regulator. The maximum input voltage is 45 V. It can deliver an output current of at least 180 mA. The IC is short-circuit proof and features temperature protection that disables the circuit in the event of impermissibly high temperatures. The watchdog function is disabled as a function of the load, so that a controller is not interrupted during sleep mode by a watchdog reset.

Application Description

The IC regulates an input voltage V_i in the range 5.5 V < V_i < 45 V to V_{qrated} = 5.0 V. In the event of an output voltage $V_Q < V_{RT}$, a reset signal is generated. The wiring of the reset switching threshold input enables the value of V_{RT} to be reduced. The reset delay time can be adjusted using an external capacitor. The integrated watchdog monitors the connected active controller. If there is no positive-going edge at the watchdog input, the reset output is set to low. The reset delay capacitor provides a wide adjustment range for the pulse repetition time. The watchdog function is only activated if the load exceeds 8 mA. This ensures that a microcontroller is not activated during power-down and the current drain is not increased. The IC is protected against overload and overtemperature.

Pin Configuration
(top view)

P-DSO-8-1

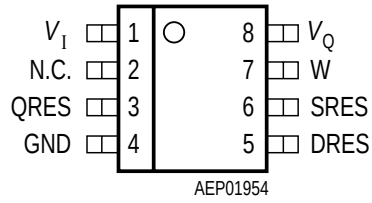


Figure 1

Pin Definitions and Functions

Pin	Symbol	Function
1	V_I	Input voltage
2	N. C.	Not connected
3	QRES	Reset output
4	GND	Ground
5	DRES	Reset delay
6	SRES	Reset switching threshold
7	W	Watchdog input
8	V_Q	5-V output voltage

Pin Configuration
(top view)

P-DSO-20-6

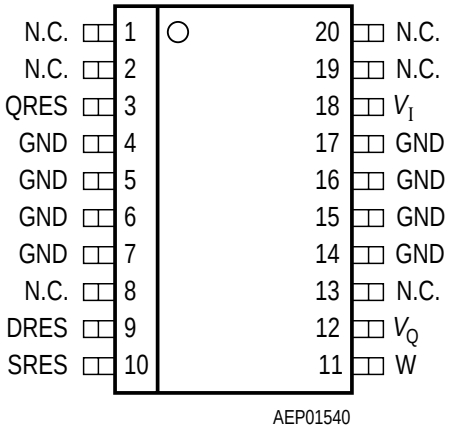


Figure 2

Pin Definitions and Functions

Pin	Symbol	Function
1, 2, 8, 13, 19, 20	N. C.	Not connected.
3	QRES	**Reset output**; the open collector output is connected to the 5-V output via an integrated resistor of 30 kΩ.
4 … 7, 14 … 17	GND	**Ground**
9	DRES	**Reset delay**; connect a capacitor to ground for delay time adjustment.
10	SRES	**Reset switching threshold**; for setting the switching threshold, output to ground with voltage divider. If this input is connected to ground, the reset is triggered at an output voltage of 4.5 V.
11	W	**Watchdog input**; positive-edge-triggered input for monitoring a microcontroller.
12	V_Q	**5-V output voltage;** block to ground with 22-µF capacitor, ESR < 3 Ω.
18	V_I	**Input voltage;** block to ground directly on the IC with ceramic capacitor.

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 generated on the reset output and not cancelled again until the upper threshold voltage 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 monitored by the watchdog logic. If pulses are missing, the rest output is set to low. The pulse sequence time can be set within a wide range with the reset delay capacitor. The IC also incorporates a member of internal circuits for protection against:

- Overload
- Overtemperature
- Reverse polarity

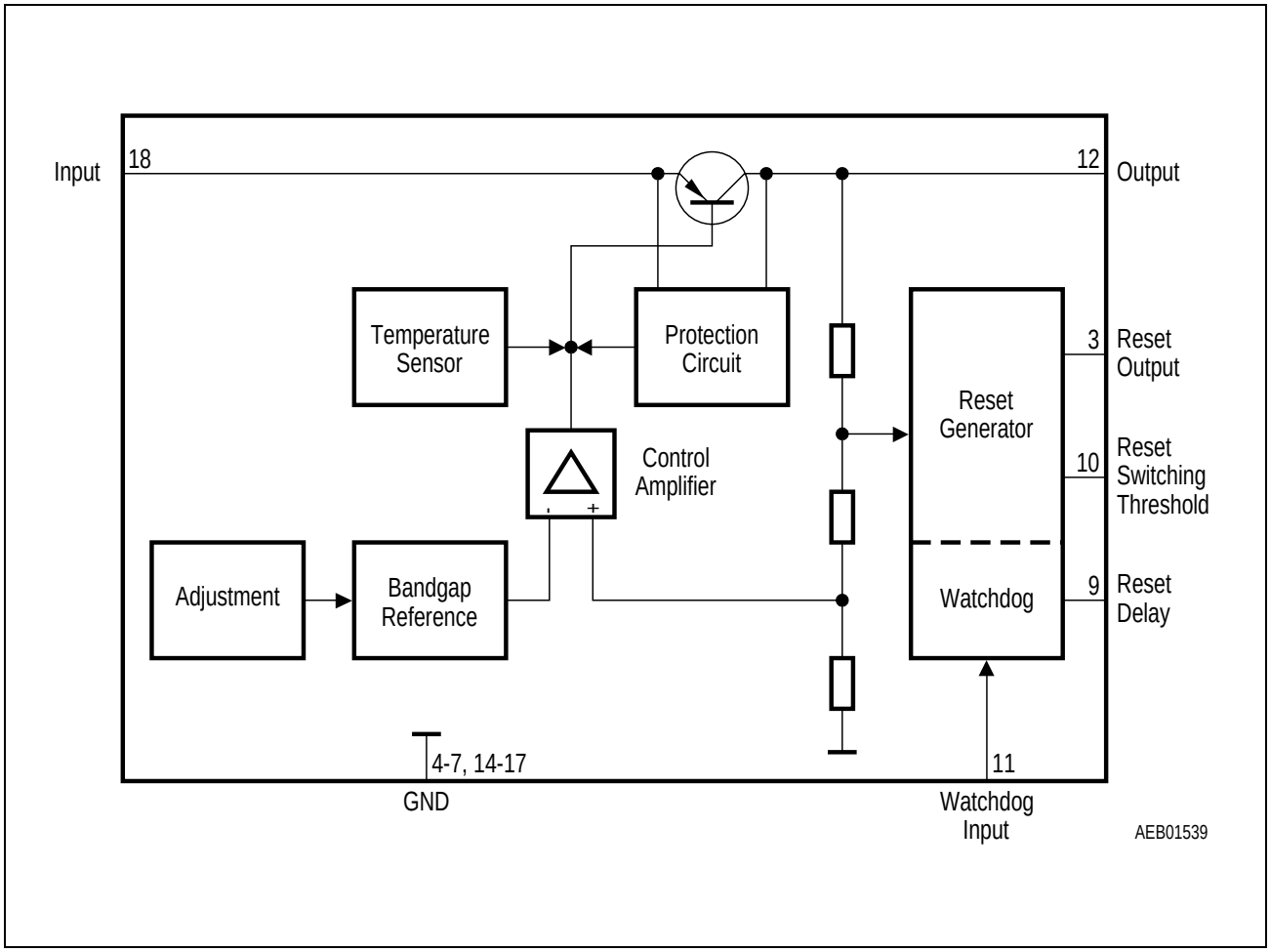


Figure 3
Block Diagram

Absolute Maximum Ratings
T_j = – 40 to 150 °C

Parameter	Symbol	Limit Values		Unit	Notes
		min.	max.		
Input					
Input voltage Input current	V_I I_I	– 30	45	V	 Internally limited
Reset Output					
Voltage Current	V_R I_R	– 0.3	7	V	 Internally limited
Reset Delay					
Voltage Current	V_D I_D	– 0.3	7	V	 Internally limited
Watchdog					
Watchdog input	V_W	– 0.3	7	V	–
Reset Input					
Reset threshold	V_{RE}	– 0.3	7	V	–
Output					
Output voltage Output current	V_Q I_Q	– 0.3	7	V	 Internally limited
Ground					
Current	I_M	– 100	50	mA	–
Temperatures					
Junction temperature Storage temperature	T_j T_S	 – 50	150 150	°C °C	–

Operating Range

Parameter	Symbol	Limit Values		Unit	Notes
		min.	max.		
Input voltage	V_I	–	45	V	–
Junction temperature	T_j	– 40	150	°C	–

Thermal Resistance

Junction ambient (soldered)	R_{thjA} R_{thjA}	–	200 70	K/W K/W	P-DSO-8-1 P-DSO-20-6
Junction case	R_{thjC} R_{thjC}	–	60 25	K/W K/W	P-DSO-8-1 P-DSO-20-6

Optimum reliability and life time are guaranteed if the junction temperature does not exceed 125 °C in operating mode. Operation at up to the maximum junction temperature of 150 °C is possible in principle. Note, however, that operation at the maximum permitted ratings could affect the reliability of the device.

Characteristics

V_I = 13.5 V; – 40 °C ≤ T_j ≤ 125 °C (unless otherwise specified)

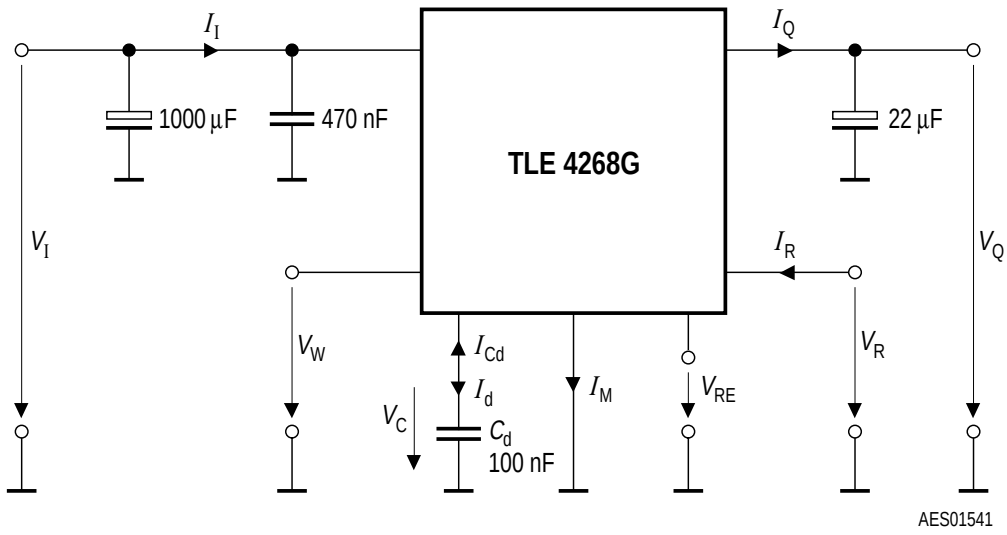
Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Output voltage	V_Q	4.90	5.00	5.10	V	5 mA ≤ I_Q ≤ 150 mA; 6 V ≤ V_I ≤ 28 V;
Output current limiting	I_Q	180	250	–	mA	–
Current consumption $I_q = I_I - I_Q$	I_q	–	300	450	µA	I_Q = 0 mA
Current consumption $I_q = I_I – I_Q$	I_q	–	13	20	mA	I_Q = 150 mA
Drop voltage	V_{DR}	–	0.25	0.5	V	I_Q = 150 mA[1)]
Load regulation	ΔV_Q	–	10	30	mV	I_Q = 5 to 150 mA
Supply voltage regulation	ΔV_Q	–	10	30	mV	V_I = 6 to 28 V I_Q = 150 mA

1) 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; – 40 °C ≤ T_j ≤ 125 °C (unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Reset Generator						
Switching threshold	V_{RT}	4.2	4.5	4.8	V	–
Switching voltage	V_{RE}	1.28	1.35	1.45	V	–
Saturation voltage	V_R	–	0.2	0.5	V	1 mA extern
Saturation voltage	V_C	–	30	100	mV	$V_Q < V_{RT}$
Charging current	I_d	5	12	18	µA	V_C = 1.0 V
Delay switching threshold	V_{DU}	1.4	1.8	2.2	V	–
Delay time	t_d	10	15	25	ms	C_d = 100 nF
Delay time	t_t	–	2	–	µs	C_d = 100 nF
Pull-up	R_R	18	30	46	kΩ	with resp. to V_Q
Lower switching threshold	V_{DRL}	0.2	0.4	0.55	V	–
Watchdog						
Discharge current	I_{Cd}	1.5	3.5	5.2	µA	V_C = 1.0 V
Charging current	I_d	5	12	18	µA	V_C = 1.0 V
Switching voltage	V_{Cd}	1.6	1.8	2.0	V	–
Lower switching threshold	V_{DWL}	0.2	0.4	0.55	V	–
Watchdog periode	T_{WP}	30	55	75	ms	C_d = 100 nF
Watchdog trigger time	T_{WT}	25	40	60	ms	C_d = 100 nF
Activating current	I_Q	2	8	15	mA	Activates watchdog
Slew rate	V_W	5	–	–	V/µs	from 20 % up to 80 % V_Q

Note: The reset output is low in range from V_Q = 1 V to V_{RT}.



$V_{Dr} = V_I - V_Q$ Outside the control range

Figure 4
Test Circuit

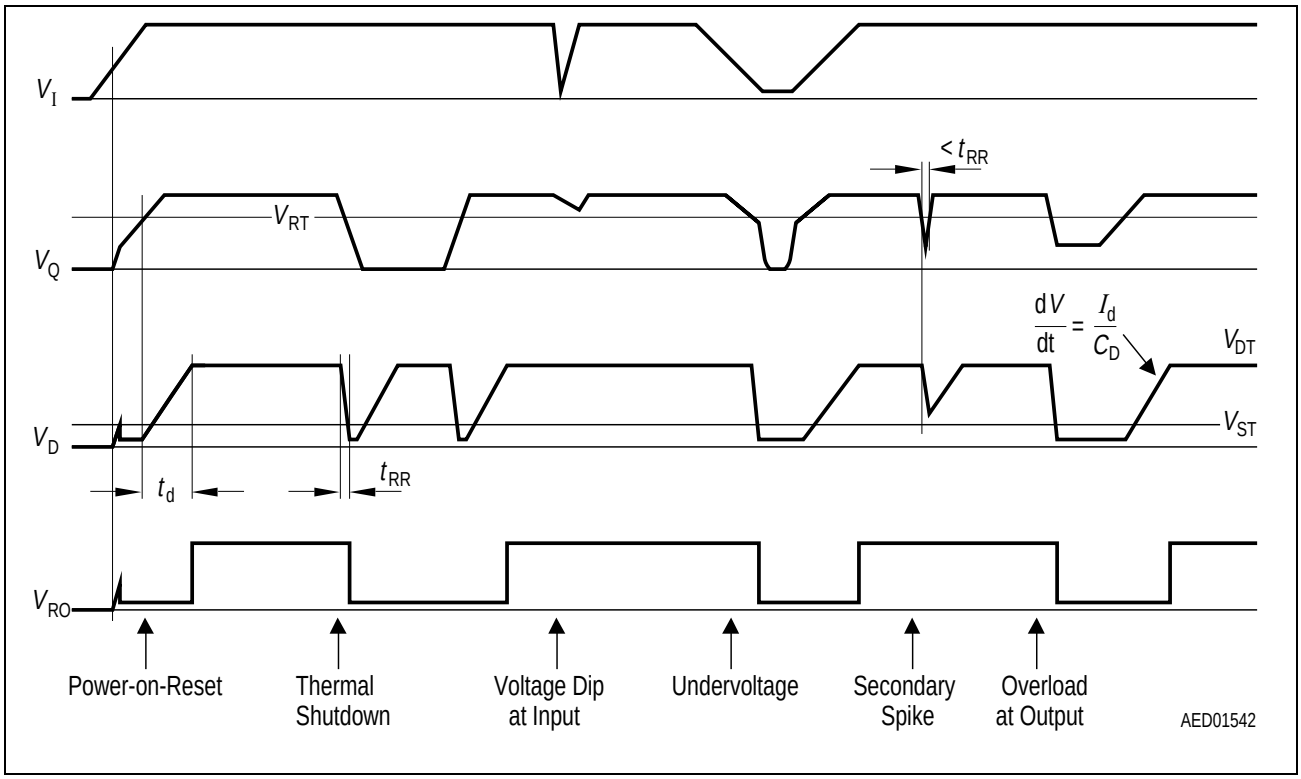


Figure 5
Timing (Watchdog Disabled)

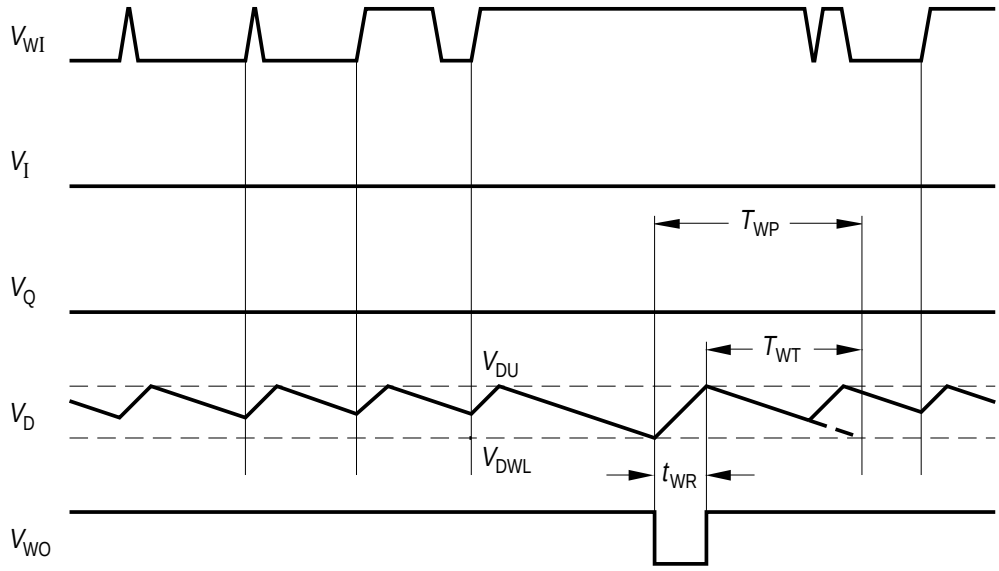
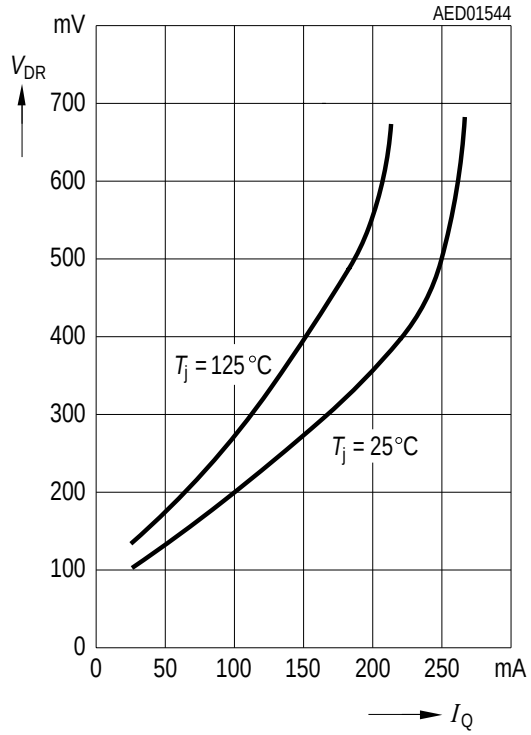
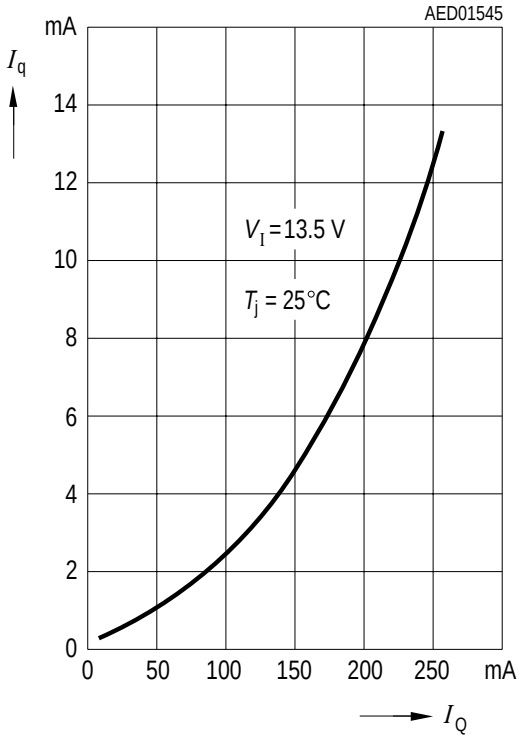


Figure 6
Timing of the Watchdog Function

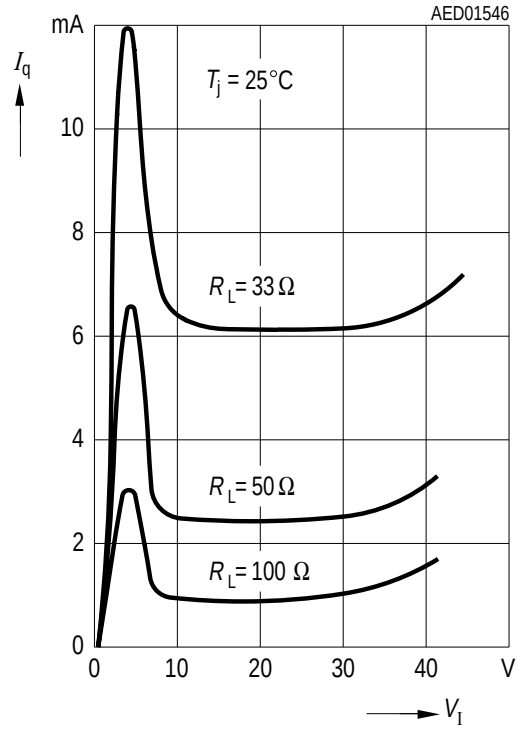
Drop Voltage V_{Dr} versus Output Current I_Q



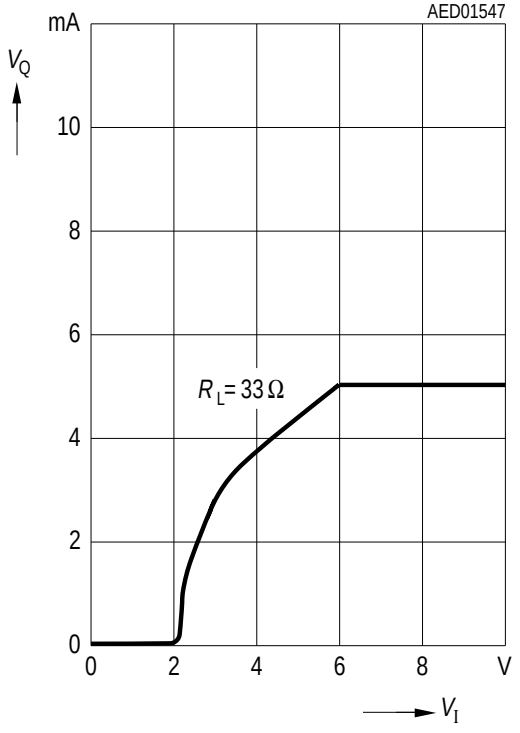
Current Consumption I_q versus Output Current I_Q



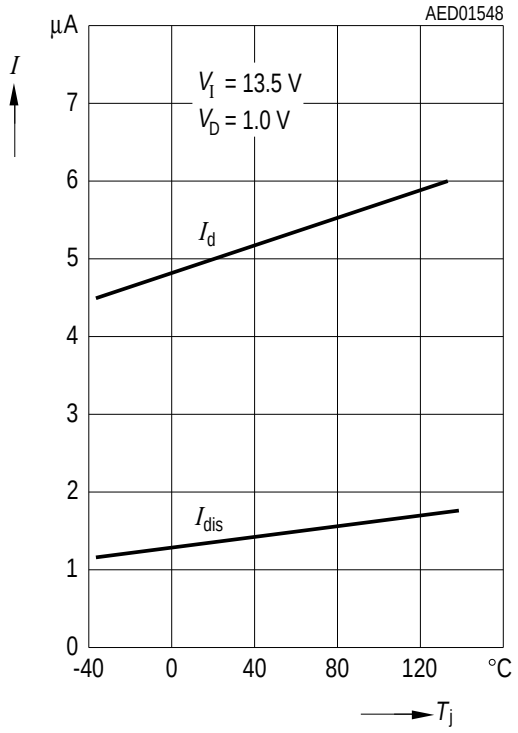
Current Consumption I_q versus Input Voltage V_i



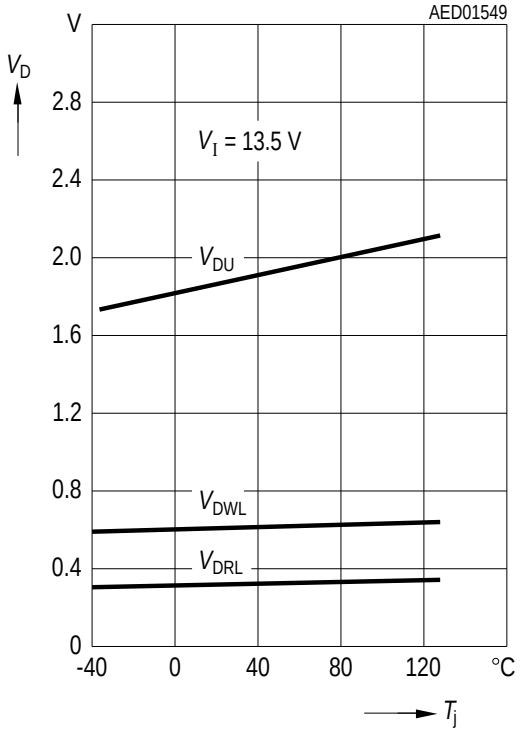
Output Voltage versus Input Voltage V_i



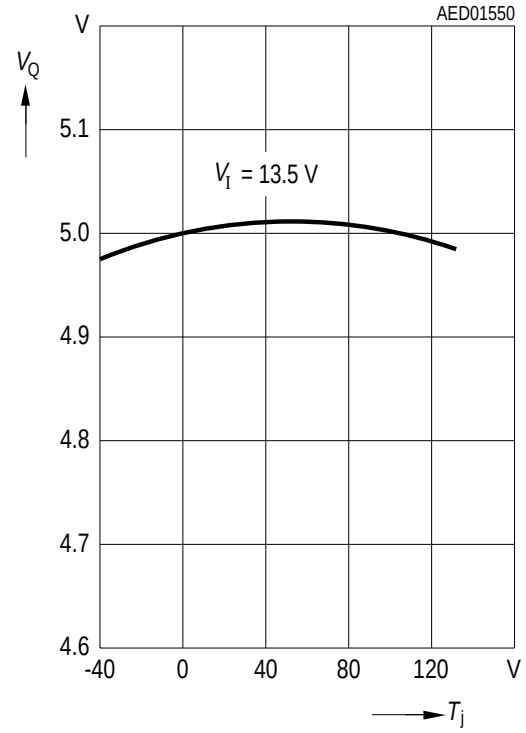
Charge Current I_d and Discharge Current I_{cd} versus Temperature T_j



Switching Voltage V_{Cd} and V_{ST} versus Temperature T_j



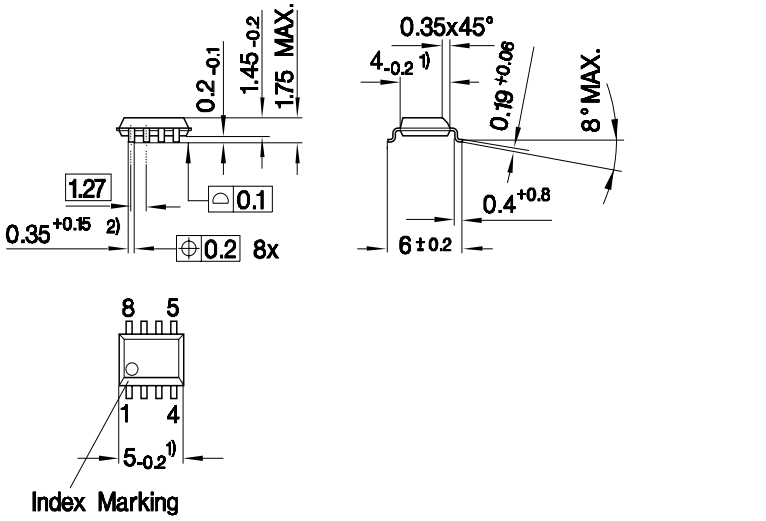
Output Voltage V_Q versus Temperature T_j



Output Current I_Q versus Input Voltage V_i

Package Outlines

P-DSO-8-1
(Plastic Dual Small Outline)



1) Does not include plastic or metal protrusion of 0.15 max. per side
2) Lead width can be 0.61 max. in dambar area

GPS05121

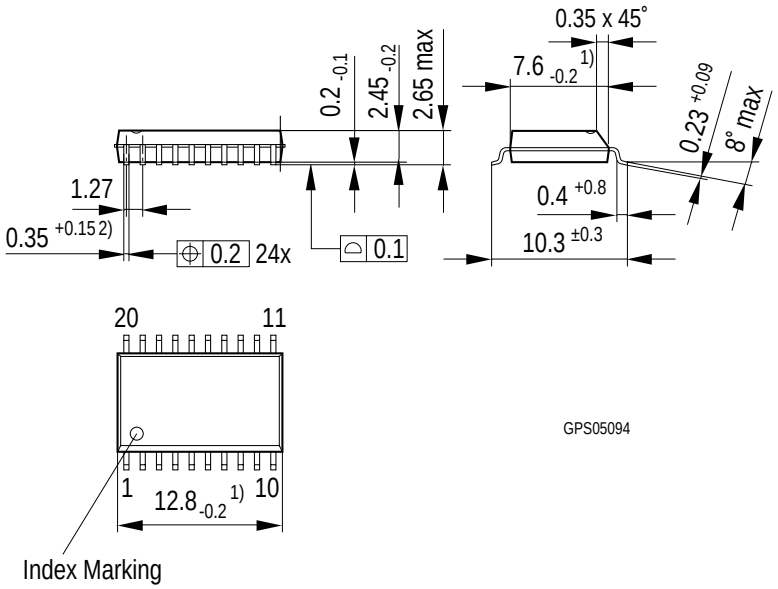
Sorts of Packing
Package outlines for tubes, trays etc. are contained in our Data Book “Package Information”.

SMD = Surface Mounted Device

Dimensions in mm

Package Outlines (cont'd)

P-DSO-20-6
(Plastic Dual Small Outline)



1) Does not include plastic or metal protrusions of 0.15 max per side
2) Does not include dambar protrusion of 0.05 max per side

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Dimensions in mm