# 1-A Dual-HBD (Dual-Half-Bridge Driver)   TLE 4207

Overview

Features

- Delivers up to 0.8 A continuous
- Optimized for DC motor management applications
- Very low current consumption
  in stand-by (Inhibit) mode
- Low saturation voltage; typ.1.2 V total @ 25 °C;
  0.4 A
- Output protected against short circuit
- Error flag diagnosis
- Overvoltage lockout and diagnosis
- Undervoltage lockout
- CMOS/TTL compatible inputs with hysteresis
- No crossover current
- Internal clamp diodes
- Overtemperature protection with hysteresis
  and diagnosis
- Enhanced power P-DSO-Package
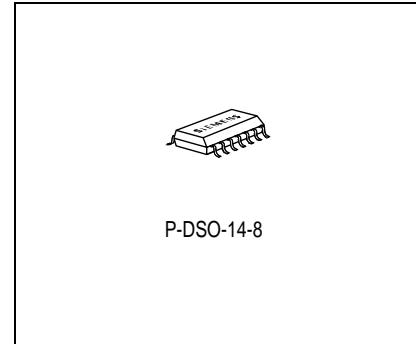
P-DSO-14-8

Type	Ordering Code	Package
TLE 4207 G	Q67006-A9275	P-DSO-14-8

Description

The TLE 4207 is a fully protected **Dual-H**alf-**B**ridge-**D**river designed specially for automotive and industrial motion control applications.

The part is built using the Siemens bipolar high voltage power technology DOPL.

The actuator (DC motor) can be connected direct between the halfbridges. Operation modes forward (cw), reverse (ccw), brake and high impedance are invoked from a

standard interface. The standard enhanced power P-DSO-14 package meets the application requirements and saves PCB-board space and costs.

Furthermore the built in features like diagnosis, over- and undervoltage-lockout, short-circuit-protection, over-temperature-protection and the very low quiescent current in stand-by mode will open a wide range of automotive and industrial applications.


V_S	☐☐	1	○	14	☐☐	N.C.
OUT2	☐☐	2		13	☐☐	OUT1
GND	☐☐	3	**TLE**	12	☐☐	GND
GND	☐☐	4	**4207G**	11	☐☐	GND
GND	☐☐	5		10	☐☐	GND
IN2	☐☐	6		9	☐☐	IN1
INH	☐☐	7		8	☐☐	EF

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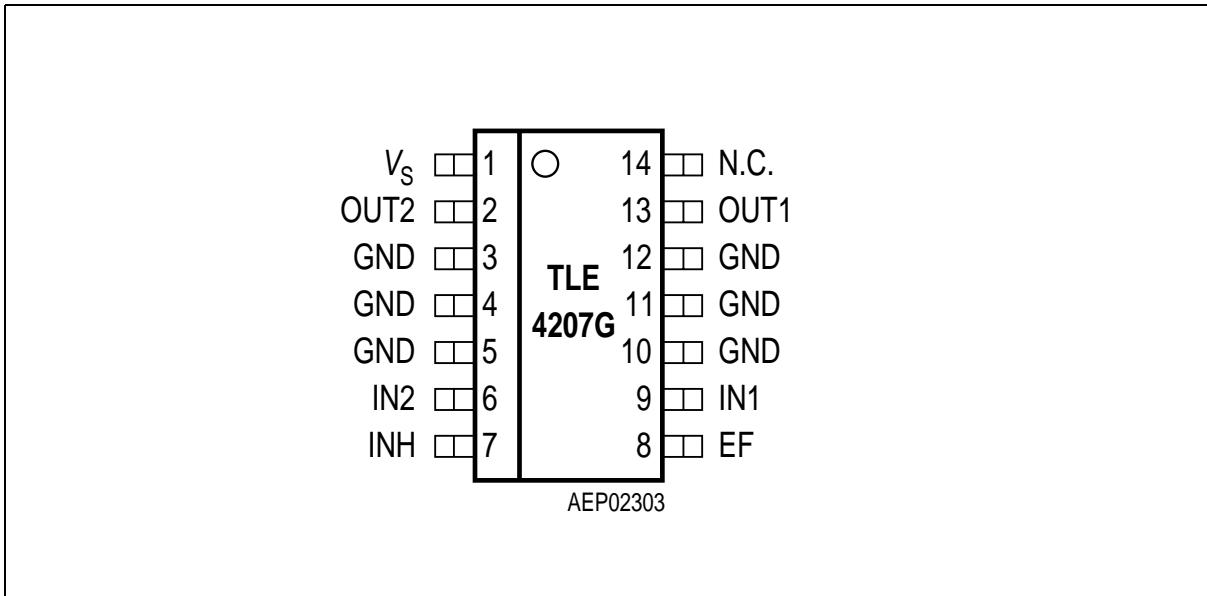
Figure 1   Pin Configuration (top view)

Pin Definitions and Functions

Pin No. P-DSO-14-8	Symbol	Function
1	V_S	**Power supply voltage;** positive reference potential for blocking capacitor
2	OUT2	**Power-output 2;** full short circuit protected; with integrated clamp diodes
3, 4, 5, 10, 11, 12	GND	**Ground;** **negative** reference potential for blocking capacitor
6	IN2	**Input channel 2;** controls OUT2 (not inverted)
7	INH	**Inhibit input;** low = IC in stand-by
8	EF	**Error Flag output;** open collector; low = error
9	IN1	**Input channel 1;** controls OUT1 (not inverted)

Data Sheet   2   2000-12-05

Pin Definitions and Functions

Pin No. P-DSO-14-8	Symbol	Function
13	OUT1	**Power output 1;** full short circuit protected; with integrated clamp diodes
14	N.C.	**Not connected**

INH	IN1	IN2	OUT1	OUT2
0	X	X	Z	Z
1	0	0	L	L
1	0	1	L	H
1	1	0	H	L
1	1	1	H	H
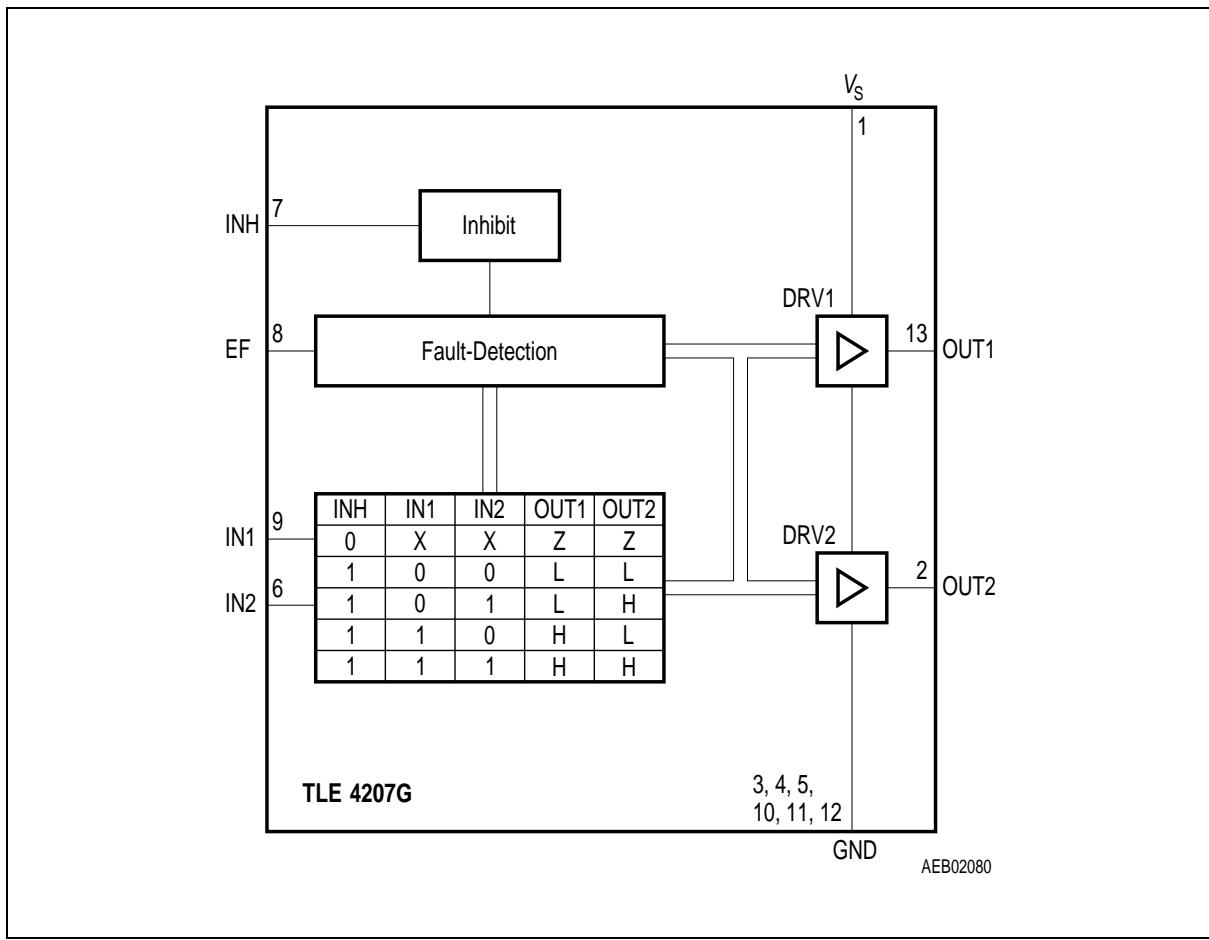
Figure 2   Block Diagram

Functional Truth Table

INH	IN1	IN2	OUT1	OUT2	Mode
0	X	X	Z	Z	Stand-By
1	0	0	L	L	Brake LL
1	0	1	L	H	CW
1	1	0	H	L	CCW
1	1	1	H	H	Brake HH

IN: 0 = Logic LOW   OUT: Z = Output in tristate condition
      1 = Logic HIGH   L = Output in sink condition
      X = don't care   H = Output in source condition

Diagnosis

EF	Error
1	no error
0	over temperature
0	over voltage

Electrical Characteristics

Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		

Voltages

Parameter	Symbol	min.	max.	Unit	Remarks
Supply voltage	V_S	-0.3	45	V	–
Supply voltage	V_S	-1	–	V	$t < 0.5$ s; $I_S > -2$ A
Logic input voltages (IN1; IN2; INH)	V_I	-5	20	V	0 V $< V_S < 45$ V
Logic output voltage (EF)	V_{EF}	-0.3	20	V	0 V $< V_S < 45$ V

Currents

Parameter	Symbol	min.	max.	Unit	Remarks
Output current (cont.)	I_{OUT1-2}	–	–	A	internally limited
Output current (peak)	I_{OUT1-2}	–	–	A	internally limited
Output current (diode)	I_{OUT1-2}	-1	1	A	–
Output current (EF)	I_{OUT1-2}	-2	5	mA	–

Temperatures

Parameter	Symbol	min.	max.	Unit	Remarks
Junction temperature	T_j	-40	150	°C	–
Storage temperature	T_{stg}	-50	150	°C	–

Thermal Resistances

Parameter	Symbol	min.	max.	Unit	Remarks
Junction pin	$R_{thj\text{-}pin}$	–	25	K/W	measured to pin 5
Junction ambient	R_{thjA}	–	65	K/W	–

Note: 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.		
Supply voltage	V_S	$V_{UV\ OFF}$	18	V	After V_S rising above $V_{UV\ ON}$
Supply voltage increasing	V_S	– 0.3	$V_{UV\ ON}$	V	Outputs in tristate
Supply voltage decreasing	V_S	– 0.3	$V_{UV\ OFF}$	V	Outputs in tristate
Logic input voltage (IN1; IN2; INH)	V_I	– 2	18	V	–
Junction temperature	T_j	– 40	150	°C	–

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

Electrical Characteristics

8 V < V_S < 18 V; INH = High; $I_{OUT1\text{-}2}$ = 0 A; − 40 °C < T_j < 150 °C;
unless otherwise specified

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

Current Consumption

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Quiescent current	I_S	–	20	50	µA	INH = LOW
Quiescent current	I_S	–	20	30	µA	INH = LOW; V_S = 13.2 V; T_j = 25 °C
Supply current	I_S	–	10	20	mA	–
Supply current	I_S	–	–	30	mA	I_{OUT1} = 0.4 A I_{OUT2} = − 0.4 A
Supply current	I_S	–	–	50	mA	I_{OUT1} = 0.8 A I_{OUT2} = − 0.8 A

Over- and Under Voltage Lockout

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
UV Switch ON voltage	$V_{UV\ ON}$	–	6.5	7.5	V	V_S increasing
UV Switch OFF voltage	$V_{UV\ OFF}$	5.0	6	–	V	V_S decreasing
UV ON/OFF hysteresis	$V_{UV\ HY}$	–	0.5	–	V	$V_{UV\ ON} - V_{UV\ OFF}$
OV Switch OFF voltage	$V_{OV\ OFF}$	–	20	24	V	V_S increasing
OV Switch ON voltage	$V_{OV\ ON}$	18.0	19.5	–	V	V_S decreasing
OV ON/OFF hysteresis	$V_{OV\ HY}$	–	0.5	–	V	$V_{OV\ OFF} - V_{OV\ ON}$

Electrical Characteristics (cont'd)

$8\ V < V_S < 18\ V$; INH = High; $I_{OUT1\text{-}2} = 0\ A$; $-40\ °C < T_j < 150\ °C$;
unless otherwise specified

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

Outputs OUT1-2

Saturation Voltages

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Source (upper) $I_{OUT} = -0.2\ A$	$V_{SAT\ U}$	–	0.85	1.15	V	$T_j = 25\ °C$
Source (upper) $I_{OUT} = -0.4\ A$	$V_{SAT\ U}$	–	0.90	1.20	V	$T_j = 25\ °C$
Sink (upper) $I_{OUT} = -0.8\ A$	$V_{SAT\ U}$	–	1.10	1.50	V	$T_j = 25\ °C$
Sink (lower) $I_{OUT} = 0.2\ A$	$V_{SAT\ L}$	–	0.15	0.23	V	$T_j = 25\ °C$
Sink (lower) $I_{OUT} = 0.4\ A$	$V_{SAT\ L}$	–	0.25	0.40	V	$T_j = 25\ °C$
Sink (lower) $I_{OUT} = 0.8\ A$	$V_{SAT\ L}$	–	0.45	0.75	V	$T_j = 25\ °C$
Total Drop $\quad I_{OUT} = 0.2\ A$	V_{SAT}	–	1	1.4	V	$V_{SAT} = V_{SAT\ U} + V_{SAT\ L}$
Total Drop $\quad I_{OUT} = 0.4\ A$	V_{SAT}	–	1.2	1.7	V	$V_{SAT} = V_{SAT\ U} + V_{SAT\ L}$
Total Drop $\quad I_{OUT} = 0.8\ A$	V_{SAT}	–	1.6	2.5	V	$V_{SAT} = V_{SAT\ U} + V_{SAT\ L}$

Clamp Diodes

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Forward voltage; upper	V_{FU}	–	1	1.5	V	$I_F = 0.4\ A$
Upper leakage current	I_{LKU}	–	–	5	mA	$I_F = 0.4\ A$ [1]
Forward voltage; lower	V_{FL}	–	0.9	1.4	V	$I_F = 0.4\ A$

Notes see page 10.

Electrical Characteristics (cont'd)

8 V < V_S < 18 V; INH = High; I_{OUT1-2} = 0 A; − 40 °C < T_j < 150 °C; unless otherwise specified

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

Input-Interface

Logic Inputs IN1; IN2

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
H-input voltage	V_{IH}	–	2	3	V	–
L-input voltage	V_{IL}	1	1.5	–	V	–
Hysteresis of input voltage	V_{IHY}	–	0.5	–	V	–
H-input current	I_{IH}	– 2	–	10	µA	V_I = 5 V
L-input current	I_{IL}	– 100	– 20	– 5	µA	V_I = 0 V

Logic Input INH

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
H-input voltage	V_{IH}	–	2.7	3.5	V	–
L-input voltage	V_{IL}	1	2	–	V	–
Hysteresis of input voltage	V_{IHY}	–	0.7	–	V	–
H-input current	I_{IH}	–	100	250	µA	V_{INH} = 5 V
L-input current	I_{IL}	– 10	–	10	µA	V_{INH} = 0 V

Error-Flag EF

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
L-output voltage level	V_{EFL}	–	0.2	0.4	V	I_{EF} = 2 mA
Leakage current	I_{EFLK}	–	–	10	µA	0 V < V_{EF} < 7 V

Electrical Characteristics (cont'd)

8 V < V_S < 18 V; INH = High; I_{OUT1-2} = 0 A; − 40 °C < T_j < 150 °C;
unless otherwise specified

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Thermal Shutdown						
Thermal shutdown junction temperature	T_{jSD}	150	175	200	°C	–
Thermal switch-on junction temperature	T_{jSO}	120	–	170	°C	–
Temperature hysteresis	ΔT	–	30	–	K	–

[1]   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 $T_A = 25°C$ and the given supply voltage.
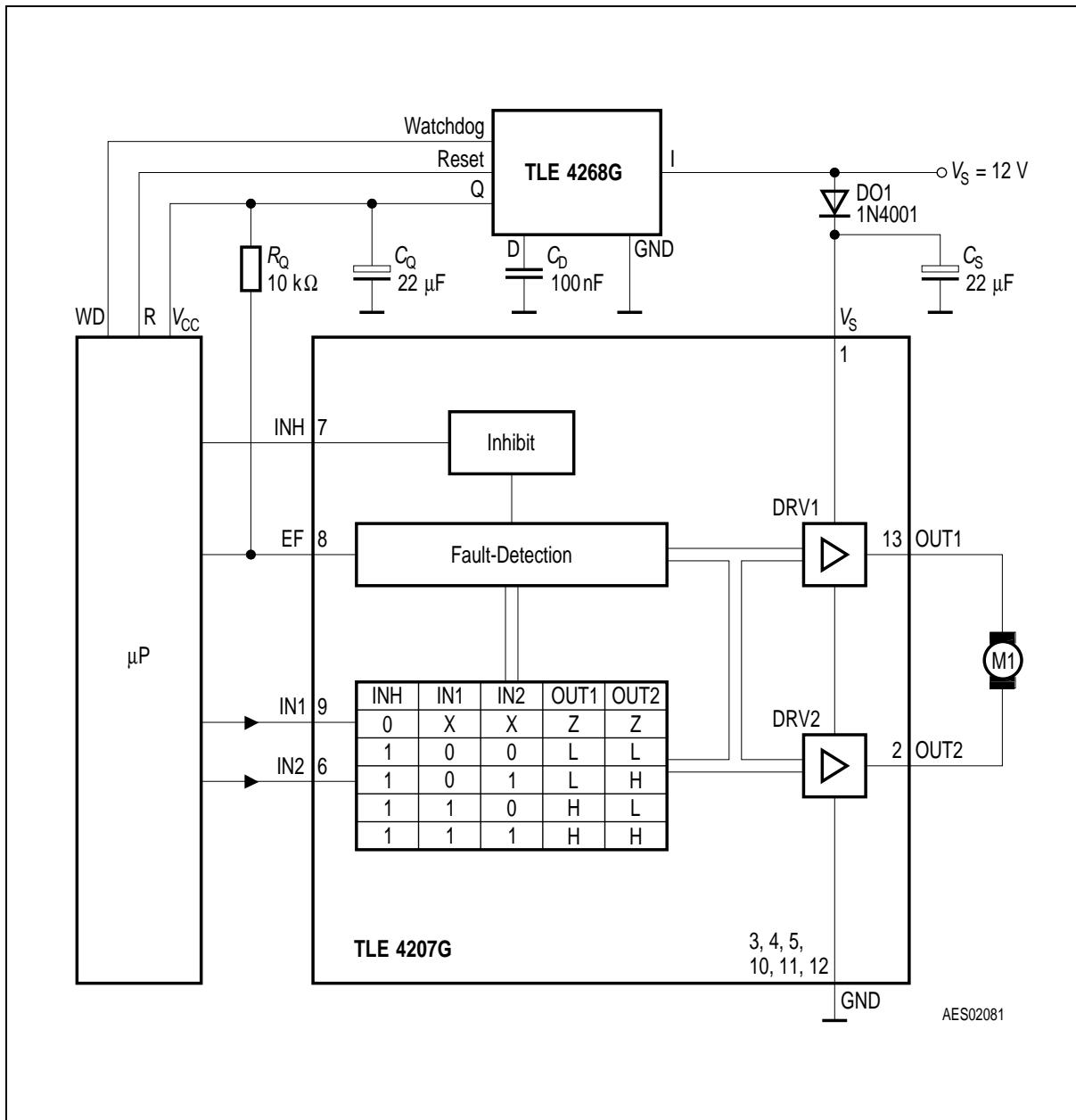
Figure 3   Application Circuit

Truth table (shown in figure):

| INH	IN1	IN2	OUT1	OUT2
0	X	X	Z	Z
1	0	0	L	L
1	0	1	L	H
1	1	0	H	L
1	1	1	H	H

Diagrams

Quiescent current I_S over Temperature
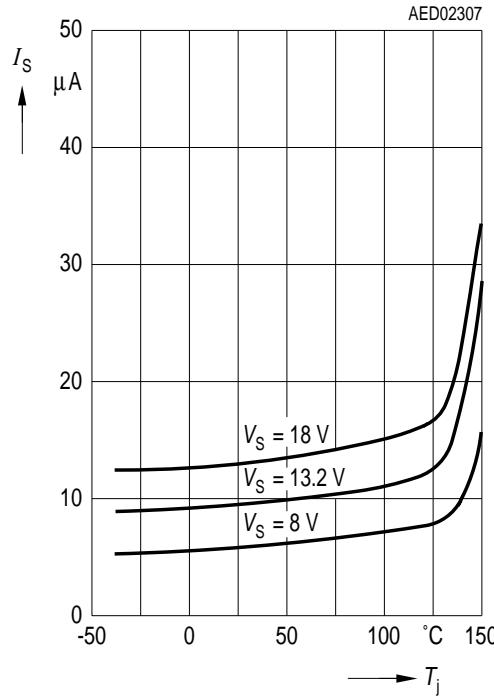
Saturation Voltage of Source $V_{SAT\,U}$ over Temperature
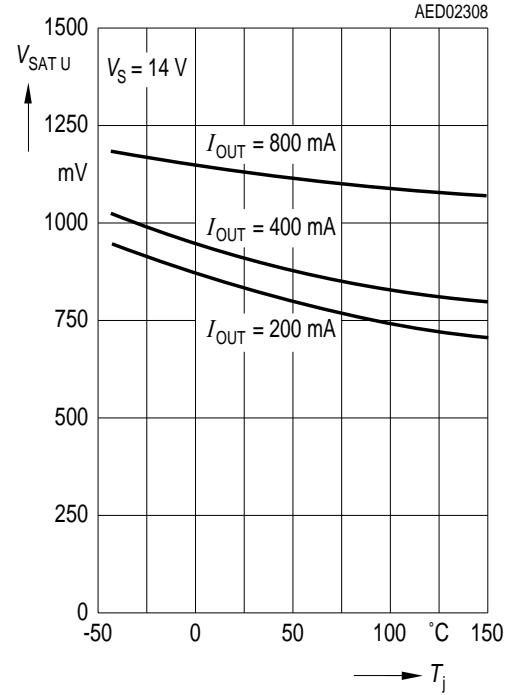
Saturation Voltage of Sink $V_{SAT\,L}$ over Temperature
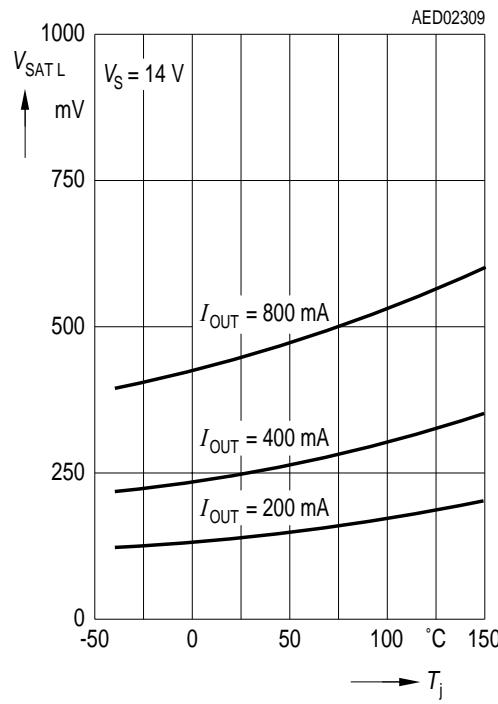
Total Drop at outputs V_{SAT} over Temperature
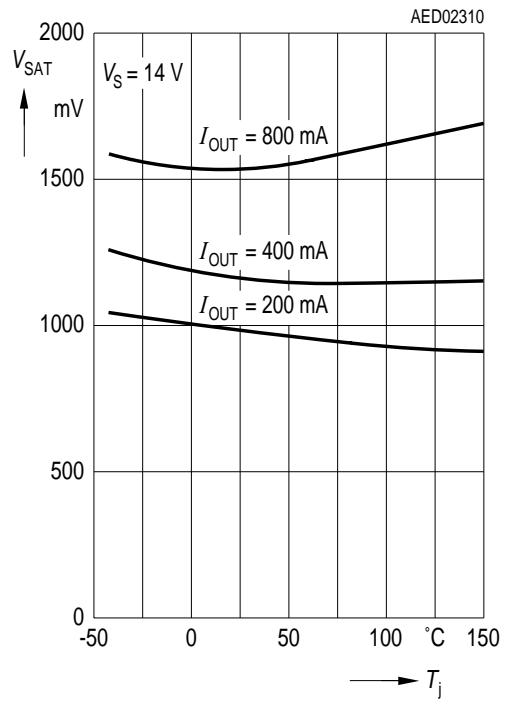
Package Outlines

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

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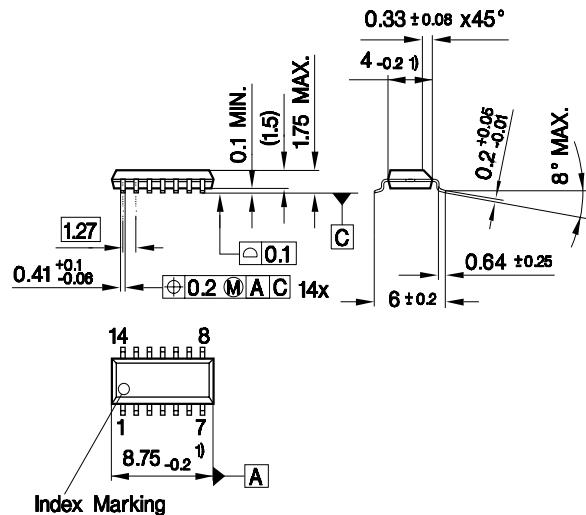
1) Does not include plastic or metal protrusion of 0.15 max. per side

orts of Packing
ackage outlines for tubes, trays etc. are contained in our
ata Book "Package Information".
SMD = Surface Mounted Device

Dimensions in mm