Infineon® Basic LED Driver

TLD1211SJ

High Side Current Source
1 channel
Typical 85mA load current, up to 2.5A load current using external transistors

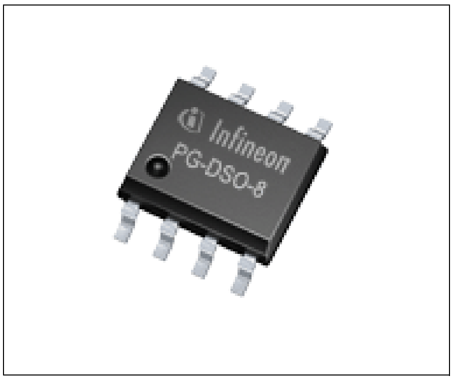
Data sheet

Rev. 1.0, 2010-03-26

Automotive

Basic LED Driver
TLD1211SJ

1 Overview



PG-DSO-8-16

Features

- Adjustable Constant Output Current up to 85 mA
- LED Current of 2.5 A possible by using external Power Transistors
- Voltage Drop across Sense Resistor typ. 0.15 V
- Internal Bandgap Voltage Reference enables High Output Current accuracy
- EN Input for PWM brightness control
- Overvoltage Protection
- Temperature dependent Output Current Reduction
- Very Low Standby Current
- Maximum Operating Voltage 28 V
- Small SMD Package
- Green Product (RoHS compliant)
- AEC Qualified

Applications

- LED Controller for Automotive applications, Low- and High-Power LED
- Universal Constant Current Source
- Interior and Exterior Lighting
- Instrument backlighting
- Illumination

Description

The TLD1211SJ is an integrated adjustable constant current source realized in a bipolar IC technology. The IC is designed to supply LEDs under the severe conditions of automotive applications resulting in constant brightness and extended LED lifetime. The TLD1211SJ is capable to drive high current, high brightness LEDs up to 2.5 A by using additional external output stages as “booster“ transistors. For LED currents up to 85mA the IC can be used as a stand alone device and requires only one voltage sense resistor as an external component.

Protection circuits prevent damage to the device in case of overload, short circuit, over voltage, and overtemperature.

Furthermore, the temperature dependent current reduction is able to protect LEDs which are thermally coupled to the IC. The integrated EN input of the TLD1211SJ enables LED brightness control by pulse width modulation.

Type	Package	Marking
TLD1211SJ	PG-DSO-8-16	TLD1211SJ

2 Block Diagram

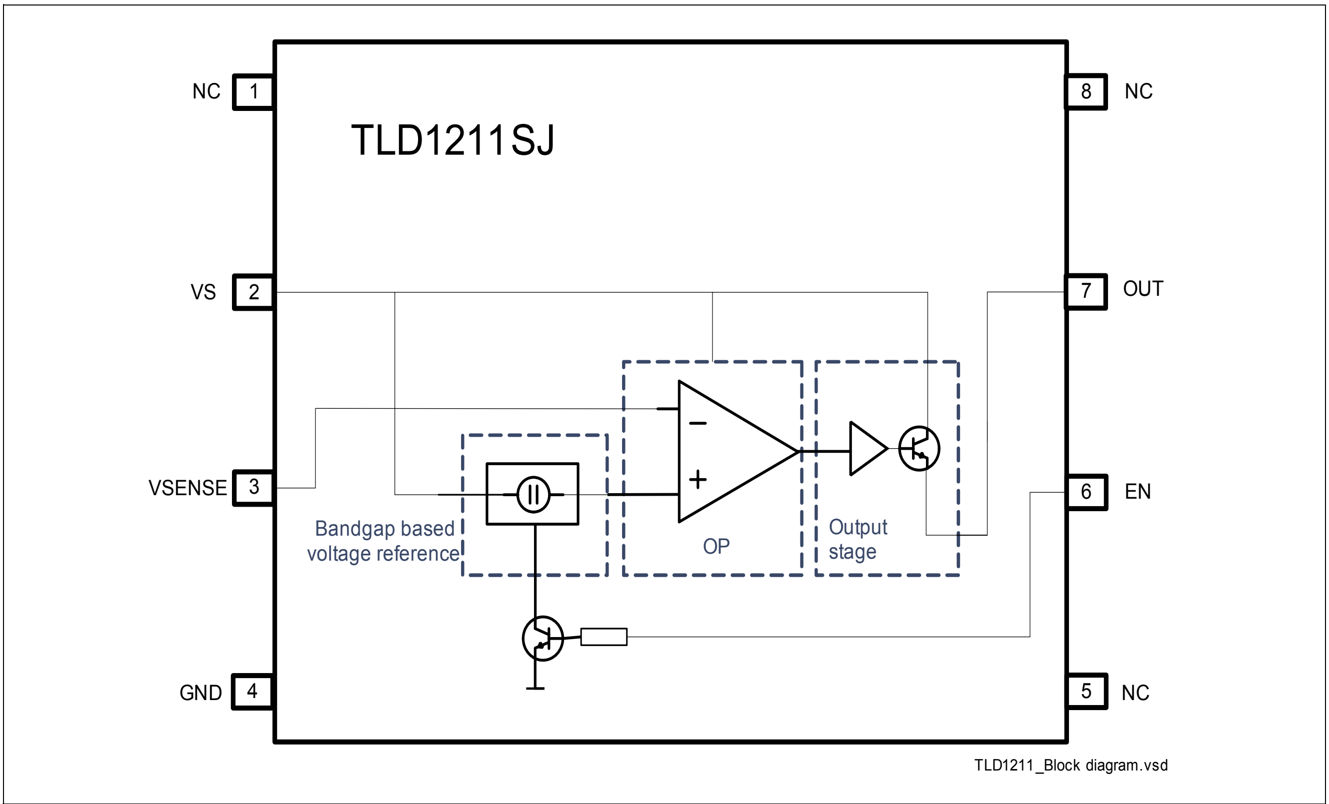


Figure 1 Block Diagram

2.1 Closed Loop Test Setup

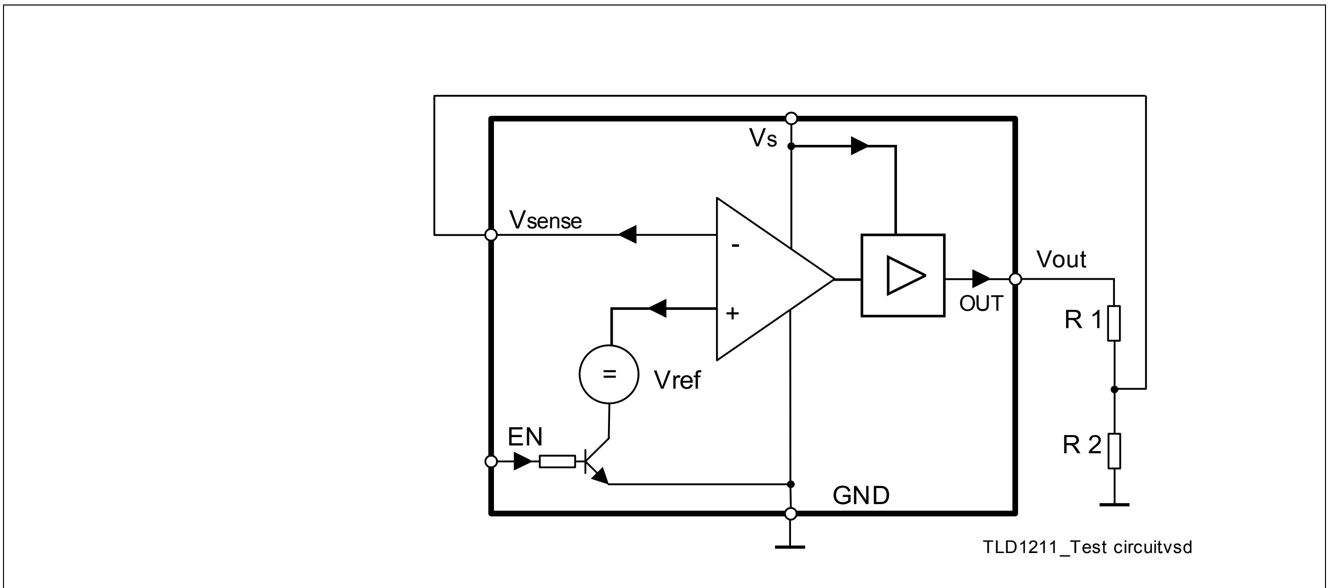


Figure 2 Closed loop Test setup

3 Pin Configuration

3.1 Pin Assignment

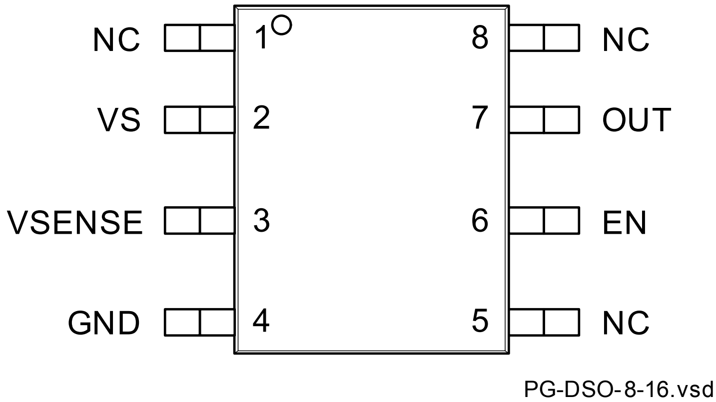


Figure 3 Pin Configuration

3.2 Pin Definition and Functions

Pin	Symbol	Function
1	NC	Not Connected
2	V_S	Supply voltage
3	V_{sense}	Sense input
4	GND	IC ground, connect with pin 2 on PCB
5	NC	Not Connected
6	EN	Enable *(PWM input)*
7	OUT	Output
8	NC	Not Connected

4 Electrical Characteristics

4.1 Absolute Maximum Ratings

Table 1 Absolute Maximum Ratings[1)]

40 °C < T_J < 150 °C; all voltages with respect to ground; positive current defined flowing into pin; unless otherwise specified

Pos.	Parameter	Symbol	Limit values		Unit	Remark
			Min.	Max.		
4.1.1	Supply voltage	V_s	-0.3	45	V	
4.1.2	Sense Voltage	V_{sense}	-0.3	7	V	
4.1.3	EN Voltage	V_{EN}	-0.3	7	V	
4.1.4	Output current	I_{out}	–	–	mA	internally limited
4.1.5	Power Dissipation	P_{tot}	0	500	mW	
4.1.6	Junction temperature	T_J	-40	150	°C	
4.1.7	Storage temperature range	T_{STG}	-55	150	°C	
4.1.8	ESD resistivity	V_{ESD_HBM}	-4000	4000	V	HBM[2)]

1) Not subject to production test, specified by design
2) ESD susceptibility HBM according to EIA/JESD 22-A 114B

4.2 Thermal Resistance

Table 2 Thermal Resistance

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
4.2.1	Junction to Ambient[1) 2)]	R_{thJA}	–	155	–	K/W	Footprint only
			–	96	–	K/W	300 mm^2 PCB heatsink area
			–	86	–	K/W	600 mm^2 PCB heatsink area

1) Not subject to production test, specified by design
2) Package was simulated on a FR4 PCB, 80 x 80 x 1.5 mm; 35 µm Cu

4.3 Electrical Characteristics

4.3

Table 3 Electrical Characteristics
8 V < V_S < 28 V; - 40 °C < T_J < 150 °C, EN = 5 V; R_1, R_2 = open; all voltages with respect to ground; positive current defined flowing into pin; unless otherwise specified

Pos.	Parameter	Symbol	Values			Unit	Note / Test Condition
			Min.	Typ.	Max.		
4.3.1	Operating current during over voltage	Is_{OV}	–	–	600	µA	V_{out} = 0 V; V_s = 42 V; V_{sense} = 0 mV
4.3.2	Operating current during open load	$Is_{open\ load}$	0.5	1.4	1.7	mA	V_{out} = open; V_{sense} = 0 mV
4.3.3	Standby current	$Is_{standby}$	–	–	300	nA	EN = 0 V; V_{sense} = 0 mV; T_j < 85°C[1)]
4.3.4	Standby current	$Is_{standby,HOT}$	–	–	30	µA	EN = 0 V; V_{sense} = 0 mV
4.3.51	Output current	$I_{out,ONCOLD}$	40	–	–	mA	V_S-V_{out} = 3 V; V_{sense} = 0 mV; T_j = -40°C
4.3.52	Output current	$I_{out,ON}$	65	85	110	mA	V_S-V_{out} = 3 V; V_{sense} = 0 mV; T_j > 0°C[1)]; T_j < 135°C[1)]
4.3.6	Output current	$I_{out,ONHOT}$	60	–	–	mA	V_S-V_{out} = 3 V; V_{sense} = 0 mV; T_j = 150°C
4.3.7	Output Leakage current	$I_{out,OFF}$	–	–	400	nA	EN = 0 V; V_{out} = 0 V
4.3.8	Current of Sense input	I_{sense}	-5	–	0.5	µA	V_{out} = 0 V, V_{sense} = 200 mV
4.3.9	Voltage of Sense input	V_{sense}	135	150	165	mV	R_1 = 390 Ω; R_2 = 10 Ω See **Figure 2**; T_j < 115°C[1)]
4.3.10	Over voltage Protection	$V_{s,\ OV}$	28	33	–	V	–
4.3.11	Drop Voltage	V_s - V_{out}	–	–	1.3	V	I_{out} < 15 mA V_{sense} = 0 mV; V_s = 8 V

EN Input

4.3.12	Current of enable input	I_{EN}	60	90	130	µA	V_{EN} = 5 V
4.3.13	High Level voltage range	$V_{EN,ON}$	1	–	5.5	V	Use resistors at pin to be CMOS/TTL compatible; See **Figure 16**
4.3.14	Low Level voltage range	$V_{EN,OFF}$	-0.3	–	0.3	V	Use resistors at pin to be CMOS/TTL compatible; See **Figure 16**

Table 3 Electrical Characteristics (cont'd)
8 V < V_S < 28 V; - 40 °C < T_J < 150 °C, EN = 5 V; R_1, R_2 = open; all voltages with respect to ground; positive current defined flowing into pin; unless otherwise specified

Pos.	Parameter	Symbol	Values			Unit	Note / Test Condition
			Min.	Typ.	Max.		
4.3.15	Turn on time[2)]	$t_{EN,ON}$	–	–	65	µs	$I_{out100\%}$ = 15mA, See **Figure 4**; R_1 = 390 Ω; R_2 = 10 Ω, See **Figure 2**
4.3.16	Turn off time[2)]	$t_{EN,OFF}$	–	–	60	µs	$I_{out100\%}$ = 15mA; See **Figure 4**; R_1 = 390 Ω; R_2 = 10 Ω, See **Figure 2**

1) Not subject to production test, based on temperature characterization
2) When using an external Boost transistor this time is reduced (See also **Figure 16**)

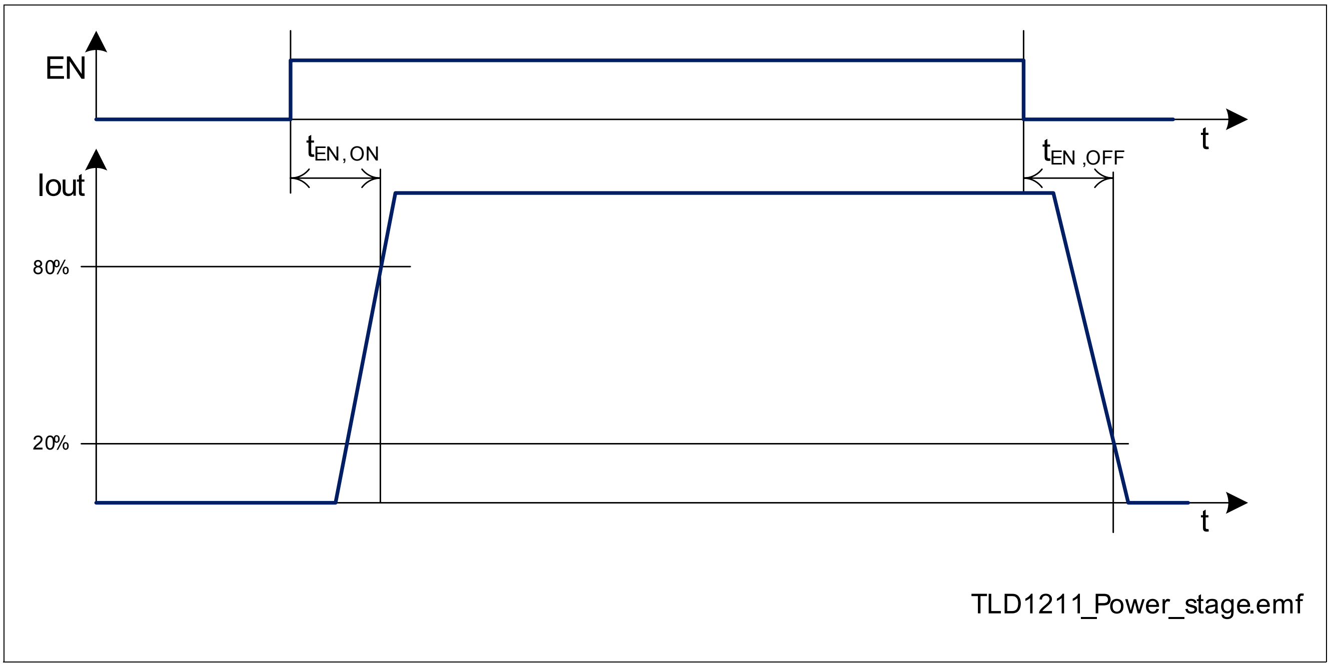


Figure 4 Timing Diagram

5 Characterization Data

Characterization data based on typical device. TLD1211SJ has been measured in a setup with undefined high thermal resistance.

5.1 Setup 1

Setup according to **Figure 2**. R_1 = 390 Ω , R_2 = 10 Ω, V_{EN} = 5 V

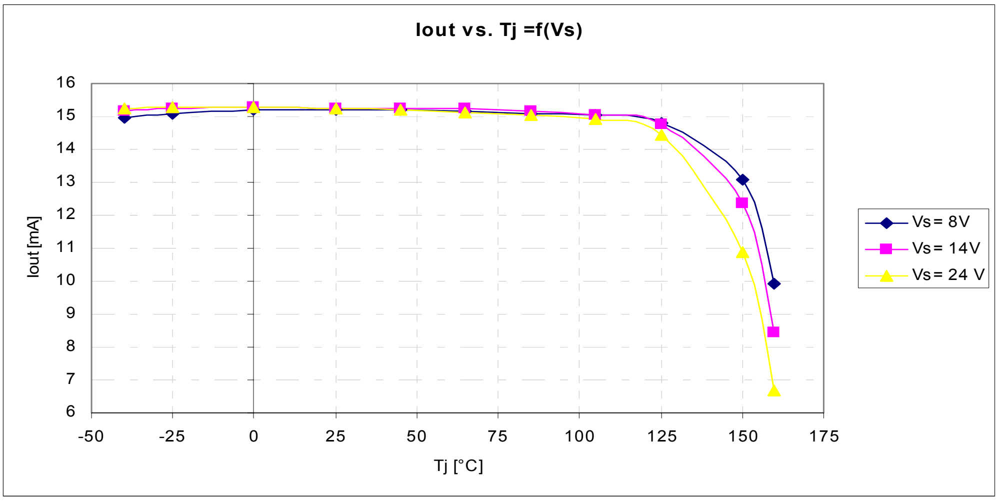


Figure 5 I_{out} **vs** T_J **=f(**V_s**)**

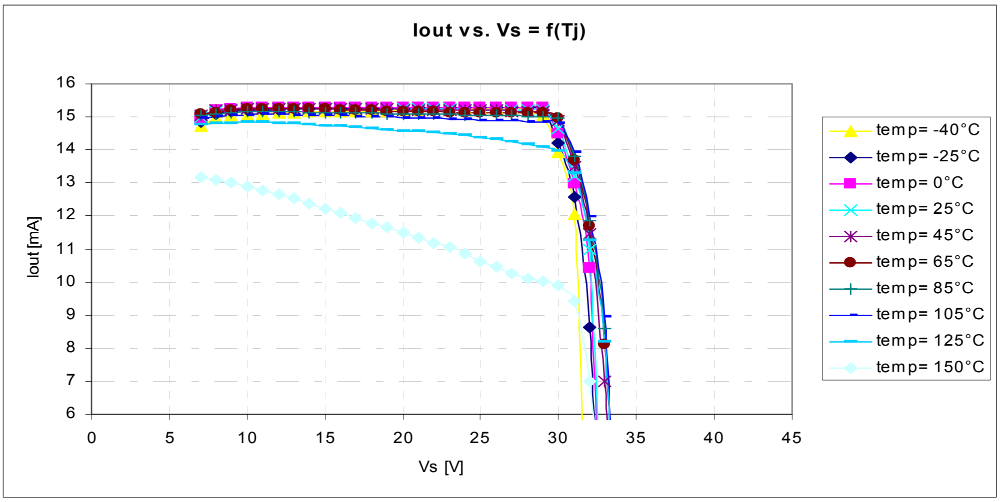


Figure 6 I_{out} **vs** V_s **=f(**T_J**)**

5.2 Setup 2

Setup according to **Figure 2**. $R_1 = 0\ \Omega$, $R_2 = 0\ \Omega$, $V_{out} = 0$ V, $V_{sense} = 0$ V, $V_{EN} = 5$ V

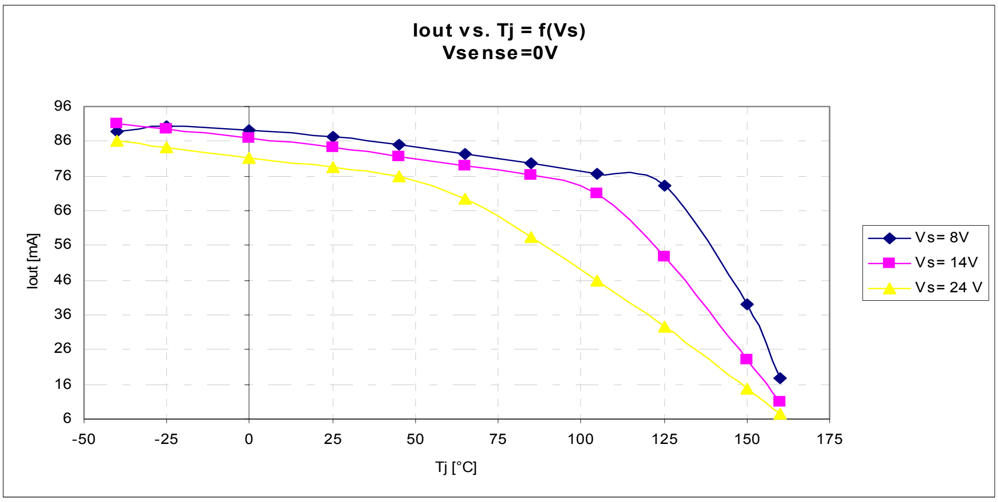


Figure 7 I_{out} **vs** T_J **=f(**V_s**)**

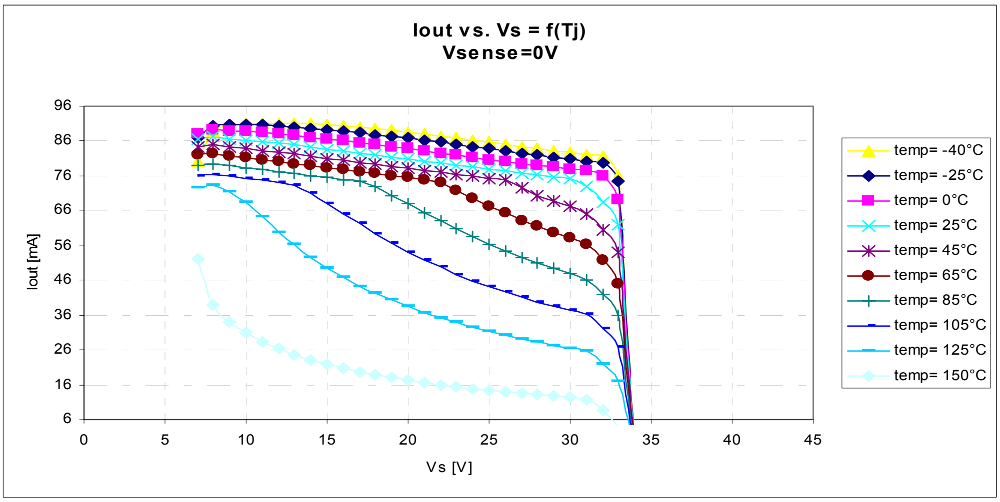


Figure 8 I_{out} **vs** V_s **=f(**T_J**)**

5.3 Setup 3

V_{out} = 0 V, V_{sense} = variable, V_{EN} = 5 V

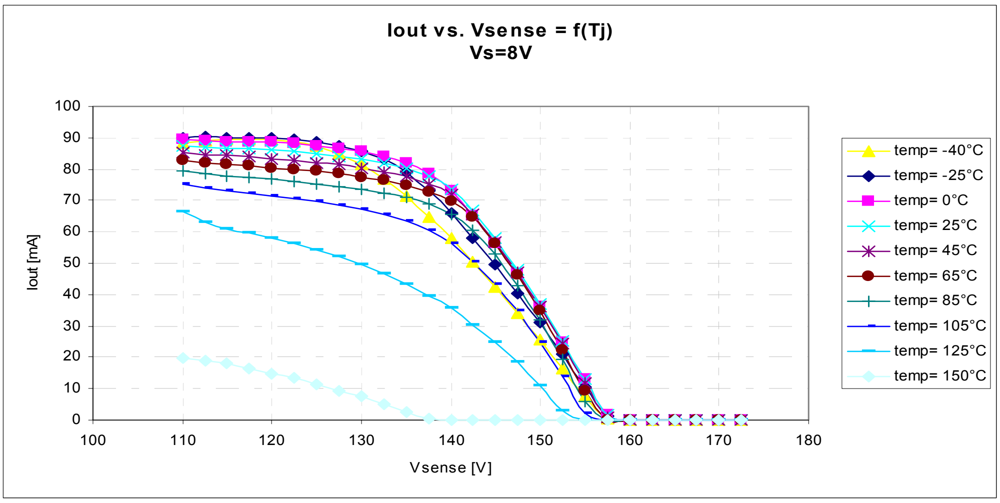


Figure 9 I_{out} **vs** V_{sense} **=f(**T_J**) at** V_s **= 8 V**

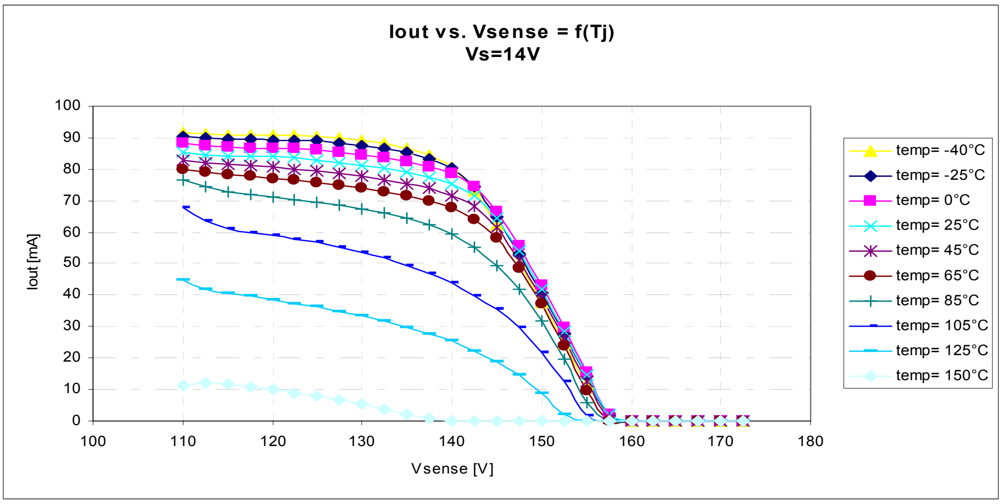


Figure 10 I_{out} **vs** V_{sense} **=f(**T_J**) at** V_s **= 14 V**

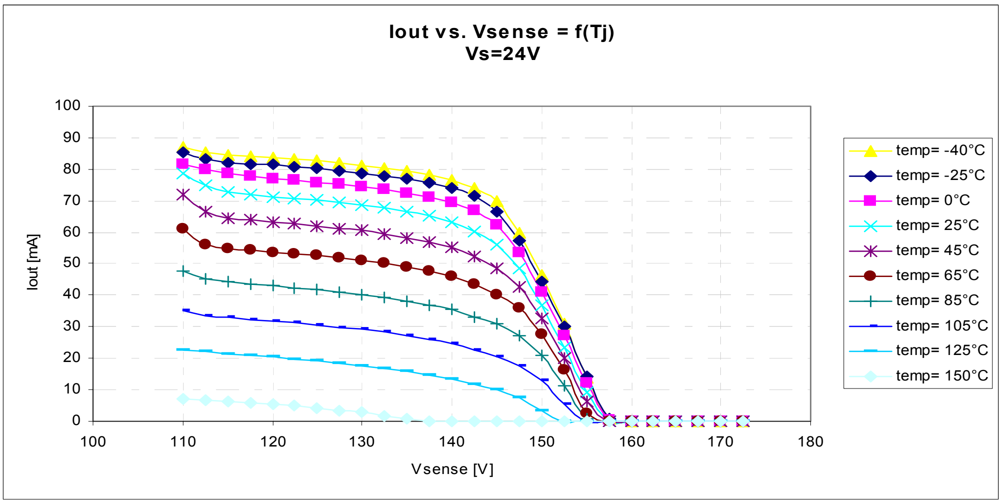


Figure 11 I_{out} vs V_{sense} =f(T_J) at V_s = 24 V

5.4 Setup 4

V_s = 14 V, V_{out} = 6 V, V_{sense} = 20 mV, V_{EN} = variable

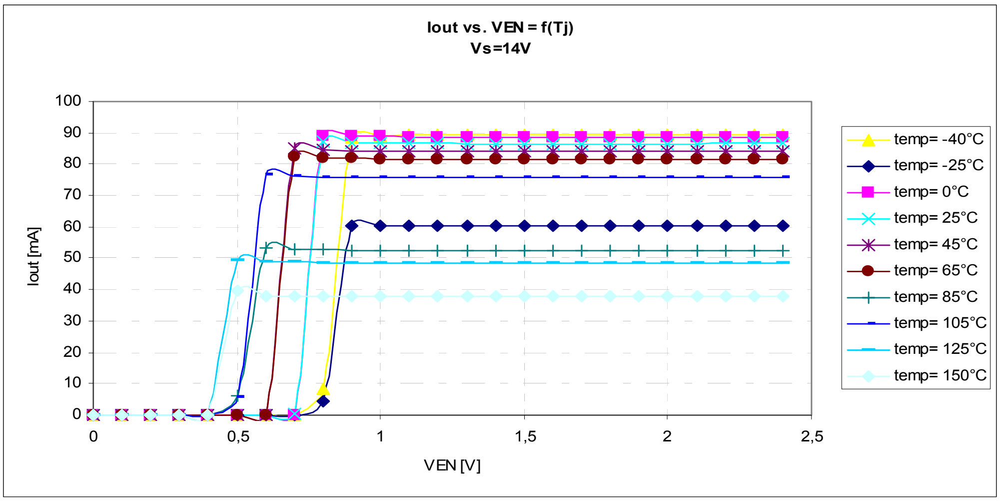


Figure 12 I_{out} vs V_{EBN} =f(T_J) at V_s = 14 V

5.5 Setup 5

V_{out} = 0 V, V_{sense} = 0 V, V_{EN} = 0 V

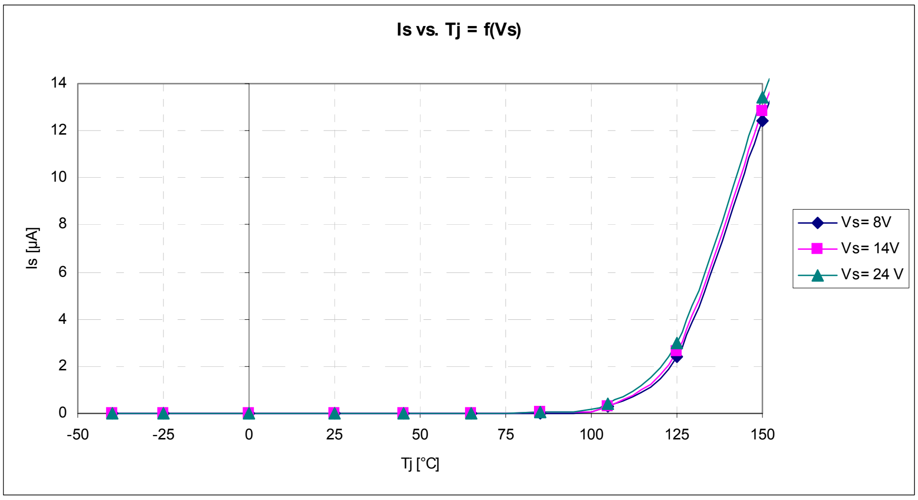


Figure 13 I_s **vs** T_J **=f(**V_s**)**

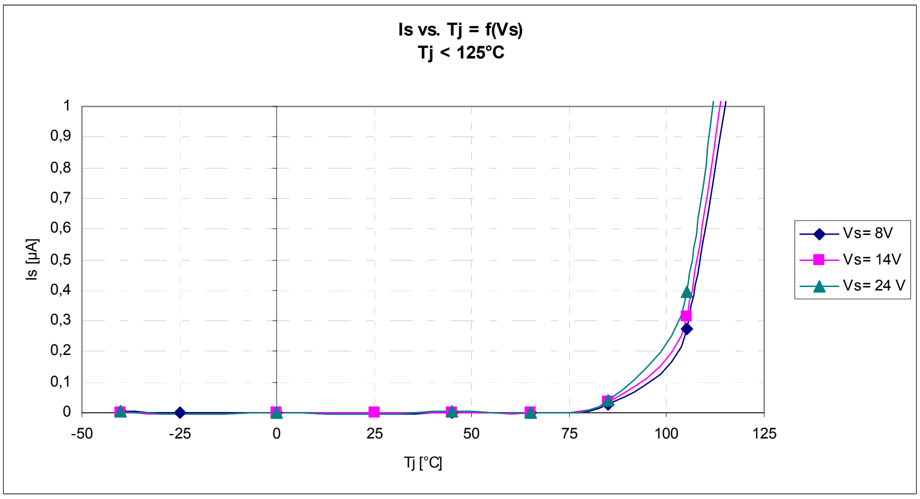


Figure 14 I_s **vs** T_J **=f(**V_s**),** T_J **< 125 °C**

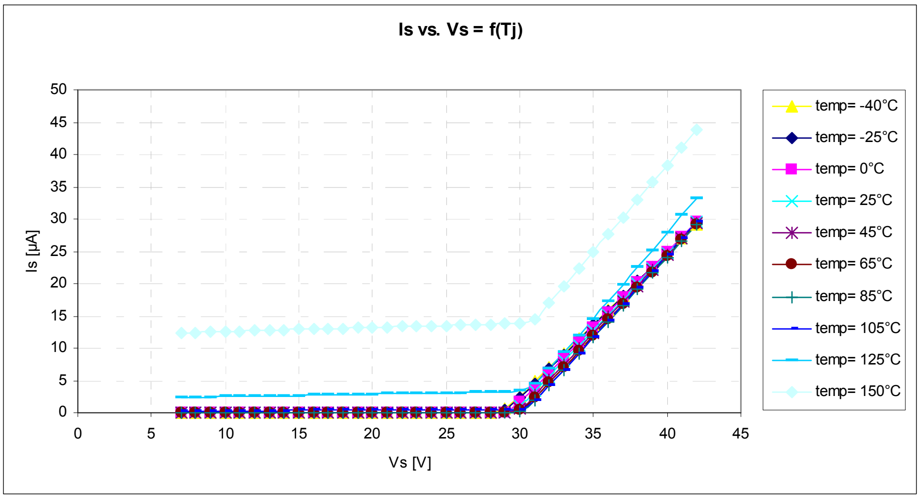


Figure 15 I_s vs V_s =f(T_J)

6 Application Information

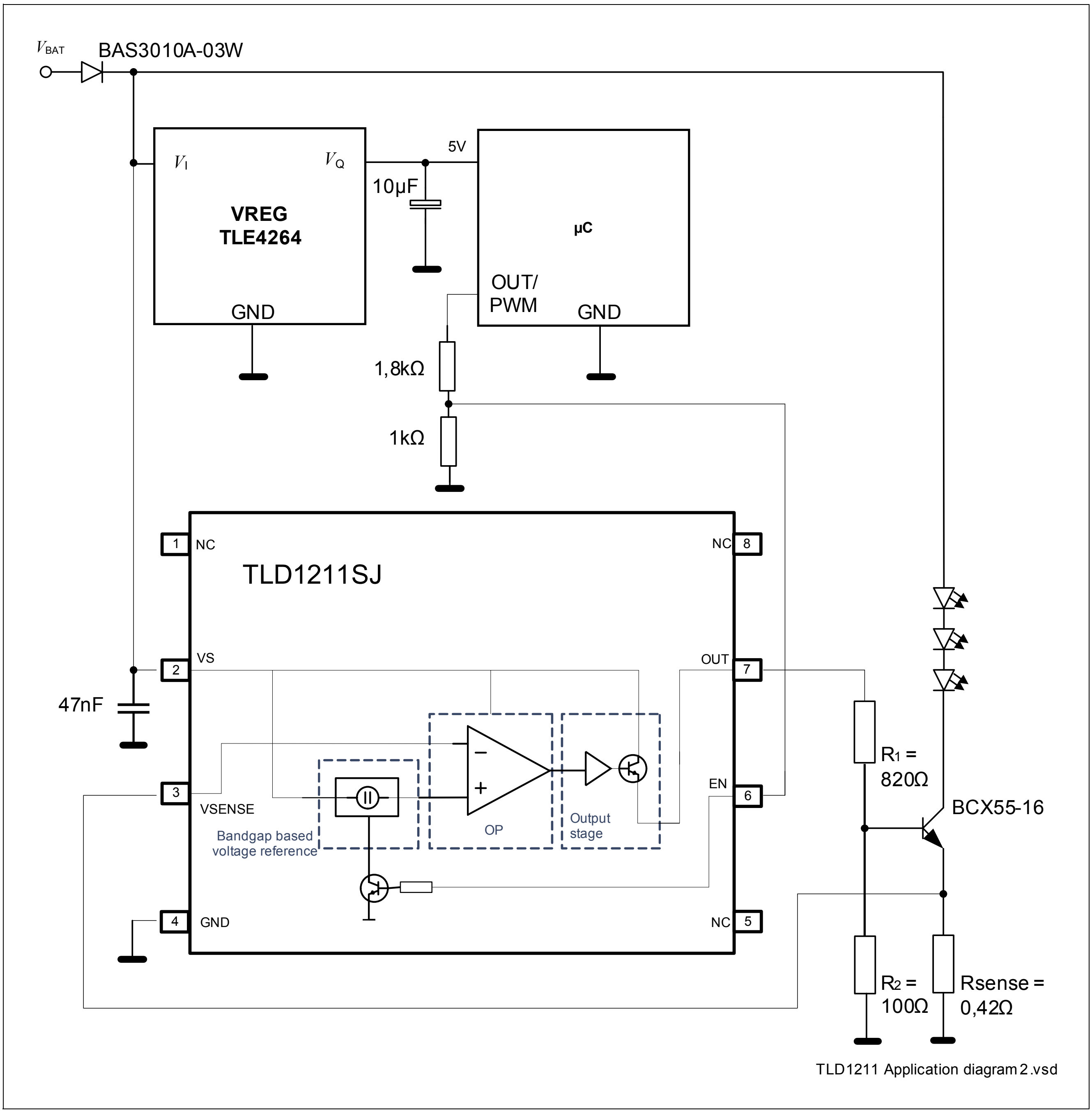


Figure 16 Application Information with External Output Stage

Note: This is a very simplified example of an application circuit. The function must be verified in the real application.

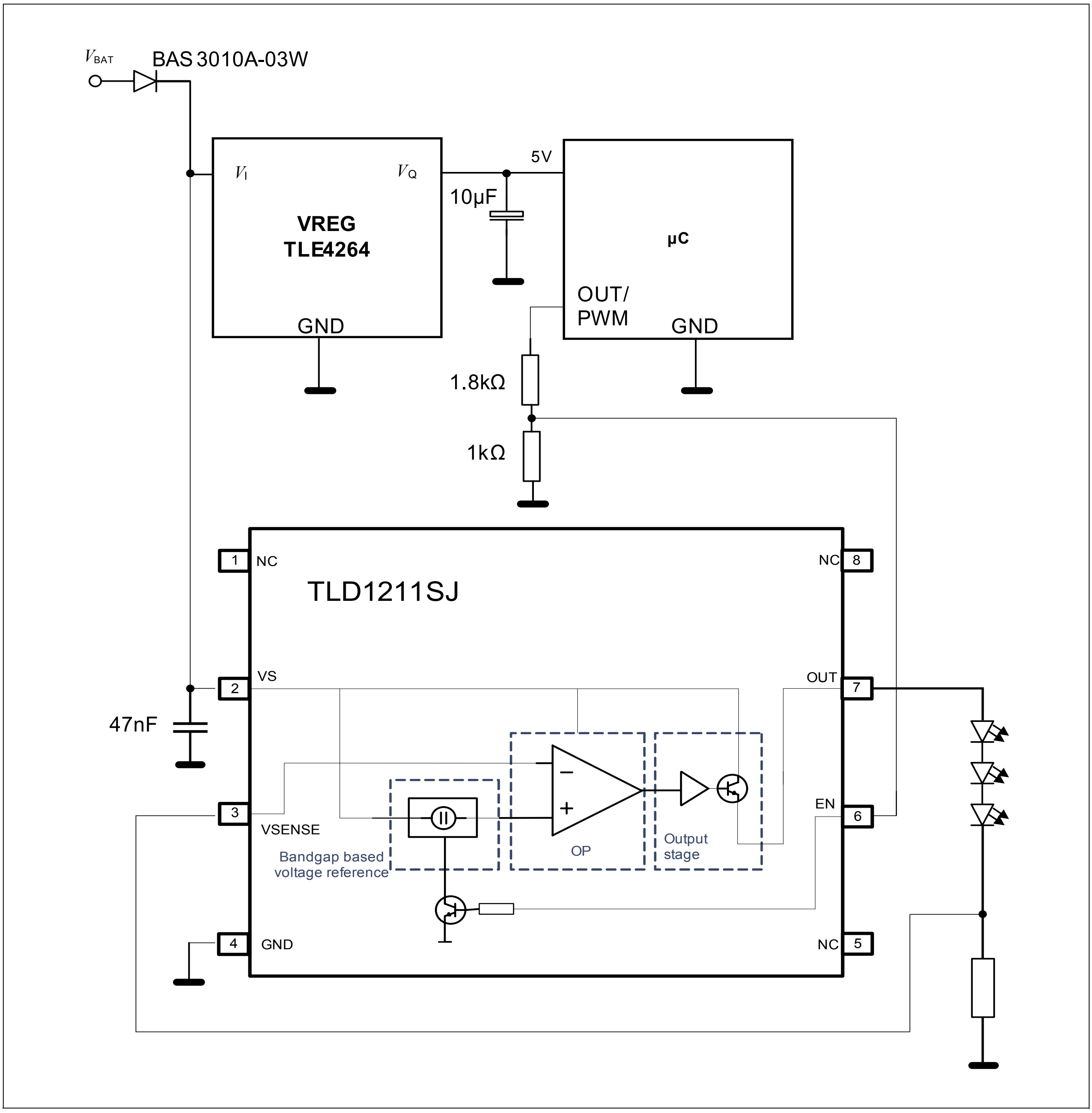
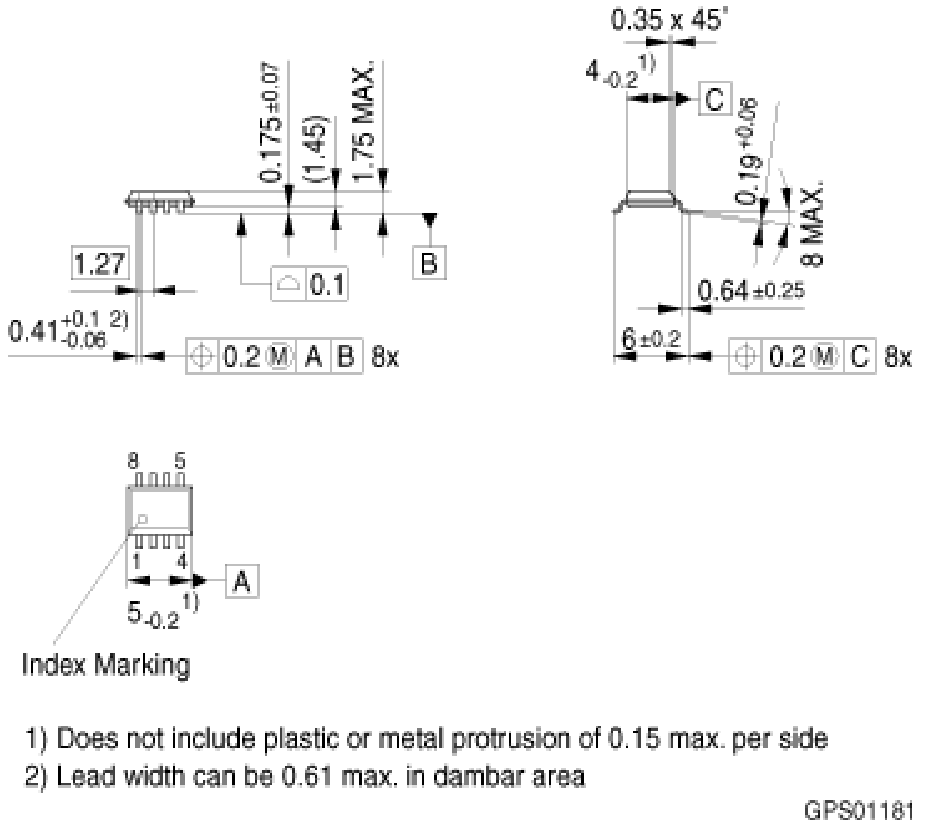


Figure 17 Application Information with Integrated Output Stage Usage

Note: This is a very simplified example of an application circuit. The function must be verified in the real application.

7 Package Outlines



Dimensions in mm

Figure 18 Package Outline; PG-DSO-8-16

Green Product (RoHS compliant)

To meet the world-wide customer requirements for environmentally friendly products and to be compliant with government regulations the device is available as a green product. Green products are RoHS-Compliant (i.e Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

For further information on alternative packages, please visit our website:
http://www.infineon.com/packages.

8 Revision History

Revision	Date	Changes
1.0	2010-03-26	Initial revision

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