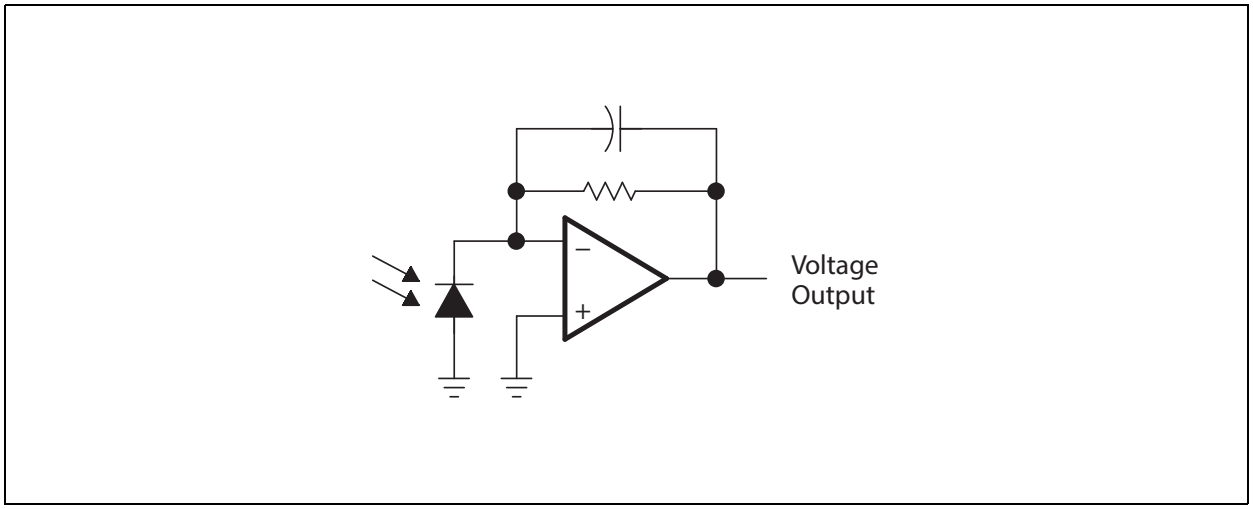
Functional Block Diagram

The functional blocks of this device are shown below:

Figure 2:
TSL257 Block Diagram



Pin Assignment

The TSL257 pin assignments are described below.

Figure 3:
Pin Diagram of Package S Sidelooker (Front View)

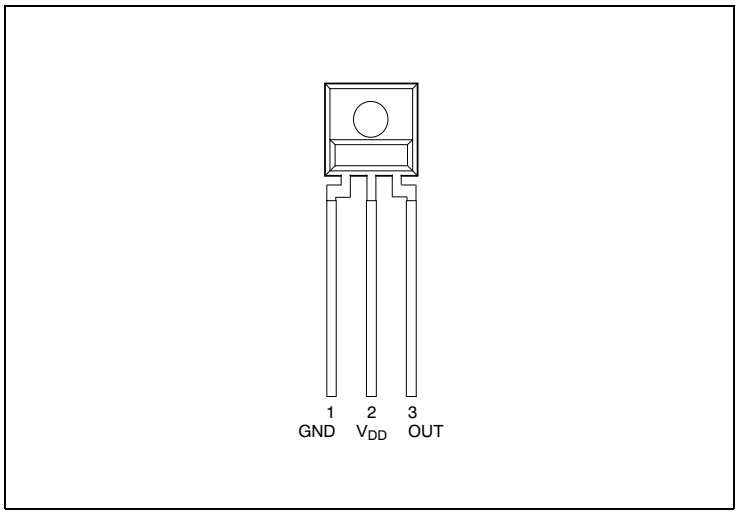


Figure 4:
Terminal Functions

Terminal		Description
No.	Name	
1	GND	Ground (substrate). All voltages are referenced to GND.
2	V_{DD}	Supply voltage
3	OUT	Output voltage

Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated under Operating Conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Figure 5:
Absolute Maximum Ratings over Operating Free-Air Temperature Range (unless otherwise noted)

Symbol	Parameter	Min	Max	Unit
V_{DD}	Supply voltage [1]		6	V
I_O	Output current		±10	mA
	Duration of short-circuit current at (or below) 25°C		5	s
T_A	Operating free-air temperature range	-25	85	°C
T_{STRG}	Storage temperature range	-25	85	°C
	Lead temperature 1.6mm (1/16 inch) from case for 10 seconds (S Package)		260	°C

Note(s):

1. All voltages are with respect to GND.

Electrical Characteristics

All limits are guaranteed. The parameters with min and max values are guaranteed with production tests or SQC (Statistical Quality Control) methods.

Operating Conditions

All defined tolerances for external components in this specification need to be assured over the whole operation condition range and also over lifetime.

Figure 6:
Recommended Operating Conditions

Symbol	Parameter	Min	Nom	Max	Unit
V_{DD}	Supply voltage	2.7		5.5	V
T_A	Operating free-air temperature range	0		70	°C

Figure 7:
Electrical Characteristics at V_{DD} = 5V, T_A = 25°C, λ_p = 470nm, R_L = 10kΩ (unless otherwise noted) (1) (2)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_D	Dark voltage	E_e = 0	0		15	mV
V_{OM}	Maximum output voltage swing	V_{DD} = 4.5V, No Load		4.49		V
		V_{DD} = 4.5V, R_L = 10kΩ	4	4.2		
V_O	Output voltage	E_e = 1.54µW/cm^2, λ_p = 470nm (4)	1.6	2	2.4	V
α_{VD}	Temperature coefficient of dark voltage (V_D)	T_A = 0°C to 70°C		-15		µV/°C
N_e	Irradiance responsivity	λ_p = 428nm (3), (7)		1.18		V/(µW/cm^2)
		λ_p = 470nm (4), (7)		1.30		
		λ_p = 565nm (5), (7)		1.58		
		λ_p = 645nm (6), (7)		1.68		

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
PSRR	Power supply rejection ratio	f_{ac} = 100Hz (8)		55		dB
		f_{ac} = 1kHz (8)		35		dB
I_{DD}	Supply current	E_e = 1.54µW/cm^2, λ_p = 470nm (4)		1.9	3.5	mA

Note(s):

1. Measured with R_L = 10kΩ between output and ground.
2. Optical measurements are made using small-angle incident radiation from a light-emitting diode (LED) optical source.
3. The input irradiance is supplied by a GaN/SiC light-emitting diode with the following characteristics: peak wavelength λ_p = 428nm, spectral halfwidth Δλ½ = 65nm.
4. The input irradiance is supplied by an InGaN light-emitting diode with the following characteristics: peak wavelength λ_p = 470nm, spectral halfwidth Δλ½ = 35nm.
5. The input irradiance is supplied by a GaP light-emitting diode with the following characteristics: peak wavelength λ_p = 565nm, spectral halfwidth Δλ½ = 28nm.
6. The input irradiance is supplied by an AlGaAs light-emitting diode with the following characteristics: peak wavelength λ_p = 645nm, spectral halfwidth Δλ½ = 25nm.
7. Irradiance responsivity is characterized over the range V_O = 0.1V to 4.5V. The best-fit straight line of Output Voltage V_O versus Irradiance E_e over this range will typically have a positive extrapolated V_O value for E_e = 0.
8. Power supply rejection ratio PSRR is defined as 20 log ($\Delta V_{DD}(f)/\Delta V_O(f)$) with $V_{DD}(f = 0)$ = 5V and $V_O(f = 0)$ = 2V.

Figure 8:
Switching Characteristics at V_{DD} = 5V, T_A = 25°C, λ_p = 470nm, R_L = 10kΩ (unless otherwise noted)

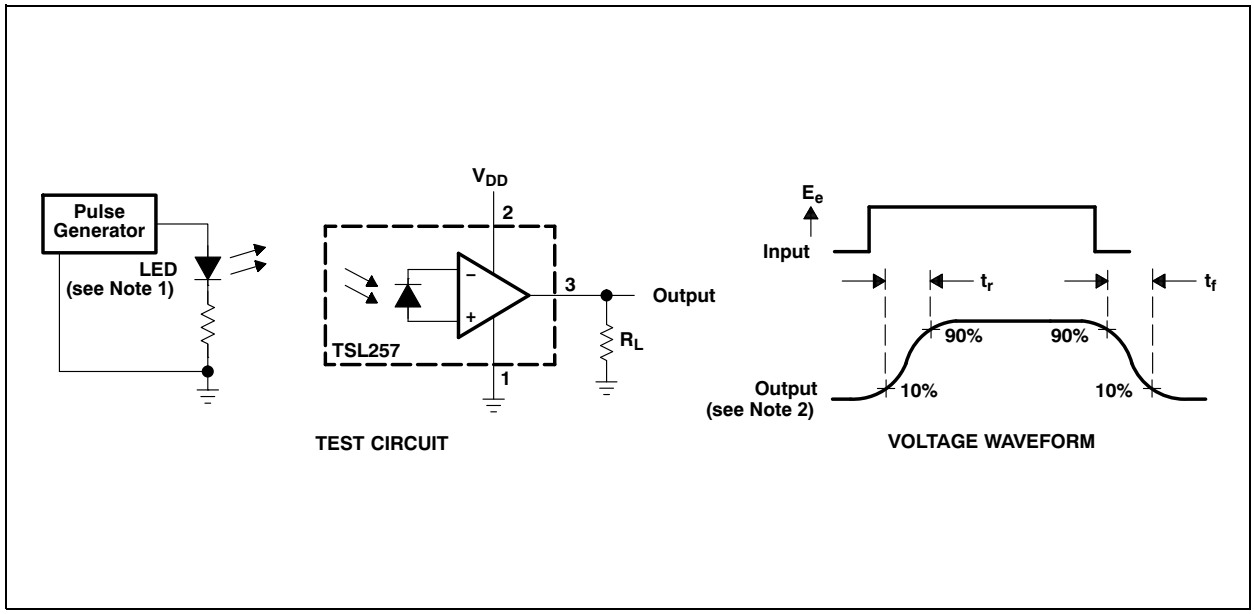
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
t_r	Output pulse rise time, 10% to 90% of final value	See note (1) and Figure 9		160	250	µs
t_f	Output pulse fall time, 10% to 90% of final value	See note (1) and Figure 9		150	250	µs
t_s	Output settling time to 1% of final value	See note (1) and Figure 9		330		µs
	Integrated noise voltage	f = dc to 1kHz, E_e = 0		200		µVrms
V_n	Output noise voltage, rms	f = 10Hz, E_e = 0		6		$\frac{\mu V}{\sqrt{Hz}}(rms)$
		f = 100Hz, E_e = 0		6		
		f = 1kHz, E_e = 0		7		

Note(s):

1. Switching characteristics apply over the range V_O = 0.1V to 4.5V.

Parameter Measurement Information

Figure 9:
Switching Times



Note(s):

1. The input irradiance is supplied by a pulsed InGaN light-emitting diode with the following characteristics: $\lambda_p = 470nm$, $t_r < 1\mu s$, $t_f < 1\mu s$.
2. The output waveform is monitored on an oscilloscope with the following characteristics: $t_r < 100ns$, $Z_i \geq 1M\Omega$, $C_i \leq 20pF$.

Typical Operating Characteristics

Figure 10:
Photodiode Spectral Responsivity

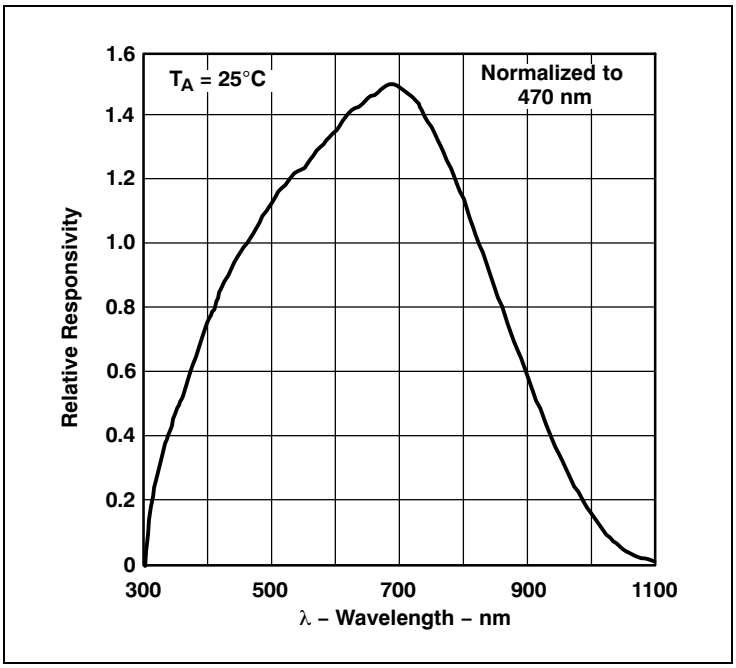


Figure 11:
Power Supply Rejection Ratio vs. Frequency

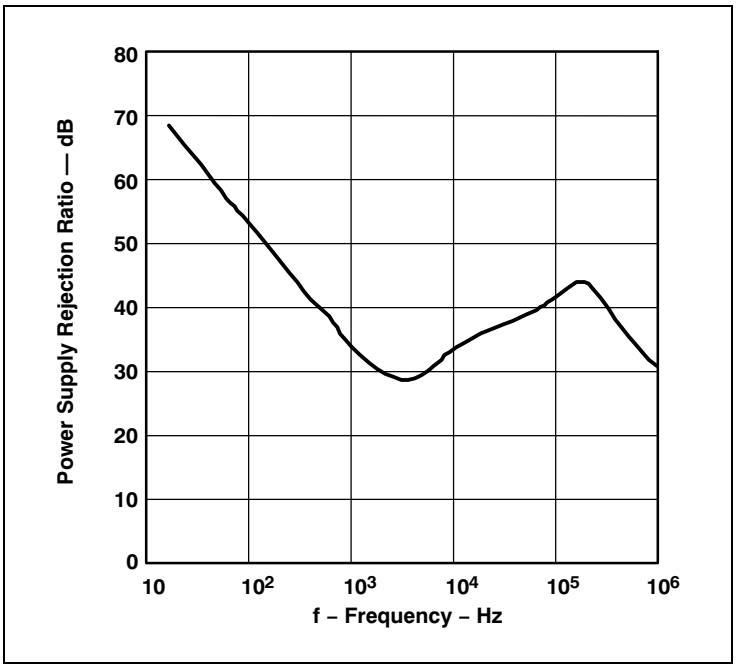


Figure 12:
Dark Voltage vs. Free-Air Temperature

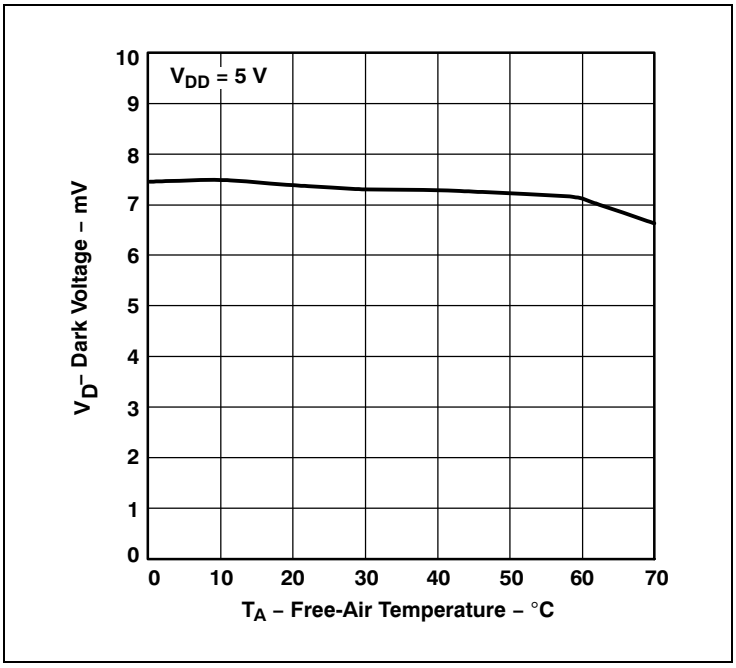
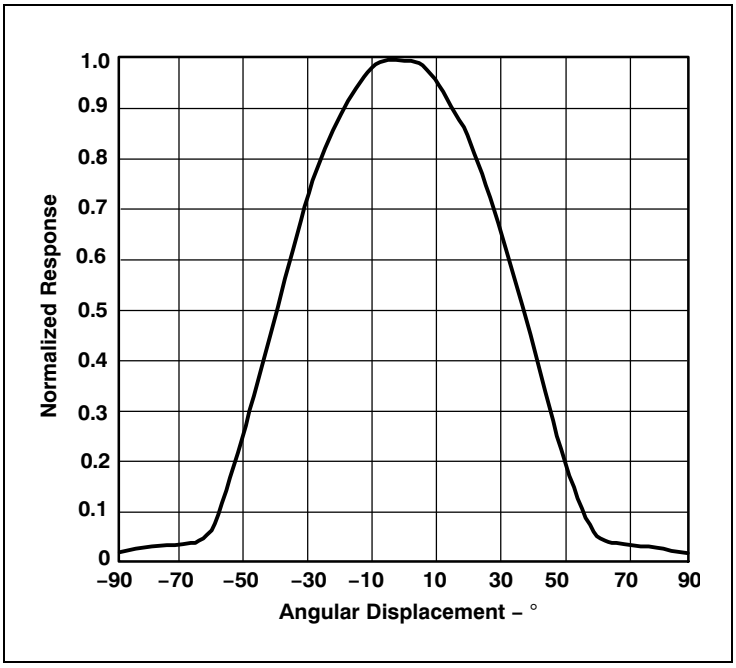


Figure 13:
Normalized Response vs. Angular Displacement

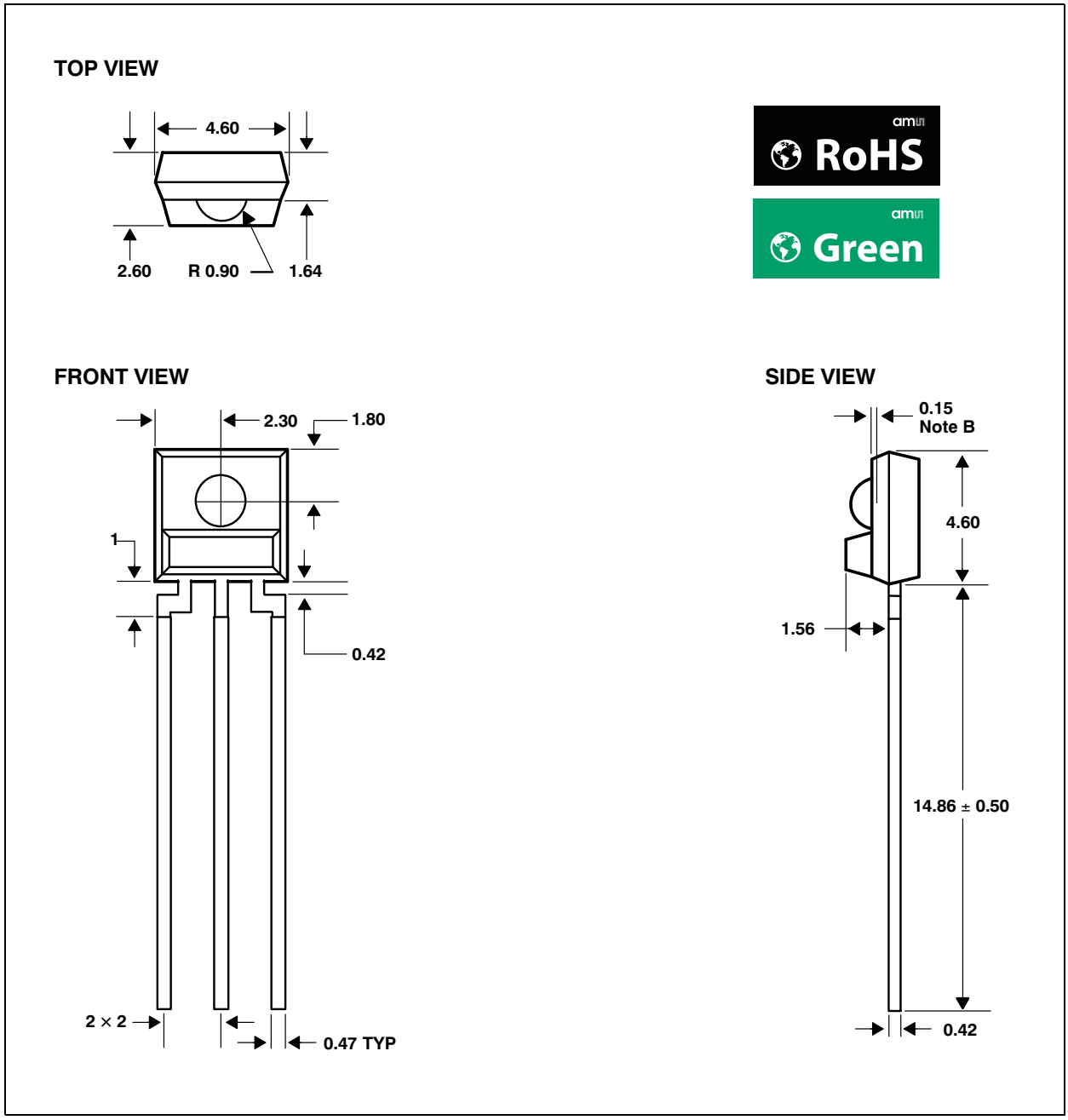


Package Mechanical Data

The device is supplied in a clear plastic three-lead sidelooker through-hole package (S).

Plastic Single-In-Line Side-Looker Package

Figure 14:
Package S - Plastic Single-In-Line Side-Looker Package Configuration



Note(s):

1. All linear dimensions are in millimeters; tolerance is ±0.25mm unless otherwise stated.
2. Dimension is to center of lens arc, which is located below the package face.
3. The integrated photodiode active area is round with a typical diameter of 0.75mm and is typically located in the center of the lens and 0.97mm below the top of the lens surface.
4. Index of refraction of clear plastic is 1.55.
5. Lead finish for TSL257-LF: solder dipped, 100% Sn.
6. This drawing is subject to change without notice.

Ordering & Contact Information

Figure 15:
Ordering Information

Ordering Code	Device	T_A	Package-Leads	Package Designator
TSL257-LF	TSL257	0°C to 70°C	3-lead Sidelooker - Lead (Pb) Free	S

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Document Status	Product Status	Definition
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Revision Information

Changes from 1-00 (2016-Jul-25) to current revision 1-01 (2018-May-04)	Page
Removed Figure 4 (Pin Diagram of Package SM Surface Mount Sidelooker)	
Updated Figure 5	4
Removed Application Information including Figure (Suggested SM Package PCB Layout)	
Removed Plastic Surface Mount Side-Looker Package including figure (Package SM)	
Updated Figure 15	12

Note(s):

1. Page and figure numbers for the previous version may differ from page and figure numbers in the current revision.
2. Correction of typographical errors is not explicitly mentioned.

Content Guide

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1 Key Benefits & Features
2 Functional Block Diagram

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4 Absolute Maximum Ratings

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5 Operating Conditions

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9 Typical Operating Characteristics

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