



BRIGHTTEK

BRIGHTTEK (EUROPE) LIMITED

Brighten up The World With LED!



ISO/TS 16949:2009



BS EN ISO 14001:2004



QC 800000 IECQ HSP98

PRODUCT DATASHEET



- ▶ EMC SMD Top View
- ▶ 3528 1.3t Series
- ▶ Infrared (IR) 940nm

NOF60S81BS (VCSEL Flood)



Release Date: 24 May 2022 Version: A1.0



3 5 2 8 1 . 3 t S e r i e s

3528 1.3t Series



FEATURES:

- **Package:** Ceramic Asymmetric VCSEL with Black Mask
- **Forward Current:** 5A (tp=300µs, DC=5%)
- **Forward Voltage (typ.):** 2.3V
- **Radiant Power (typ.):** 4000mW@5A
- **Colour:** Infrared (IR)
- **Peak Wavelength (typ.):** 940nm
- **Field of Illumination:** 60° x 45°
- **Materials:**
 - Resin: Glass (Water Diffused)
 - L/T Finish: Au plated
- **Operating Temperature:** -40~+125°C
- **Storage Temperature:** -40~+125°C
- **Grouping parameters:**
 - Forward Voltage
 - Radiant Power
 - Peak Wavelength
- **Soldering methods:** Reflow
- **Preconditioning:** MSL2 according to J-STD020

APPLICATIONS:

- Automotive
- Security Camera
- Motion Detection
- Night Viewer
- Surveillance
- 3D Sensing
- Facial / Gesture Recognition
- Virtual Reality

CHARACTERISTICS:

Absolute Maximum Characteristics (Ta=25°C)

Parameter	Symbol	Ratings	Unit
Pulse Forward Current (100μs; Duty Cycle 2%)	I _{PF}	8	A
Power Consumption	P _{tot}	21.5	W
Junction Temperature	T _j	145	°C
Thermal Resistance Junction to Solder Point	R _{th}	10	K/W
Temperature Coefficient of Wavelength	Δ _{Shift}	0.07	nm/K
ESD withstand voltage HBM: H3A ¹	V _{ESD-HBM}	8	kV
ESD withstand voltage CDM: C2b ²	V _{ESD-CDM}	750	V
Operating Temperature	T _{OPR}	-40~+125	°C
Storage Temperature	T _{STG}	-40~+125	°C
Soldering Temperature	T _{SOL}	260	°C

1. According to AEC-Q101-001-Rev.A.
2. According to AEC-Q101-005-Rev.A.

VCSEL Characteristics (Ta=25°C, I_F=5A, t_p=300μs, DC=5%)

Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Forward Voltage	V _F	---	2.3	2.7	V	I _F =5A
Radiant Power	Φ _e	---	4		W	I _F =5A
Peak Wavelength	λ _P	---	940	---	nm	I _F =5A
Spectral Bandwidth	Δλ	---	4	---	nm	I _F =5A
Field of Illumination (FOI) at FWHM	θ _H	---	60	---	deg	I _F =5A
	θ _H	---	45	---		

1. Radiant Power (P_O) ±10%, Forward Voltage (V_F) ±0.1V, Viewing angle(2θ_{1/2}) ±10°

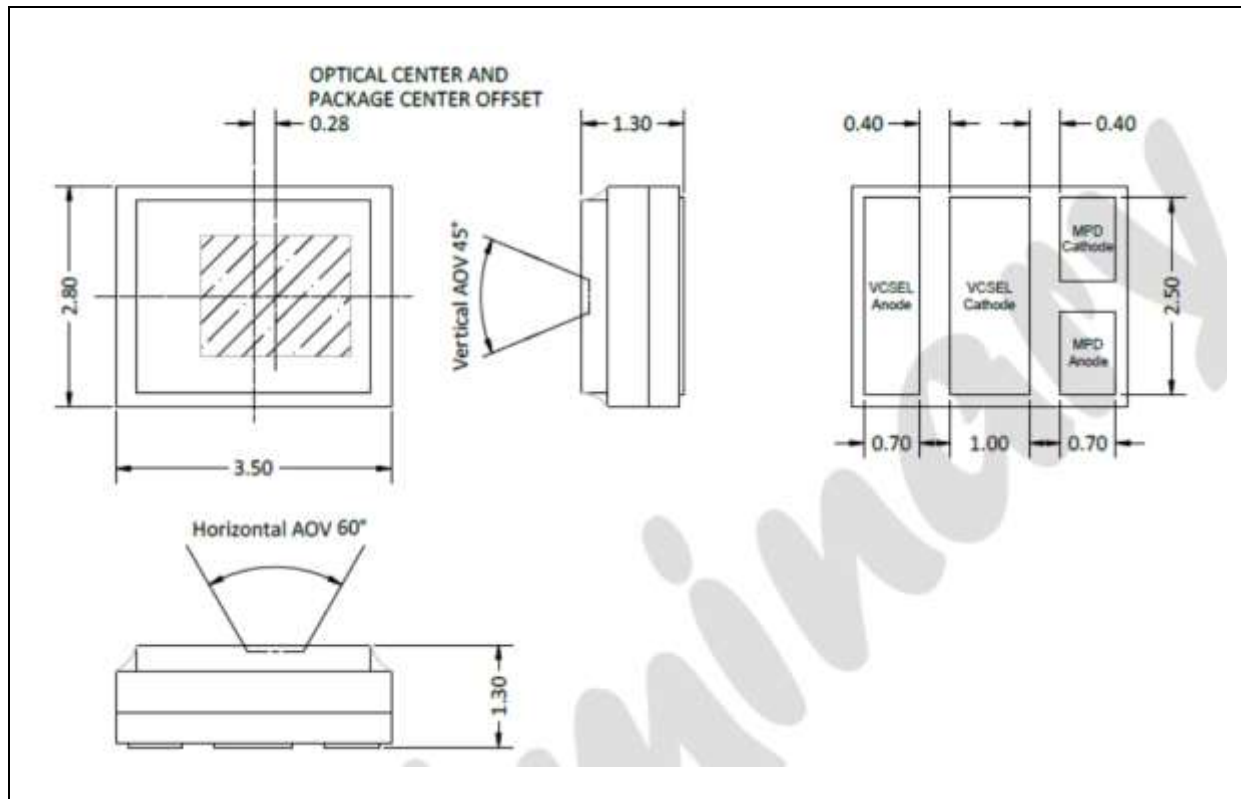
CHARACTERISTICS:

Monitor Photodiode (MPD) Characteristics (Ta=25°C)

Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Forward Voltage	V_F	0.5	---	1.3	V	$I_F=10\text{mA}$
Peak Sensing Wavelength	λ_{PS}	---	940	---	nm	---
Spectral Range	λ	400	---	1100	nm	---
Light Current	I_L	---	2	---	μA	$V_R=5\text{V}$, $E_e=1\text{mW}/\text{cm}^2$
Reverse Breakdown Voltage	V_{BR}	---	---	35	V	$I_R=100\mu\text{A}$
Reverse Dark Current	I_D	---	---	10	nA	---

OUTLINE DIMENSION:

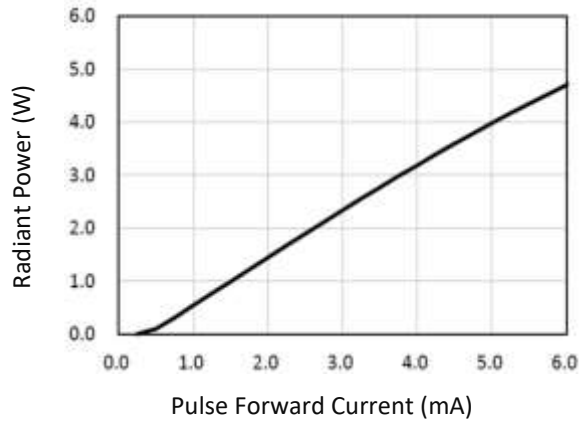
Package Dimension:



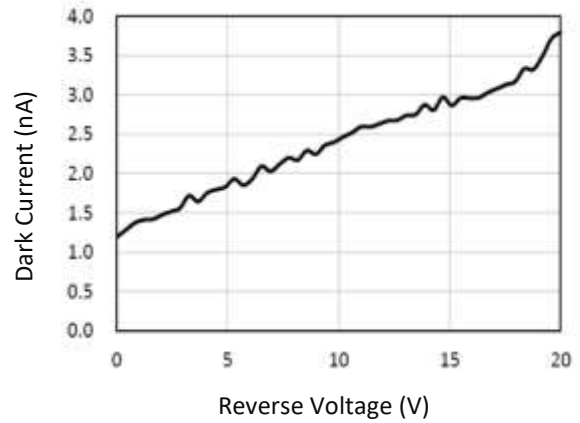
1. All dimensions are in millimetre (mm).
2. Tolerance $\pm 0.1\text{mm}$, unless otherwise noted.

ELECTRO-OPTICAL CHARACTERISTICS:

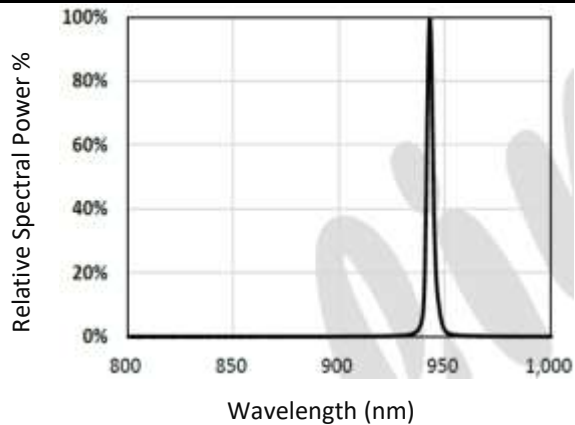
Radiant Power v.s. Pulse Forward Current



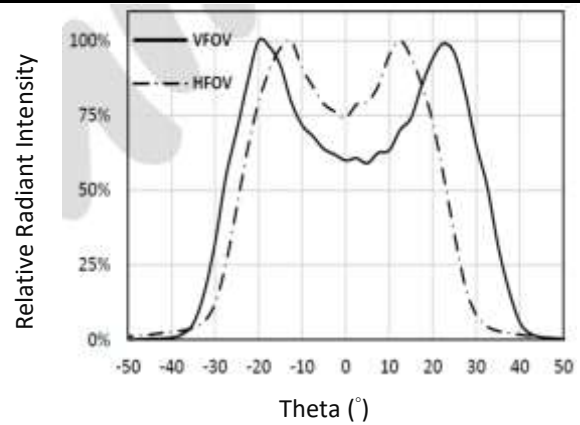
MPD-Dark Current



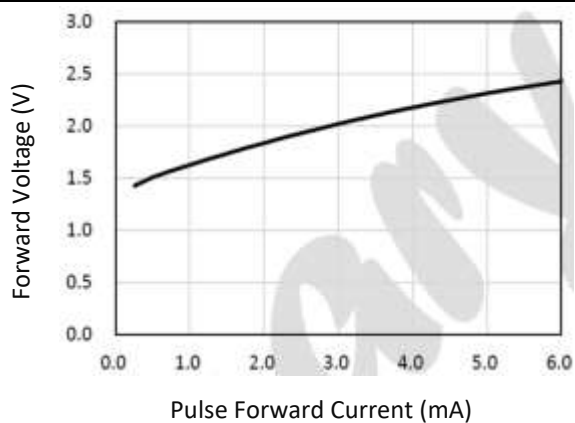
Relative Spectral Power v.s. Wavelength



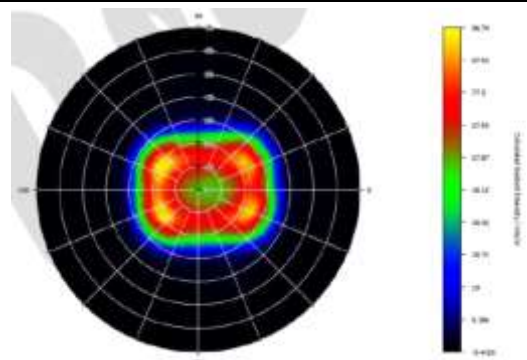
Radiation Distribution



Forward Current v.s. Pulse Forward Voltage

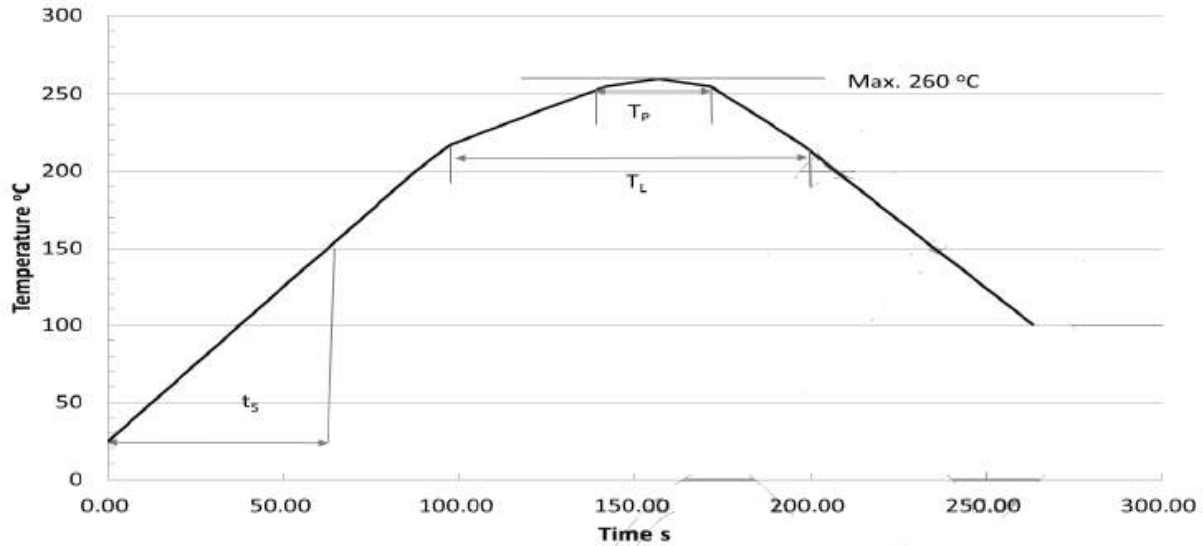


2D Radiation Distribution



RECOMMENDED SOLDERING PROFILE:

Reflow Lead-free Solder:



Profile Feature	Symbol	Pb-Free (SnAgCu) Assembly			Unit
		Minimum	Recommendation	Maximum	
Ramp-up Rate to Preheat (25°C to 150°C)			2	3	K/s
Time t _s (T _{Smin} to T _{Smax})	t _s	60	100	120	s
Ramp-up Rate to Peak (T _{Smax} to T _P)			2	3	K/s
Liquidus Temperature	T _L	217			°C
Time above Liquidus temperature	t _L		80	100	s
Peak Temperature	T _P		245	260	°C
Time within 5 °C of the specified peak temperature T _P - 5 K	t _p	10	20	30	s
Ramp-down Rate (T _P to 100 °C)			3	4	K/s
Time 25 °C to T _P				480	s

Note:

1. Maximum reflow soldering: 2 times.
2. Recommended soldering temperature is 245°C. The maximum soldering temperature should be limited to 260°C.
3. Before, during, and after soldering, should not apply stress on the components and PCB board.

PRECAUTIONS OF USE:

Storage:

It is recommended to store the products in the following conditions:

- Humidity: 60% R.H. Max.
- Temperature: 5°C~30°C (41°F ~86°F).

Shelf life in sealed bag: 12 months at 5°C~30°C and <60% R.H.

Once the package is opened, the products should be used within a week. Otherwise, they should be kept in a damp-proof box with desiccating agent <10% R.H. and apply baking before use.

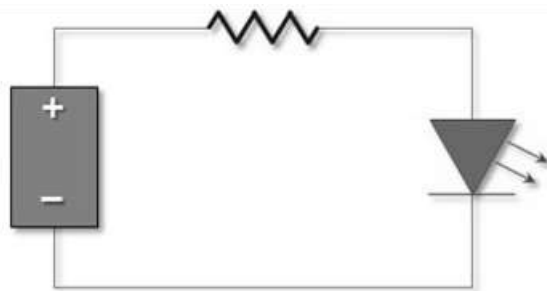
Baking:

It is recommended to bake the LED before soldering if the pack has been unsealed for longer than 24hrs. The suggested baking conditions are as followings:

- $60\pm 3^{\circ}\text{C}$ x 24hrs and <5%RH, taped / reel package.

It's normal to see slight color fading of carrier (light yellow) after baking in process.

Testing Circuit:



Must apply resistor(s) for protection (over current proof).

Cleaning:

Use alcohol-based cleaning solvents such as isopropyl alcohol to clean the LED carrier / package. Avoid putting any stress force directly on to the LED lens.

ESD (Electrostatic Discharge):

Static Electricity or power surge will damage the LED. Use of a conductive wrist band or anti-electrostatic glove is recommended when handling the LED all time. All devices, equipment, machinery, work tables, and storage racks must be properly grounded.

In the events of manual working in process, make sure the devices are well protected from ESD at any time.

REVISION RECORD:

Version	Date	Summary of Revision
A1.0	24/05/2022	Datasheet set-up.