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## Study on high signal-to-noise ratio (SNR) silicon *p-n* junction photodetector

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### Keywords

silicon *p-n* junction photodetector, antireflection layer, adjustment technique of spectrum band, spectral responsivity, high signal-to-noise ratio (SNR)

### Abstract

On the basis of n-type single-crystal (100) silicon substrate, a silicon *p-n* junction photodetector has been successfully developed. Three methods to improve photoresponse signal-to-noise ratio (SNR) were profoundly studied: the *p-n* junction depth was optimized to enhance the spectral responsivity within the wavelength range of 500-600 nm, an antireflection layer with the appropriate thickness was added to reduce the reflected light and enhance the sensitivity, the adjustment technique of spectral band response was adopted to remove the noise signal with normal silicon absorptive wavelengths. Eventually, the spectral responsivity SNR can be over  $10^4$  at 500-600 nm while the peak of spectral responsivity is 0.48 A/W at about 520 nm. After being optimized, silicon *p-n* junction photodetectors, which possess the properties of lower dark current, higher sensitivity, shorter response time and larger SNR, can be achieved.



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