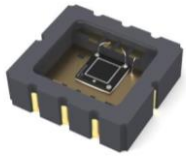
dephan
detect every photon

D-R46K3GC-LCC8
D-R36K3GC-LCC8
D-R3K23GC-LCC8
New generation solid-state photomultipliers

D-R46K3GC-LCC8
D-R36K3GC-LCC8
D-R3K23GC-LCC8
Specification (preliminary)



The new-type solid state photomultipliers D-R46K3GC-LCC8, D-R36K3GC-LCC8 and D-R3K23GC-LCC8 have been developed to replace APD in detection and measurement of short light pulses in the near-infrared wavelength range. They combine wide dynamic range and resistance to background illumination of APD with high threshold sensitivity and speed of SiPM. They are well-suited for LiDAR, PET and other pulse-detection applications.

Features

- High threshold sensitivity
- Wide dynamic range
- Tolerance to background illumination
- Mild operating voltage (60-70 V)
- CMOS-compatible technology
- Array/matrix capability

Structure

Parameter	Symbol	D-R46K3GC-LCC8	D-R36K3GC-LCC8	D-R3K23GC-LCC8	Unit
Photosensitive area	-	1×1 (square)	⌀1 (round)	⌀0.3 (round)	mm
Number of cells	-	$4.6 \cdot 10^4$	$3.6 \cdot 10^4$	$3.2 \cdot 10^3$	-
Cell pitch	-	5			µm
Geometrical fill factor	-	> 90			%
Package	-	SMD LCC8 covered with optical encapsulant			-
Encapsulant refractive index	-	1.4			-

Absolute maximum ratings

Parameter	Symbol	D-R46K3GC-LCC8	D-R36K3GC-LCC8	D-R3K23GC-LCC8	Unit
Operating conditions	T_{opr}	-40 to +40°C, no condensation			-
Soldering conditions	T_{sol}	350°C max once, 3 s max, at least 1 mm away from lead root			-

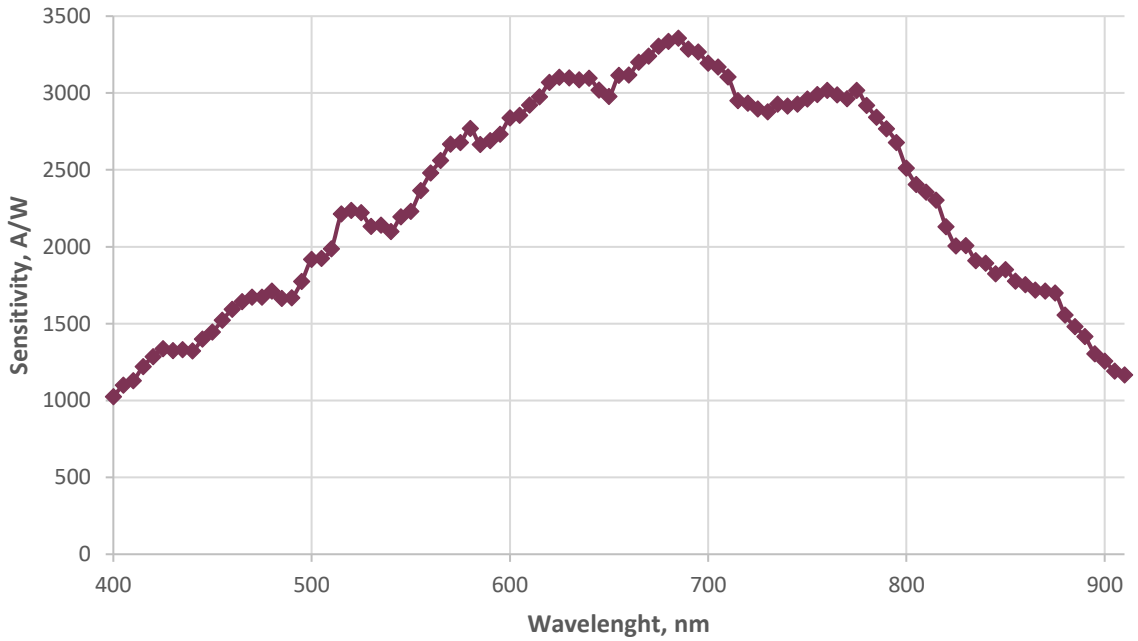
Electrical and optical characteristics (T_a = 25°C)

Parameter	Symbol	D-R46K3GC-LCC8	D-R36K3GC-LCC8	D-R3K23GC-LCC8	Unit
Spectral response range	λ	400..900			nm
Peak sensitivity wavelength	λ_p	650			nm
Photon detection efficiency (fast*)	PDE	@650nm: > 30 @905nm: > 10			%
Gain	M	$> 5 \cdot 10^3$			-
Crosstalk probability	p_{ct}	< 1			%
Threshold sensitivity**	S	@905nm: < 200			photons
Single-photon jitter (FWHM)	$\Delta t_{jitter,1ph}$	@905nm: < 450			ps
Terminal capacitance	C_t	20	16	4	pF
Operating voltage	V_{op}	60-70 (see test ticket)			V
Dark current, typical	$I_{dark,typ}$	5-20	3-15	0.5-2.5	μA
Dark current, max	$I_{dark,max}$	30		5.0	μA
Gain voltage factor (25°C)	dM/dV	< 4.0			$10^3 \cdot V^{-1}$
Gain temperature factor (on constant voltage)	dM/dT	< 150			$°C^{-1}$
Voltage temperature factor (on constant gain)	dV_{op}/dT	< 35			mV/°C

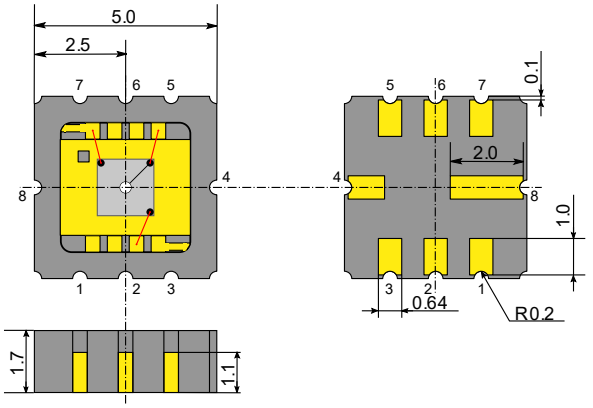
* affecting photoresponse amplitude at 1GHz bandwidth

** detection probability ≥ 90%, false detection rate ≤1 kHz, 1GHz bandwidth, room temperature

Spectral response (typical, see test ticket)



Dimensional outline (unit: mm)

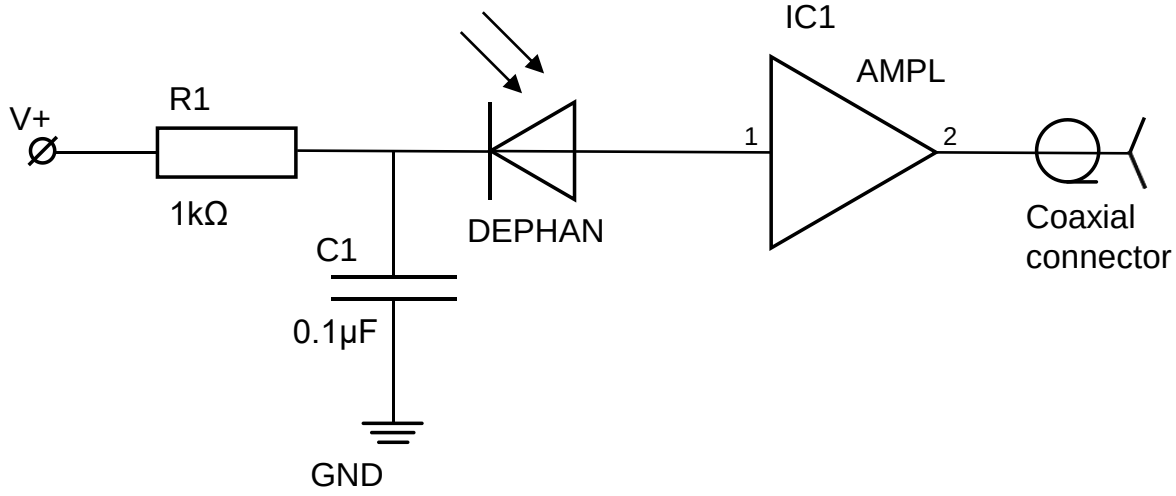


Pad connection

Pad number	Connection type
5	V_{sup+}
3, 4, 8	GND*
1, 2, 6, 7	NC

*Connect simultaneously for best performance

Connection example

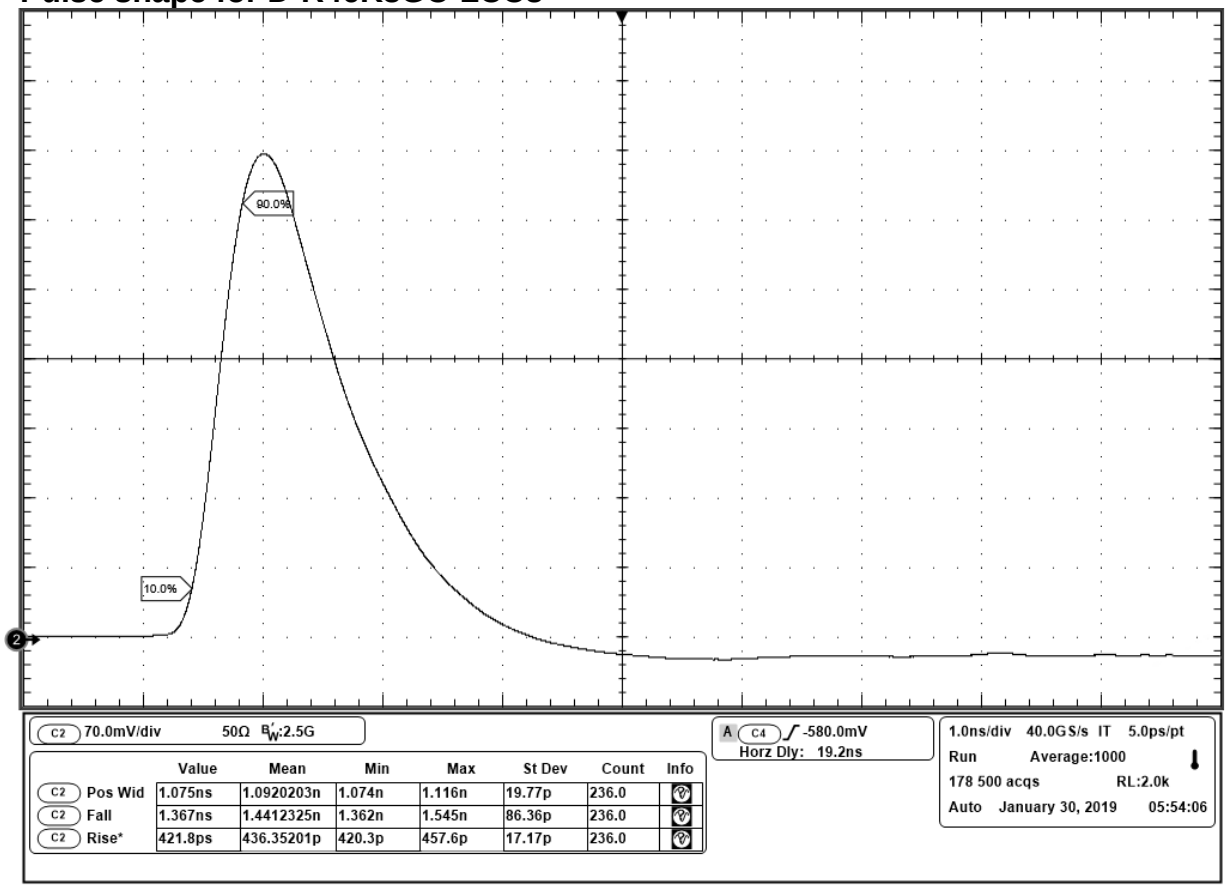


Typical pulse parameters

(In connection scheme shown above, λ=442nm)

Parameter	Symbol	D-R46K3GC-LCC8	D-R36K3GC-LCC8	D-R3K23GC-LCC8	Unit
Rise time (10% to 90%)	t_{rise}	0.42		0.33	ns
Fall time (90% to 10%)	t_{fall}	1.37		0.30	ns

Pulse shape for D-R46K3GC-LCC8



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