

General

J16TE Series detectors are Judson's high-quality Ge photodiodes mounted on thermoelectric coolers for reduced dark current, improved sensitivity, and superior stability. See general operating notes (page 2) for a detailed description of the effects of cooling on Ge photodiodes.

The TE coolers require less than 3W of DC power. The built-in thermistor can be used to monitor or control the detector temperature.

J16TE Series detectors are mounted in TO-style packages which are filled with dry nitrogen and hermetically sealed.

J16TE1 Series

1-Stage Thermoelectrically Cooled Ge

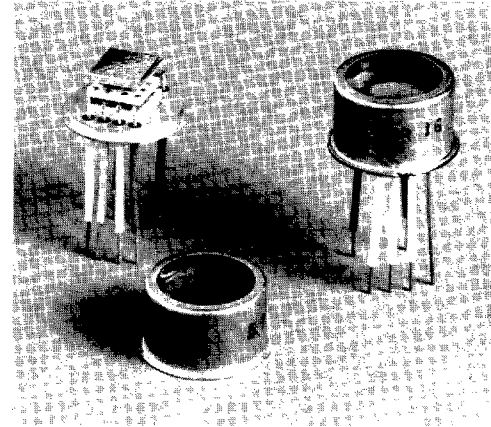
J16TE1 Series detectors are Judson's large-area Germanium detectors packaged on one-stage thermoelectric coolers. Active diameters of 10 and 13mm allow maximum light collection. The low-cost cooler can be used at -10°C for reduced dark currents, or at higher temperatures for improved stability of response in elevated or variable ambient temperatures.

J16TE2 Series

2-Stage Thermoelectrically Cooled Ge

J16TE2 Series detectors are Ge photodiodes on high-performance two-stage coolers. DC offset current and dark current are significantly reduced at the -30°C operating temperature (Figs. 11-4 and 11-5).

These low offsets and dark currents make J16TE2 Series detectors ideal for ultrasensitive fiber optic power meters. They offer accurate measurements of optical power levels as low as -80dBm (10pW) in the DC mode and -90dBm (1pW) with an optical chopper and lock-in amplifier.



Thermoelectric Cooler Operation

Figures 11-7 and 11-8 show typical TE1 and TE2 cooler power requirements. A simple convection heat sink is required for maximum cooling.

Figure 11-9 shows the effect of heat sink temperature on J16TE2 detector temperature. The HSA2 package option (page 43) provides a convenient heat sink for J16TE2 Series detectors.

Power supplies and controllers for the TE coolers are described on page 42.

Preamplifiers

The PA-7 preamplifier offers DC stability, low noise, adjustable gain, and wide bandwidth (DC to 50kHz). The PA-9 fixed-gain preamplifier offers lowest noise at higher frequencies (1kHz to 100kHz).

At high frequencies, the detector capacitance and preamp voltage noise contribute significantly to the system noise (Fig. 11-6).

Typical Specifications J16TE Series Thermoelectrically Cooled Ge at specified operating temperature

Model Number	Active Size (dia.) (mm)	Operating Temperature	Responsivity @ 1300nm (A/W)	Shunt Resistance R_D @ $V_R = 10\text{mV}$ (M Ω)		Typical NEP @ λ_{peak} and 300Hz (pW/Hz $^{1/2}$)	Capacitance C_D @ $V_R = 0\text{V}$ (nF)	Maximum Reverse Voltage V_R (V)	Packages	
				Min.	Typ.				Standard	Options
J16TE1 Series One-Stage Thermoelectrically Cooled Ge										
J16TE1-P6-R10M-HS J16TE1-P6-R10M-SC	10	-10°C	0.6	.04	.08	0.6	12	2	P6	-
J16TE1-P6-R13M-HS J16TE1-P6-R13M-SC	13			.03	.06	0.7	120	2		
J16TE1-P6-R13M-SC				.06	.12	0.4	200	0.25		
J16TE2 Series Two-Stage Thermoelectrically Cooled Ge										
J16TE2-8A6-R01M-HS J16TE2-8A6-R01M-SC	1	-30°C	0.6	15	40	.04	0.15	10	8A6	66G HSA2 (Page 43)
J16TE2-8A6-R02M-HS J16TE2-8A6-R02M-SC	2			40	100	.02	2	0.25		
J16TE2-8A6-R03M-HS J16TE2-8A6-R03M-SC	3			5	13	.07	0.6	5		
J16TE2-8A6-R05M-HS J16TE2-8A6-R05M-SC	5			20	50	.03	8	0.25		
J16TE2-8A6-R03M-HS J16TE2-8A6-R03M-SC	3			2	4	.15	1	5		
J16TE2-8A6-R05M-HS J16TE2-8A6-R05M-SC	5			10	20	.06	14	0.25		
J16TE2-8A6-R05M-HS J16TE2-8A6-R05M-SC	5	1	3	.16	3	5				
J16TE2-8A6-R05M-SC		5	15	.07	36	0.25				

Figure 11-1 J16TE1-P6

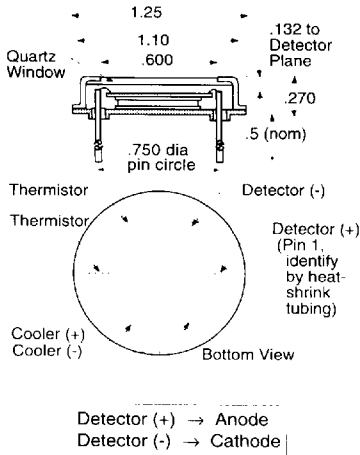


Figure 11-2 J16TE2-8A6

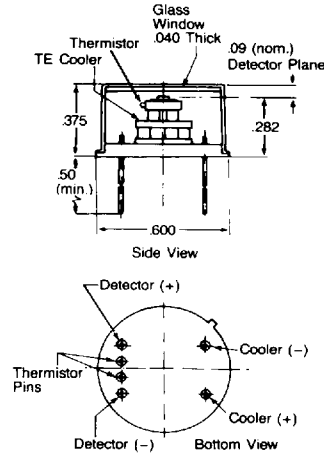


Figure 11-3 J16TE2-66G

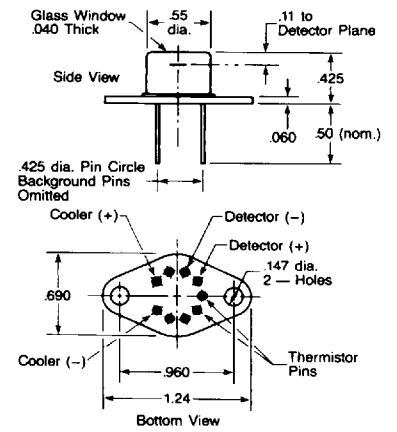


Figure 11-4 "DC Offset Current" vs Temperature (Near 0V Bias)

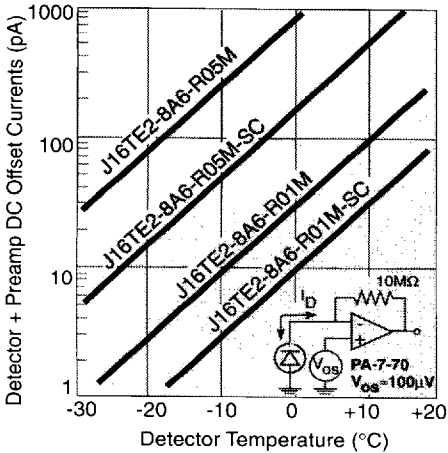


Figure 11-5 Dark Current vs Temperature

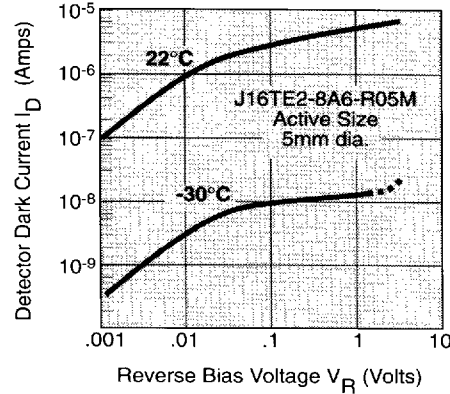


Figure 11-6 Total Noise Equivalent Power vs Frequency (-30°C)

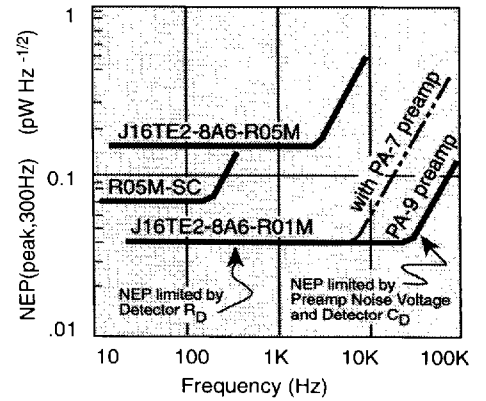


Figure 11-7 J16TE1 Detector Temperature vs TE1 Cooler Current

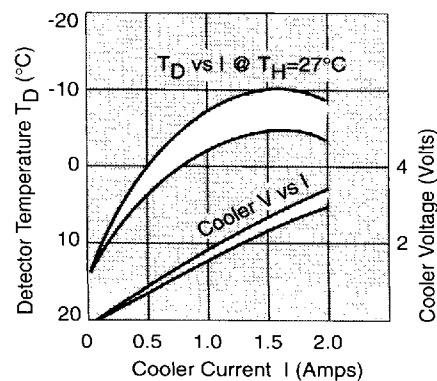


Figure 11-8 J16TE2 Detector Temperature vs TE2 Cooler Current

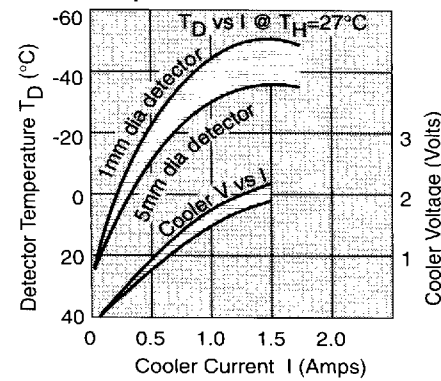


Figure 11-9 J16TE2 Detector Temperature vs Heat Sink Temperature at Constant Current

