

■ Features

The thermopile sensor consists of a series of 116 thermoelements, forming a sensitive region size of $900 \times 900 \mu\text{m}^2$. The sensor is hermetically sealed into a TO-18 metal housing, with an optical filter. This standard filter allows measurements to be made in the spectral range above $5 \mu\text{m}$ wavelength. The thermosensor exhibits an almost white noise, comparable to an ohmic resistance. It has a constant signal versus frequency up to its frequency limit, and is directly proportional to incident radiation. The thermopile sensors are featured with an additional temperature reference resistor on the same chip. The standard version of temperature reference resistor is housing connected to ground.

■ Applications

- * Ear thermometers; clinic thermometers
- * Infrared thermometers
- * Consumer applications: hair dryer, micro-wave oven, air conditioner, refrigerator
- * Continuous temperature control of manufacturing
- * Security system
- * Radiation monitor switch system
- * Absorbing measurement for gas analysis
- * Thermoelectric converter
- * Heat flux flowmeter

■ Electrical Characteristics

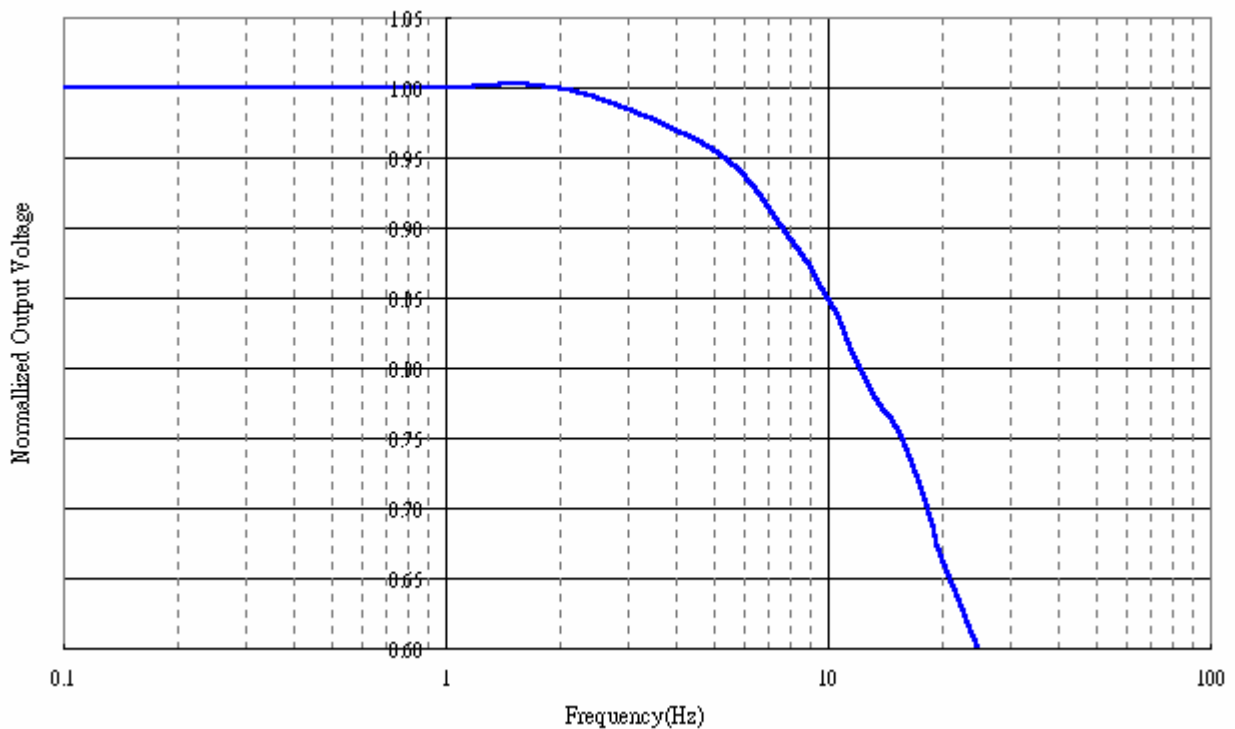
| Parameter | Condition | Min. | Typ. | Max. | Unit |
|--|---|---------------------|---------------------|---------------------|-------------------------|
| Thermopile | | | | | |
| Output Voltage | T _{ambient} =25C T _{black-body} =37C | 630 | 900 | 1170 | uV |
| Number of thermojunctions | | — | 116 | — | |
| Chip size | | — | 1740*1740 | — | μm ² |
| Active region size | High efficiency absorber layer | — | 900*900 | — | μm |
| Thickness of substrate | Silicon-substrate | 600 | 625 | 650 | μm |
| Resistance of thermopile | 25°C | 50 | 60 | 80 | KΩ |
| Temperature Coefficient of Thermopile Resistance | | | <0.1 %/°C | | |
| *Sensitivity * | With 5-14 μm filter | 30 | 37 | 45 | V/W |
| Detecctivity | | 0.8*10 ⁸ | 1.1*10 ⁸ | 1.3*10 ⁸ | cm*Hz ^{1/2} /W |
| Time constant | | — | 20 | — | ms |
| Noise voltage | | 28 | 32 | 36 | nV/Hz ^{1/2} |
| NEP | | 0.71 | 0.86 | 1.07 | nW/Hz ^{1/2} |
| Filter Range | | | Cut on 5+/-0.5um | | |
| Field of View | Incident Angle to achieve 10% responsivity | | 72 | | Degree |
| Sealing | | | <1*10 ⁻⁷ | | Atm*cc/sec |
| Temperature range | Operation | -20 | — | 100 | °C |

| | | | | | |
|---------------------------------------|------------|------|------|------|----|
| Temperature reference resistor | | | | | |
| Resistance | 25°C | 97 | 100 | 103 | KΩ |
| β value | 25°C/100°C | 3944 | 3964 | 3984 | K |

* Measured at 1 Hz chopper frequency, within spectral range 5-14 μ m, using a blackbody radiator of 500K temperature.

Note : Thermistor should be operated under 1mA.

■ Frequency response



■ Thermopile voltage(uV) vs. blackbody & ambient temperature(C)

| Ta \ Tb | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |
|---------|------|------|------|------|------|------|------|------|------|------|------|
| 5 | 1643 | 1713 | 1783 | 1855 | 1927 | 2000 | 2073 | 2147 | 2222 | 2298 | 2374 |
| 6 | 1590 | 1660 | 1731 | 1802 | 1875 | 1947 | 2021 | 2095 | 2170 | 2245 | 2322 |
| 7 | 1537 | 1607 | 1678 | 1749 | 1822 | 1894 | 1968 | 2042 | 2117 | 2192 | 2269 |
| 8 | 1484 | 1554 | 1624 | 1696 | 1768 | 1841 | 1914 | 1988 | 2063 | 2139 | 2215 |
| 9 | 1429 | 1499 | 1570 | 1642 | 1714 | 1786 | 1860 | 1934 | 2009 | 2085 | 2161 |
| 10 | 1374 | 1444 | 1515 | 1587 | 1659 | 1731 | 1805 | 1879 | 1954 | 2030 | 2106 |
| 11 | 1319 | 1389 | 1460 | 1531 | 1603 | 1676 | 1749 | 1824 | 1898 | 1974 | 2050 |
| 12 | 1262 | 1332 | 1403 | 1475 | 1547 | 1620 | 1693 | 1767 | 1842 | 1918 | 1994 |
| 13 | 1205 | 1276 | 1346 | 1418 | 1490 | 1563 | 1636 | 1710 | 1785 | 1861 | 1937 |
| 14 | 1148 | 1218 | 1289 | 1360 | 1432 | 1505 | 1579 | 1653 | 1728 | 1803 | 1879 |
| 15 | 1090 | 1160 | 1230 | 1302 | 1374 | 1447 | 1520 | 1595 | 1669 | 1745 | 1821 |
| 16 | 1031 | 1101 | 1172 | 1243 | 1315 | 1388 | 1461 | 1536 | 1610 | 1686 | 1762 |
| 17 | 971 | 1041 | 1112 | 1183 | 1256 | 1328 | 1402 | 1476 | 1551 | 1626 | 1703 |
| 18 | 911 | 981 | 1052 | 1123 | 1195 | 1268 | 1342 | 1416 | 1491 | 1566 | 1642 |
| 19 | 850 | 920 | 991 | 1062 | 1135 | 1207 | 1281 | 1355 | 1430 | 1505 | 1582 |
| 20 | 789 | 859 | 929 | 1001 | 1073 | 1146 | 1219 | 1293 | 1368 | 1444 | 1520 |
| 21 | 726 | 797 | 867 | 939 | 1011 | 1084 | 1157 | 1231 | 1306 | 1382 | 1458 |
| 22 | 664 | 734 | 804 | 876 | 948 | 1021 | 1094 | 1168 | 1243 | 1319 | 1395 |
| 23 | 600 | 670 | 741 | 812 | 885 | 957 | 1031 | 1105 | 1180 | 1255 | 1332 |
| 24 | 536 | 606 | 677 | 748 | 820 | 893 | 967 | 1041 | 1116 | 1191 | 1267 |
| 25 | 471 | 541 | 612 | 683 | 756 | 828 | 902 | 976 | 1051 | 1126 | 1203 |
| 26 | 406 | 476 | 547 | 618 | 690 | 763 | 836 | 911 | 985 | 1061 | 1137 |
| 27 | 340 | 410 | 480 | 552 | 624 | 697 | 770 | 845 | 919 | 995 | 1071 |
| 28 | 273 | 343 | 414 | 485 | 557 | 630 | 704 | 778 | 853 | 928 | 1004 |
| 29 | 205 | 276 | 346 | 418 | 490 | 563 | 636 | 710 | 785 | 861 | 937 |
| 30 | 137 | 207 | 278 | 350 | 422 | 495 | 568 | 642 | 717 | 793 | 869 |
| 31 | 69 | 139 | 209 | 281 | 353 | 426 | 499 | 574 | 648 | 724 | 800 |
| 32 | 0 | 69 | 140 | 212 | 284 | 356 | 430 | 504 | 579 | 655 | 731 |
| 33 | -71 | 0 | 70 | 142 | 214 | 286 | 360 | 434 | 509 | 585 | 661 |
| 34 | -141 | -71 | 0 | 71 | 143 | 216 | 289 | 363 | 438 | 514 | 590 |
| 35 | -213 | -143 | -72 | 0 | 72 | 144 | 218 | 292 | 367 | 442 | 519 |
| 36 | -285 | -215 | -144 | -73 | 0 | 72 | 146 | 220 | 295 | 370 | 447 |
| 37 | -357 | -287 | -217 | -145 | -73 | 0 | 73 | 147 | 222 | 298 | 374 |
| 38 | -431 | -361 | -290 | -219 | -146 | -74 | 0 | 74 | 149 | 224 | 301 |
| 39 | -505 | -435 | -364 | -292 | -220 | -148 | -74 | 0 | 75 | 151 | 227 |
| 40 | -579 | -509 | -439 | -367 | -295 | -222 | -149 | -75 | 0 | 76 | 152 |



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■ Thermistor vs. temperature

The resistance of the temperature reference resistor varies with temperature and the behaviour is illustrated in the following table.

| Ta(C) | min(k-ohms) | Typical(k-ohms) | Max(k-ohms) |
|-------|-------------|-----------------|-------------|
| -40 | 2958 | 3106 | 3259 |
| -35 | 2157 | 2262 | 2369 |
| -30 | 1590 | 1664 | 1740 |
| -25 | 1183 | 1236 | 1291 |
| -20 | 888.9 | 927.3 | 966.5 |
| -15 | 673.8 | 701.9 | 730.4 |
| -10 | 515.1 | 535.8 | 556.8 |
| -5 | 397.1 | 412.4 | 427.9 |
| 0 | 308.4 | 319.9 | 331.5 |
| 5 | 241.4 | 250.1 | 258.8 |
| 10 | 190.3 | 196.9 | 203.5 |
| 15 | 151.0 | 156.1 | 161.1 |
| 20 | 120.7 | 124.5 | 128.4 |
| 25 | 97.0 | 100.0 | 103.0 |
| 30 | 78.29 | 80.80 | 83.31 |
| 35 | 63.56 | 65.66 | 67.78 |
| 40 | 51.89 | 53.67 | 55.45 |
| 45 | 42.60 | 44.10 | 45.61 |
| 50 | 35.15 | 36.43 | 37.71 |
| 55 | 29.16 | 30.24 | 31.34 |
| 60 | 24.30 | 25.23 | 26.17 |

At temperature 25°C, $R(T)=R_{25}e^{\beta\left[\frac{1}{T}-\frac{1}{T_{25}}\right]}$ describes the resistance vs. temperature, where R_{25} is the resistance at ambient temperature 25°C and T, T_{25} are the ambient temperatures in unit of kelvin degrees.

| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|------------|----------|-------------|----------|
| 0.0 | 308.4 | 319.9 | 331.5 |
| 0.1 | 306.9 | 318.3 | 329.9 |
| 0.2 | 305.4 | 316.7 | 328.2 |
| 0.3 | 303.9 | 315.2 | 326.6 |
| 0.4 | 302.4 | 313.6 | 324.9 |
| 0.5 | 300.9 | 312.0 | 323.3 |
| 0.6 | 299.4 | 310.5 | 321.7 |
| 0.7 | 297.9 | 308.9 | 320.1 |
| 0.8 | 296.4 | 307.4 | 318.5 |
| 0.9 | 295.0 | 305.9 | 316.9 |
| 1.0 | 293.5 | 304.4 | 315.3 |
| 1.1 | 292.1 | 302.9 | 313.8 |
| 1.2 | 290.6 | 301.4 | 312.2 |
| 1.3 | 289.2 | 299.9 | 310.6 |
| 1.4 | 287.8 | 298.4 | 309.1 |
| 1.5 | 286.4 | 296.9 | 307.6 |
| 1.6 | 285.0 | 295.4 | 306.0 |
| 1.7 | 283.6 | 294.0 | 304.5 |
| 1.8 | 282.2 | 292.5 | 303.0 |
| 1.9 | 280.8 | 291.1 | 301.5 |
| 2.0 | 279.4 | 289.6 | 300.0 |
| 2.1 | 278.0 | 288.2 | 298.5 |
| 2.2 | 276.7 | 286.8 | 297.0 |
| 2.3 | 275.3 | 285.4 | 295.6 |
| 2.4 | 274.0 | 284.0 | 294.1 |
| 2.5 | 272.6 | 282.6 | 292.6 |
| 2.6 | 271.3 | 281.2 | 291.2 |
| 2.7 | 270.0 | 279.8 | 289.8 |
| 2.8 | 268.6 | 278.4 | 288.3 |
| 2.9 | 267.3 | 277.1 | 286.9 |
| 3.0 | 266.0 | 275.7 | 285.5 |
| 3.1 | 264.7 | 274.4 | 284.1 |
| 3.2 | 263.4 | 273.0 | 282.7 |
| 3.3 | 262.2 | 271.7 | 281.3 |
| 3.4 | 260.9 | 270.4 | 279.9 |
| 3.5 | 259.6 | 269.0 | 278.5 |
| 3.6 | 258.4 | 267.7 | 277.2 |
| 3.7 | 257.1 | 266.4 | 275.8 |
| 3.8 | 255.9 | 265.1 | 274.5 |
| 3.9 | 254.6 | 263.8 | 273.1 |
| 4.0 | 253.4 | 262.5 | 271.8 |

| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|------------|----------|-------------|----------|
| 4.1 | 252.2 | 261.3 | 270.4 |
| 4.2 | 250.9 | 260.0 | 269.1 |
| 4.3 | 249.7 | 258.7 | 267.8 |
| 4.4 | 248.5 | 257.5 | 266.5 |
| 4.5 | 247.3 | 256.2 | 265.2 |
| 4.6 | 246.1 | 255.0 | 263.9 |
| 4.7 | 244.9 | 253.7 | 262.6 |
| 4.8 | 243.7 | 252.5 | 261.3 |
| 4.9 | 242.6 | 251.3 | 260.1 |
| 5.0 | 241.4 | 250.1 | 258.8 |
| 5.1 | 240.2 | 248.8 | 257.5 |
| 5.2 | 239.1 | 247.6 | 256.3 |
| 5.3 | 237.9 | 246.4 | 255.0 |
| 5.4 | 236.8 | 245.3 | 253.8 |
| 5.5 | 235.6 | 244.1 | 252.6 |
| 5.6 | 234.5 | 242.9 | 251.3 |
| 5.7 | 233.4 | 241.7 | 250.1 |
| 5.8 | 232.3 | 240.6 | 248.9 |
| 5.9 | 231.2 | 239.4 | 247.7 |
| 6.0 | 230.1 | 238.2 | 246.5 |
| 6.1 | 229.0 | 237.1 | 245.3 |
| 6.2 | 227.9 | 236.0 | 244.1 |
| 6.3 | 226.8 | 234.8 | 242.9 |
| 6.4 | 225.7 | 233.7 | 241.8 |
| 6.5 | 224.6 | 232.6 | 240.6 |
| 6.6 | 223.5 | 231.5 | 239.4 |
| 6.7 | 222.5 | 230.3 | 238.3 |
| 6.8 | 221.4 | 229.2 | 237.1 |
| 6.9 | 220.3 | 228.1 | 236.0 |
| 7.0 | 219.3 | 227.0 | 234.9 |
| 7.1 | 218.3 | 226.0 | 233.7 |
| 7.2 | 217.2 | 224.9 | 232.6 |
| 7.3 | 216.2 | 223.8 | 231.5 |
| 7.4 | 215.2 | 222.7 | 230.4 |
| 7.5 | 214.1 | 221.7 | 229.3 |
| 7.6 | 213.1 | 220.6 | 228.2 |
| 7.7 | 212.1 | 219.6 | 227.1 |
| 7.8 | 211.1 | 218.5 | 226.0 |
| 7.9 | 210.1 | 217.5 | 224.9 |
| 8.0 | 209.1 | 216.4 | 223.8 |
| 8.1 | 208.1 | 215.4 | 222.8 |



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| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 8.2 | 207.1 | 214.4 | 221.7 |
| 8.3 | 206.2 | 213.4 | 220.6 |
| 8.4 | 205.2 | 212.4 | 219.6 |
| 8.5 | 204.2 | 211.4 | 218.5 |
| 8.6 | 203.2 | 210.3 | 217.5 |
| 8.7 | 202.3 | 209.4 | 216.5 |
| 8.8 | 201.3 | 208.4 | 215.4 |
| 8.9 | 200.4 | 207.4 | 214.4 |
| 9.0 | 199.4 | 206.4 | 213.4 |
| 9.1 | 198.5 | 205.4 | 212.4 |
| 9.2 | 197.6 | 204.4 | 211.4 |
| 9.3 | 196.6 | 203.5 | 210.4 |
| 9.4 | 195.7 | 202.5 | 209.4 |
| 9.5 | 194.8 | 201.6 | 208.4 |
| 9.6 | 193.9 | 200.6 | 207.4 |
| 9.7 | 193.0 | 199.7 | 206.4 |
| 9.8 | 192.1 | 198.7 | 205.4 |
| 9.9 | 191.2 | 197.8 | 204.4 |
| 10.0 | 190.3 | 196.9 | 203.5 |
| 10.1 | 189.4 | 195.9 | 202.5 |
| 10.2 | 188.5 | 195.0 | 201.6 |
| 10.3 | 187.6 | 194.1 | 200.6 |
| 10.4 | 186.8 | 193.2 | 199.7 |
| 10.5 | 185.9 | 192.3 | 198.7 |
| 10.6 | 185.0 | 191.4 | 197.8 |
| 10.7 | 184.2 | 190.5 | 196.9 |
| 10.8 | 183.3 | 189.6 | 195.9 |
| 10.9 | 182.4 | 188.7 | 195.0 |
| 11.0 | 181.6 | 187.8 | 194.1 |
| 11.1 | 180.7 | 186.9 | 193.2 |
| 11.2 | 179.9 | 186.1 | 192.3 |
| 11.3 | 179.1 | 185.2 | 191.4 |
| 11.4 | 178.2 | 184.3 | 190.5 |
| 11.5 | 177.4 | 183.5 | 189.6 |
| 11.6 | 176.6 | 182.6 | 188.7 |
| 11.7 | 175.8 | 181.8 | 187.8 |
| 11.8 | 175.0 | 180.9 | 186.9 |
| 11.9 | 174.1 | 180.1 | 186.1 |
| 12.0 | 173.3 | 179.2 | 185.2 |
| 12.1 | 172.5 | 178.4 | 184.3 |
| 12.2 | 171.7 | 177.6 | 183.5 |

| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 12.3 | 171.0 | 176.8 | 182.6 |
| 12.4 | 170.2 | 175.9 | 181.8 |
| 12.5 | 169.4 | 175.1 | 180.9 |
| 12.6 | 168.6 | 174.3 | 180.1 |
| 12.7 | 167.8 | 173.5 | 179.2 |
| 12.8 | 167.0 | 172.7 | 178.4 |
| 12.9 | 166.3 | 171.9 | 177.6 |
| 13.0 | 165.5 | 171.1 | 176.7 |
| 13.1 | 164.8 | 170.3 | 175.9 |
| 13.2 | 164.0 | 169.5 | 175.1 |
| 13.3 | 163.2 | 168.8 | 174.3 |
| 13.4 | 162.5 | 168.0 | 173.5 |
| 13.5 | 161.8 | 167.2 | 172.7 |
| 13.6 | 161.0 | 166.4 | 171.9 |
| 13.7 | 160.3 | 165.7 | 171.1 |
| 13.8 | 159.5 | 164.9 | 170.3 |
| 13.9 | 158.8 | 164.1 | 169.5 |
| 14.0 | 158.1 | 163.4 | 168.7 |
| 14.1 | 157.4 | 162.6 | 167.9 |
| 14.2 | 156.6 | 161.9 | 167.2 |
| 14.3 | 155.9 | 161.1 | 166.4 |
| 14.4 | 155.2 | 160.4 | 165.6 |
| 14.5 | 154.5 | 159.7 | 164.9 |
| 14.6 | 153.8 | 158.9 | 164.1 |
| 14.7 | 153.1 | 158.2 | 163.3 |
| 14.8 | 152.4 | 157.5 | 162.6 |
| 14.9 | 151.7 | 156.8 | 161.8 |
| 15.0 | 151.0 | 156.1 | 161.1 |
| 15.1 | 150.3 | 155.3 | 160.4 |
| 15.2 | 149.7 | 154.6 | 159.6 |
| 15.3 | 149.0 | 153.9 | 158.9 |
| 15.4 | 148.3 | 153.2 | 158.2 |
| 15.5 | 147.6 | 152.5 | 157.4 |
| 15.6 | 147.0 | 151.8 | 156.7 |
| 15.7 | 146.3 | 151.1 | 156.0 |
| 15.8 | 145.6 | 150.5 | 155.3 |
| 15.9 | 145.0 | 149.8 | 154.6 |
| 16.0 | 144.3 | 149.1 | 153.9 |
| 16.1 | 143.7 | 148.4 | 153.2 |
| 16.2 | 143.0 | 147.7 | 152.5 |
| 16.3 | 142.4 | 147.1 | 151.8 |



| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 16.4 | 141.7 | 146.4 | 151.1 |
| 16.5 | 141.1 | 145.7 | 150.4 |
| 16.6 | 140.5 | 145.1 | 149.7 |
| 16.7 | 139.8 | 144.4 | 149.0 |
| 16.8 | 139.2 | 143.8 | 148.4 |
| 16.9 | 138.6 | 143.1 | 147.7 |
| 17.0 | 137.9 | 142.5 | 147.0 |
| 17.1 | 137.3 | 141.8 | 146.3 |
| 17.2 | 136.7 | 141.2 | 145.7 |
| 17.3 | 136.1 | 140.6 | 145.0 |
| 17.4 | 135.5 | 139.9 | 144.4 |
| 17.5 | 134.9 | 139.3 | 143.7 |
| 17.6 | 134.3 | 138.7 | 143.1 |
| 17.7 | 133.7 | 138.0 | 142.4 |
| 17.8 | 133.1 | 137.4 | 141.8 |
| 17.9 | 132.5 | 136.8 | 141.1 |
| 18.0 | 131.9 | 136.2 | 140.5 |
| 18.1 | 131.3 | 135.6 | 139.9 |
| 18.2 | 130.7 | 135.0 | 139.2 |
| 18.3 | 130.1 | 134.4 | 138.6 |
| 18.4 | 129.5 | 133.8 | 138.0 |
| 18.5 | 129.0 | 133.2 | 137.4 |
| 18.6 | 128.4 | 132.6 | 136.7 |
| 18.7 | 127.8 | 132.0 | 136.1 |
| 18.8 | 127.3 | 131.4 | 135.5 |
| 18.9 | 126.7 | 130.8 | 134.9 |
| 19.0 | 126.1 | 130.2 | 134.3 |
| 19.1 | 125.6 | 129.6 | 133.7 |
| 19.2 | 125.0 | 129.0 | 133.1 |
| 19.3 | 124.5 | 128.5 | 132.5 |
| 19.4 | 123.9 | 127.9 | 131.9 |
| 19.5 | 123.4 | 127.3 | 131.3 |
| 19.6 | 122.8 | 126.8 | 130.7 |
| 19.7 | 122.3 | 126.2 | 130.1 |
| 19.8 | 121.7 | 125.6 | 129.6 |
| 19.9 | 121.2 | 125.1 | 129.0 |
| 20.0 | 120.7 | 124.5 | 128.4 |
| 20.1 | 120.1 | 124.0 | 127.8 |
| 20.2 | 119.6 | 123.4 | 127.3 |
| 20.3 | 119.1 | 122.9 | 126.7 |
| 20.4 | 118.5 | 122.3 | 126.1 |

| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 20.5 | 118.0 | 121.8 | 125.6 |
| 20.6 | 117.5 | 121.3 | 125.0 |
| 20.7 | 117.0 | 120.7 | 124.5 |
| 20.8 | 116.5 | 120.2 | 123.9 |
| 20.9 | 116.0 | 119.6 | 123.4 |
| 21.0 | 115.4 | 119.1 | 122.8 |
| 21.1 | 114.9 | 118.6 | 122.3 |
| 21.2 | 114.4 | 118.1 | 121.7 |
| 21.3 | 113.9 | 117.6 | 121.2 |
| 21.4 | 113.4 | 117.0 | 120.6 |
| 21.5 | 112.9 | 116.5 | 120.1 |
| 21.6 | 112.4 | 116.0 | 119.6 |
| 21.7 | 111.9 | 115.5 | 119.0 |
| 21.8 | 111.5 | 115.0 | 118.5 |
| 21.9 | 111.0 | 114.5 | 118.0 |
| 22.0 | 110.5 | 114.0 | 117.5 |
| 22.1 | 110.0 | 113.5 | 117.0 |
| 22.2 | 109.5 | 113.0 | 116.4 |
| 22.3 | 109.0 | 112.5 | 115.9 |
| 22.4 | 108.6 | 112.0 | 115.4 |
| 22.5 | 108.1 | 111.5 | 114.9 |
| 22.6 | 107.6 | 111.0 | 114.4 |
| 22.7 | 107.2 | 110.5 | 113.9 |
| 22.8 | 106.7 | 110.0 | 113.4 |
| 22.9 | 106.2 | 109.6 | 112.9 |
| 23.0 | 105.8 | 109.1 | 112.4 |
| 23.1 | 105.3 | 108.6 | 111.9 |
| 23.2 | 104.9 | 108.1 | 111.4 |
| 23.3 | 104.4 | 107.7 | 110.9 |
| 23.4 | 103.9 | 107.2 | 110.5 |
| 23.5 | 103.5 | 106.7 | 110.0 |
| 23.6 | 103.0 | 106.3 | 109.5 |
| 23.7 | 102.6 | 105.8 | 109.0 |
| 23.8 | 102.2 | 105.3 | 108.5 |
| 23.9 | 101.7 | 104.9 | 108.1 |
| 24.0 | 101.3 | 104.4 | 107.6 |
| 24.1 | 100.8 | 104.0 | 107.1 |
| 24.2 | 100.4 | 103.5 | 106.7 |
| 24.3 | 100.0 | 103.1 | 106.2 |
| 24.4 | 99.54 | 102.6 | 105.7 |
| 24.5 | 99.11 | 102.2 | 105.3 |



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| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 24.6 | 98.69 | 101.7 | 104.8 |
| 24.7 | 98.26 | 101.3 | 104.4 |
| 24.8 | 97.84 | 100.9 | 103.9 |
| 24.9 | 97.42 | 100.4 | 103.4 |
| 25.0 | 97.00 | 100.0 | 103.0 |
| 25.1 | 96.58 | 99.57 | 102.6 |
| 25.2 | 96.16 | 99.14 | 102.1 |
| 25.3 | 95.74 | 98.71 | 101.7 |
| 25.4 | 95.33 | 98.29 | 101.2 |
| 25.5 | 94.92 | 97.86 | 100.8 |
| 25.6 | 94.51 | 97.44 | 100.4 |
| 25.7 | 94.10 | 97.02 | 99.95 |
| 25.8 | 93.69 | 96.61 | 99.52 |
| 25.9 | 93.29 | 96.19 | 99.10 |
| 26.0 | 92.88 | 95.78 | 98.67 |
| 26.1 | 92.48 | 95.37 | 98.25 |
| 26.2 | 92.09 | 94.96 | 97.83 |
| 26.3 | 91.69 | 94.55 | 97.42 |
| 26.4 | 91.29 | 94.15 | 97.00 |
| 26.5 | 90.90 | 93.74 | 96.59 |
| 26.6 | 90.51 | 93.34 | 96.18 |
| 26.7 | 90.12 | 92.94 | 95.77 |
| 26.8 | 89.73 | 92.55 | 95.36 |
| 26.9 | 89.35 | 92.15 | 94.96 |
| 27.0 | 88.97 | 91.76 | 94.55 |
| 27.1 | 88.58 | 91.37 | 94.15 |
| 27.2 | 88.20 | 90.98 | 93.75 |
| 27.3 | 87.83 | 90.59 | 93.35 |
| 27.4 | 87.45 | 90.20 | 92.96 |
| 27.5 | 87.08 | 89.82 | 92.57 |
| 27.6 | 86.70 | 89.44 | 92.17 |
| 27.7 | 86.33 | 89.06 | 91.78 |
| 27.8 | 85.97 | 88.68 | 91.40 |
| 27.9 | 85.60 | 88.30 | 91.01 |
| 28.0 | 85.23 | 87.93 | 90.62 |
| 28.1 | 84.87 | 87.55 | 90.24 |
| 28.2 | 84.51 | 87.18 | 89.86 |
| 28.3 | 84.15 | 86.81 | 89.48 |
| 28.4 | 83.79 | 86.45 | 89.11 |
| 28.5 | 83.43 | 86.08 | 88.73 |
| 28.6 | 83.08 | 85.72 | 88.36 |

| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 28.7 | 82.73 | 85.35 | 87.99 |
| 28.8 | 82.37 | 84.99 | 87.62 |
| 28.9 | 82.02 | 84.63 | 87.25 |
| 29.0 | 81.68 | 84.28 | 86.88 |
| 29.1 | 81.33 | 83.92 | 86.52 |
| 29.2 | 80.98 | 83.57 | 86.15 |
| 29.3 | 80.64 | 83.21 | 85.79 |
| 29.4 | 80.30 | 82.86 | 85.43 |
| 29.5 | 79.96 | 82.52 | 85.07 |
| 29.6 | 79.62 | 82.17 | 84.72 |
| 29.7 | 79.29 | 81.82 | 84.36 |
| 29.8 | 78.95 | 81.48 | 84.01 |
| 29.9 | 78.62 | 81.14 | 83.66 |
| 30.0 | 78.29 | 80.80 | 83.31 |
| 30.1 | 77.96 | 80.46 | 82.96 |
| 30.2 | 77.63 | 80.12 | 82.62 |
| 30.3 | 77.30 | 79.78 | 82.27 |
| 30.4 | 76.98 | 79.45 | 81.93 |
| 30.5 | 76.65 | 79.12 | 81.59 |
| 30.6 | 76.33 | 78.79 | 81.25 |
| 30.7 | 76.01 | 78.46 | 80.91 |
| 30.8 | 75.69 | 78.13 | 80.57 |
| 30.9 | 75.37 | 77.80 | 80.24 |
| 31.0 | 75.05 | 77.48 | 79.91 |
| 31.1 | 74.74 | 77.15 | 79.57 |
| 31.2 | 74.43 | 76.83 | 79.24 |
| 31.3 | 74.11 | 76.51 | 78.92 |
| 31.4 | 73.80 | 76.19 | 78.59 |
| 31.5 | 73.50 | 75.88 | 78.26 |
| 31.6 | 73.19 | 75.56 | 77.94 |
| 31.7 | 72.88 | 75.25 | 77.62 |
| 31.8 | 72.58 | 74.93 | 77.30 |
| 31.9 | 72.28 | 74.62 | 76.98 |
| 32.0 | 71.97 | 74.31 | 76.66 |
| 32.1 | 71.67 | 74.00 | 76.34 |
| 32.2 | 71.37 | 73.70 | 76.03 |
| 32.3 | 71.08 | 73.39 | 75.71 |
| 32.4 | 70.78 | 73.09 | 75.40 |
| 32.5 | 70.49 | 72.79 | 75.09 |
| 32.6 | 70.19 | 72.48 | 74.78 |
| 32.7 | 69.90 | 72.18 | 74.47 |



| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 32.8 | 69.61 | 71.89 | 74.17 |
| 32.9 | 69.32 | 71.59 | 73.86 |
| 33.0 | 69.03 | 71.29 | 73.56 |
| 33.1 | 68.75 | 71.00 | 73.26 |
| 33.2 | 68.46 | 70.71 | 72.96 |
| 33.3 | 68.18 | 70.42 | 72.66 |
| 33.4 | 67.90 | 70.13 | 72.36 |
| 33.5 | 67.62 | 69.84 | 72.06 |
| 33.6 | 67.34 | 69.55 | 71.77 |
| 33.7 | 67.06 | 69.26 | 71.48 |
| 33.8 | 66.78 | 68.98 | 71.18 |
| 33.9 | 66.51 | 68.69 | 70.89 |
| 34.0 | 66.23 | 68.41 | 70.60 |
| 34.1 | 65.96 | 68.13 | 70.31 |
| 34.2 | 65.69 | 67.85 | 70.03 |
| 34.3 | 65.42 | 67.57 | 69.74 |
| 34.4 | 65.15 | 67.30 | 69.46 |
| 34.5 | 64.88 | 67.02 | 69.17 |
| 34.6 | 64.61 | 66.75 | 68.89 |
| 34.7 | 64.35 | 66.47 | 68.61 |
| 34.8 | 64.08 | 66.20 | 68.33 |
| 34.9 | 63.82 | 65.93 | 68.06 |
| 35.0 | 63.56 | 65.66 | 67.78 |
| 35.1 | 63.30 | 65.40 | 67.50 |
| 35.2 | 63.04 | 65.13 | 67.23 |
| 35.3 | 62.78 | 64.86 | 66.96 |
| 35.4 | 62.52 | 64.60 | 66.69 |
| 35.5 | 62.26 | 64.34 | 66.42 |
| 35.6 | 62.01 | 64.07 | 66.15 |
| 35.7 | 61.76 | 63.81 | 65.88 |
| 35.8 | 61.50 | 63.55 | 65.61 |
| 35.9 | 61.25 | 63.30 | 65.35 |
| 36.0 | 61.00 | 63.04 | 65.08 |
| 36.1 | 60.75 | 62.78 | 64.82 |
| 36.2 | 60.51 | 62.53 | 64.56 |
| 36.3 | 60.26 | 62.27 | 64.30 |
| 36.4 | 60.01 | 62.02 | 64.04 |
| 36.5 | 59.77 | 61.77 | 63.78 |
| 36.6 | 59.53 | 61.52 | 63.52 |
| 36.7 | 59.28 | 61.27 | 63.27 |
| 36.8 | 59.04 | 61.02 | 63.01 |

| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 36.9 | 58.80 | 60.78 | 62.76 |
| 37.0 | 58.57 | 60.53 | 62.51 |
| 37.1 | 58.33 | 60.29 | 62.26 |
| 37.2 | 58.09 | 60.04 | 62.01 |
| 37.3 | 57.86 | 59.80 | 61.76 |
| 37.4 | 57.62 | 59.56 | 61.51 |
| 37.5 | 57.39 | 59.32 | 61.26 |
| 37.6 | 57.16 | 59.08 | 61.02 |
| 37.7 | 56.92 | 58.84 | 60.78 |
| 37.8 | 56.69 | 58.61 | 60.53 |
| 37.9 | 56.47 | 58.37 | 60.29 |
| 38.0 | 56.24 | 58.14 | 60.05 |
| 38.1 | 56.01 | 57.90 | 59.81 |
| 38.2 | 55.78 | 57.67 | 59.57 |
| 38.3 | 55.56 | 57.44 | 59.33 |
| 38.4 | 55.34 | 57.21 | 59.10 |
| 38.5 | 55.11 | 56.98 | 58.86 |
| 38.6 | 54.89 | 56.75 | 58.63 |
| 38.7 | 54.67 | 56.53 | 58.39 |
| 38.8 | 54.45 | 56.30 | 58.16 |
| 38.9 | 54.23 | 56.08 | 57.93 |
| 39.0 | 54.01 | 55.85 | 57.70 |
| 39.1 | 53.80 | 55.63 | 57.47 |
| 39.2 | 53.58 | 55.41 | 57.24 |
| 39.3 | 53.37 | 55.19 | 57.01 |
| 39.4 | 53.15 | 54.97 | 56.79 |
| 39.5 | 52.94 | 54.75 | 56.56 |
| 39.6 | 52.73 | 54.53 | 56.34 |
| 39.7 | 52.52 | 54.31 | 56.12 |
| 39.8 | 52.31 | 54.10 | 55.89 |
| 39.9 | 52.10 | 53.88 | 55.67 |
| 40.0 | 51.89 | 53.67 | 55.45 |
| 40.1 | 51.68 | 53.45 | 55.23 |
| 40.2 | 51.48 | 53.24 | 55.02 |
| 40.3 | 51.27 | 53.03 | 54.80 |
| 40.4 | 51.07 | 52.82 | 54.58 |
| 40.5 | 50.86 | 52.61 | 54.37 |
| 40.6 | 50.66 | 52.40 | 54.15 |
| 40.7 | 50.46 | 52.19 | 53.94 |
| 40.8 | 50.26 | 51.99 | 53.73 |
| 40.9 | 50.06 | 51.78 | 53.52 |



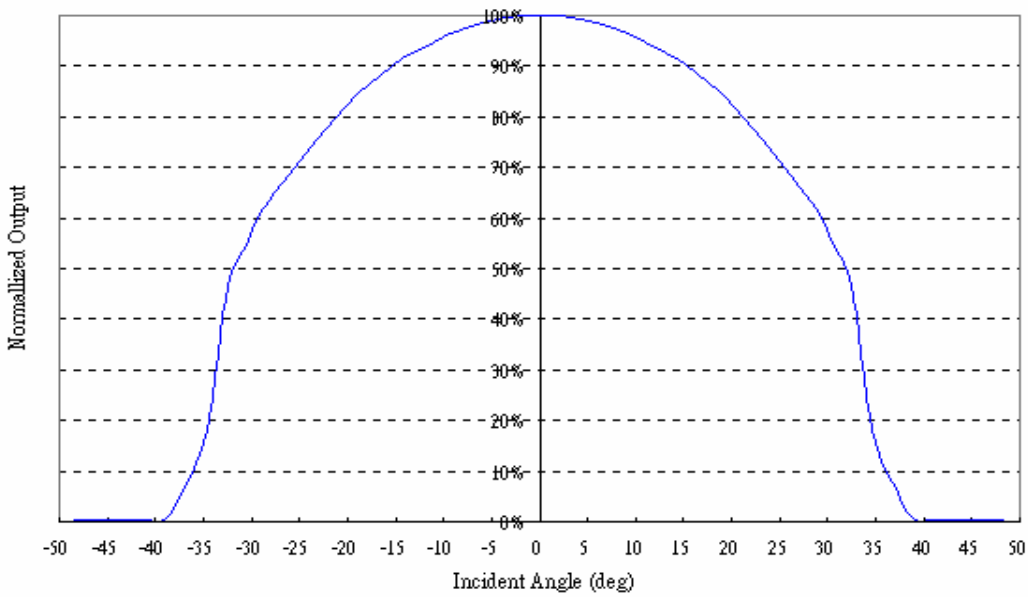
| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 41.0 | 49.86 | 51.58 | 53.31 |
| 41.1 | 49.66 | 51.37 | 53.10 |
| 41.2 | 49.47 | 51.17 | 52.89 |
| 41.3 | 49.27 | 50.97 | 52.68 |
| 41.4 | 49.07 | 50.77 | 52.47 |
| 41.5 | 48.88 | 50.57 | 52.27 |
| 41.6 | 48.69 | 50.37 | 52.06 |
| 41.7 | 48.49 | 50.17 | 51.86 |
| 41.8 | 48.30 | 49.97 | 51.66 |
| 41.9 | 48.11 | 49.78 | 51.45 |
| 42.0 | 47.92 | 49.58 | 51.25 |
| 42.1 | 47.73 | 49.39 | 51.05 |
| 42.2 | 47.54 | 49.19 | 50.85 |
| 42.3 | 47.36 | 49.00 | 50.65 |
| 42.4 | 47.17 | 48.81 | 50.46 |
| 42.5 | 46.98 | 48.62 | 50.26 |
| 42.6 | 46.80 | 48.43 | 50.06 |
| 42.7 | 46.61 | 48.24 | 49.87 |
| 42.8 | 46.43 | 48.05 | 49.67 |
| 42.9 | 46.25 | 47.86 | 49.48 |
| 43.0 | 46.07 | 47.67 | 49.29 |
| 43.1 | 45.89 | 47.49 | 49.10 |
| 43.2 | 45.71 | 47.30 | 48.91 |
| 43.3 | 45.53 | 47.12 | 48.72 |
| 43.4 | 45.35 | 46.93 | 48.53 |
| 43.5 | 45.17 | 46.75 | 48.34 |
| 43.6 | 44.99 | 46.57 | 48.15 |
| 43.7 | 44.82 | 46.39 | 47.96 |
| 43.8 | 44.64 | 46.20 | 47.78 |
| 43.9 | 44.47 | 46.03 | 47.59 |
| 44.0 | 44.29 | 45.85 | 47.41 |
| 44.1 | 44.12 | 45.67 | 47.23 |
| 44.2 | 43.95 | 45.49 | 47.04 |
| 44.3 | 43.78 | 45.31 | 46.86 |
| 44.4 | 43.61 | 45.14 | 46.68 |
| 44.5 | 43.44 | 44.96 | 46.50 |
| 44.6 | 43.27 | 44.79 | 46.32 |
| 44.7 | 43.10 | 44.62 | 46.14 |
| 44.8 | 42.93 | 44.44 | 45.97 |
| 44.9 | 42.76 | 44.27 | 45.79 |
| 45.0 | 42.60 | 44.10 | 45.61 |

| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 45.1 | 42.43 | 43.93 | 45.44 |
| 45.2 | 42.27 | 43.76 | 45.26 |
| 45.3 | 42.10 | 43.59 | 45.09 |
| 45.4 | 41.94 | 43.42 | 44.92 |
| 45.5 | 41.78 | 43.25 | 44.74 |
| 45.6 | 41.62 | 43.09 | 44.57 |
| 45.7 | 41.45 | 42.92 | 44.40 |
| 45.8 | 41.29 | 42.76 | 44.23 |
| 45.9 | 41.13 | 42.59 | 44.06 |
| 46.0 | 40.98 | 42.43 | 43.89 |
| 46.1 | 40.82 | 42.26 | 43.72 |
| 46.2 | 40.66 | 42.10 | 43.56 |
| 46.3 | 40.50 | 41.94 | 43.39 |
| 46.4 | 40.35 | 41.78 | 43.23 |
| 46.5 | 40.19 | 41.62 | 43.06 |
| 46.6 | 40.04 | 41.46 | 42.90 |
| 46.7 | 39.88 | 41.30 | 42.73 |
| 46.8 | 39.73 | 41.14 | 42.57 |
| 46.9 | 39.58 | 40.99 | 42.41 |
| 47.0 | 39.42 | 40.83 | 42.25 |
| 47.1 | 39.27 | 40.67 | 42.09 |
| 47.2 | 39.12 | 40.52 | 41.93 |
| 47.3 | 38.97 | 40.36 | 41.77 |
| 47.4 | 38.82 | 40.21 | 41.61 |
| 47.5 | 38.67 | 40.05 | 41.45 |
| 47.6 | 38.52 | 39.90 | 41.29 |
| 47.7 | 38.38 | 39.75 | 41.14 |
| 47.8 | 38.23 | 39.60 | 40.98 |
| 47.9 | 38.08 | 39.45 | 40.82 |
| 48.0 | 37.94 | 39.30 | 40.67 |
| 48.1 | 37.79 | 39.15 | 40.52 |
| 48.2 | 37.65 | 39.00 | 40.36 |
| 48.3 | 37.50 | 38.85 | 40.21 |
| 48.4 | 37.36 | 38.70 | 40.06 |
| 48.5 | 37.22 | 38.56 | 39.91 |
| 48.6 | 37.08 | 38.41 | 39.76 |
| 48.7 | 36.94 | 38.26 | 39.61 |
| 48.8 | 36.79 | 38.12 | 39.46 |
| 48.9 | 36.65 | 37.98 | 39.31 |
| 49.0 | 36.52 | 37.83 | 39.16 |
| 49.1 | 36.38 | 37.69 | 39.01 |



| Temp.(C) | min.(KΩ) | typical(KΩ) | max.(KΩ) |
|-------------|----------|-------------|----------|
| 49.2 | 36.24 | 37.55 | 38.87 |
| 49.3 | 36.10 | 37.40 | 38.72 |
| 49.4 | 35.96 | 37.26 | 38.57 |
| 49.5 | 35.83 | 37.12 | 38.43 |
| 49.6 | 35.69 | 36.98 | 38.28 |
| 49.7 | 35.56 | 36.84 | 38.14 |
| 49.8 | 35.42 | 36.70 | 38.00 |
| 49.9 | 35.29 | 36.57 | 37.86 |
| 50.0 | 35.15 | 36.43 | 37.71 |

■ **Field of view**

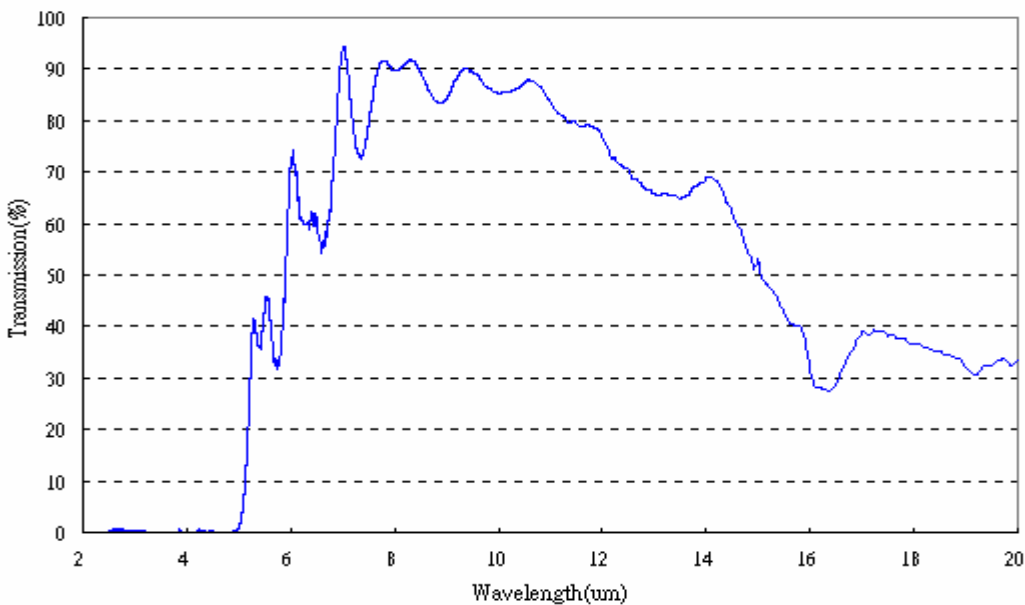


■ **Transmission of filter**

Transmission of optical filter is measured by FTIR from 2 μ m

Cut on wavelength : 5.0 +/-0.5 μ m

Band range and minimum average transmission : 7~14 μ m , 78%

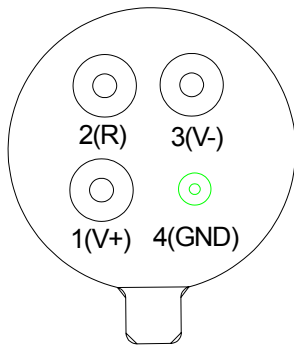


Reliability Test

| Items | Conditions | Variation of Output Voltage | MIL-STD reference | IEC reference |
|-----------------------|--|-----------------------------|-------------------|---------------------|
| Vibration | 15g, 20 min/ cycle, 12 cycles/ axis | <+/- 2% | 202F, 204D, B | |
| Mechanical Shock | Half-sine, 100g, 6 ms | <+/- 2% | | IEC 68-2-27 test Ea |
| Damp Heat | 85°C, 85RH, 504 Hrs | <+/- 2% | | IEC 68-2-3 test Ca |
| Cold | -40°C, 504Hrs | <+/- 2% | | IEC 68-2-1 test Aa |
| Dry Heat | 130°C, 1008 Hrs | <+/- 3% | | IEC 68-2-2 test Ba |
| Thermal Shock | -40°C/85°C, 30 mins dwell, 10 Cycles | <+/- 2% | | IEC 68-2-14 test Nb |
| General preservation | 1atm, 15°C~35°C, 1 years | <+/- 2% | | |
| Leakage | 35psig, 30min, (1 x 10 ⁻⁷ atm*cc/sec) | 100% No Leakage | 883D, 1014.9, E | |
| Lead tension strength | | > 5Kg | | |

*The thermopile sensor can be damaged by ESD . Please take appropriate precautions of the handling .

Pin assignment & description



BACKSIDE VIEW

Pin assignment:

2 : thermistor pin

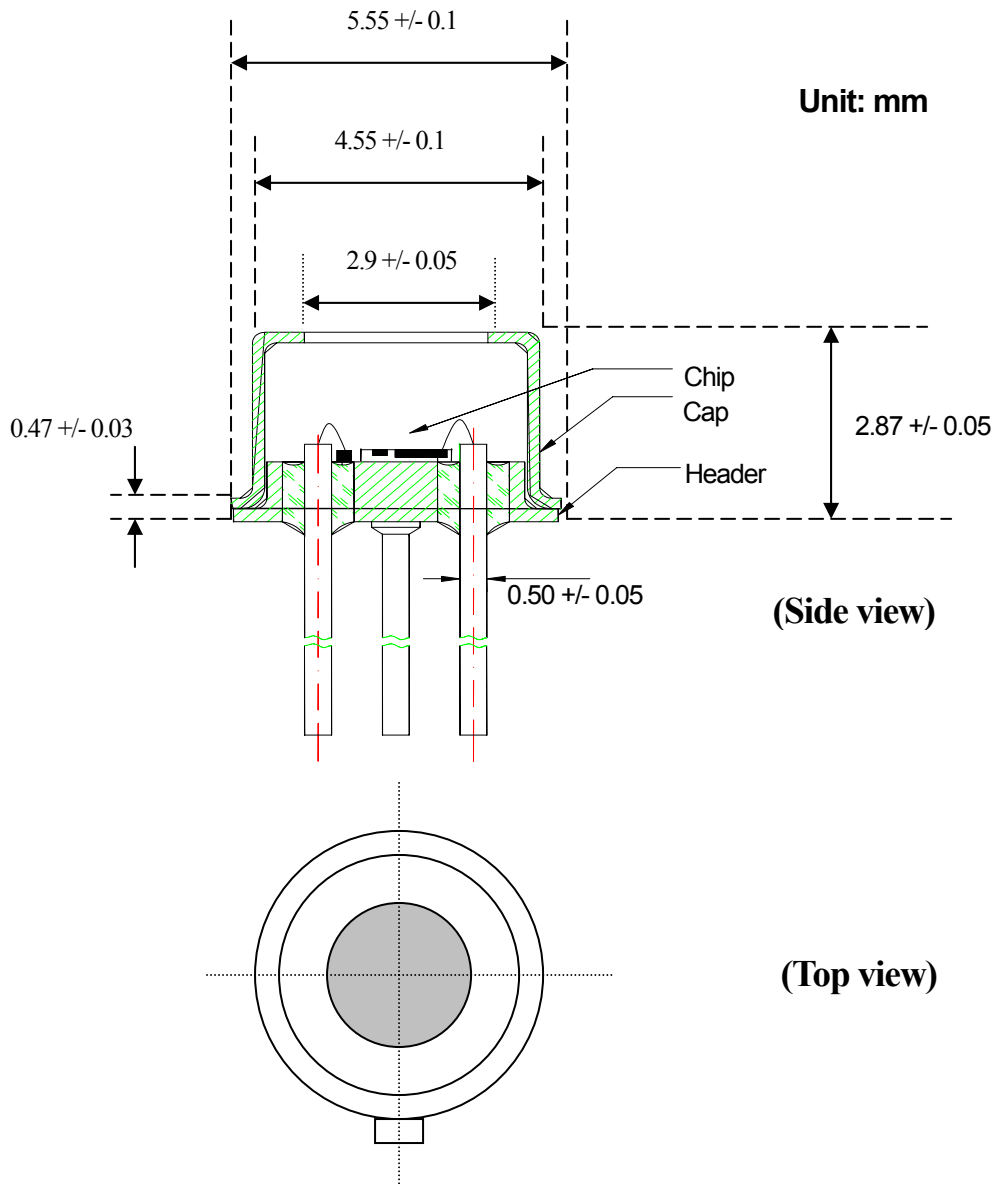
4 : thermistor pin (GND)

1 : thermopile output pin (+)

3 : thermopile output pin (-)

■ Package

The sensor is hermetically sealed into a TO-18 metal housing, with optical filter. This standard filter allows measurements to be made in the spectral range above $5\mu\text{m}$ wavelength. The dimensions of header and cap are shown below.



(Bottom view)

