SGS-THOMSON MICROELECTRONICS

# P6KE6V8P, A → 440P, A
# P6KE6V8CP, CA → 440CP, CA

## UNI-AND BIDIRECTIONAL TRANSIENT VOLTAGE SUPPRESSORS

- HIGH SURGE CAPABILITY :
  600 W / 1 ms EXPO
- VERY FAST CLAMPING TIME :
  1 ps FOR UNIDIRECTIONAL TYPES
  5 ns FOR BIDIRECTIONAL TYPES
- LARGE VOLTAGE RANGE :
  5.8 V → 376 V
- ORDER CODE :
  TYPE NUMBER FOR UNIDIRECTIONAL TYPES, TYPE NUMBER + SUFFIX C FOR BIDIRECTIONAL TYPES

**CB-417**
(Plastic)

### DESCRIPTION

Transient voltage suppressor diodes especially useful in protecting integrated circuits, MOS, hybrids and other voltage-sensitive semiconductors and components.

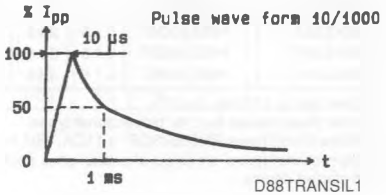
### ABSOLUTE RATINGS (limiting values)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $P_p$ | Peak Pulse Power for 1 ms Exponential Pulse | $T_j$ Initial = 25 °C See note 1 | 600 | W |
| P | Power Dissipation on Infinite Heatsink | $T_{amb}$ = 75 °C | 5 | W |
| $I_{FSM}$ | Non Repetitive Surge Peak Forward Current for Unidirectional Types | $T_j$ Initial = 25 °C t = 10 ms | 100 | A |
| $T_{stg}$<br>$T_j$ | Storage and Operating Junction Temperature Range | | – 55 to 175<br>175 | °C<br>°C |
| $T_L$ | Maximum Lead Temperature for Soldering During 10 s at 4 mm from Case | | 230 | °C |

### THERMAL RESISTANCE

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{th(j-l)}$ | Junction-leads on Infinite Heatsink for $L_{lead}$ = 10 mm | 20 | °C/W |

**Note :** 1. For surges upper than the maximum values, the diode will present a short-circuit anode-cathode.



## ELECTRICAL CHARACTERISTICS ($T_j$ = 25 °C)

| Symbol | Parameter | | Value |
|---|---|---|---|
| $V_{RM}$ | Stand-off Voltage | | See tables |
| $V_{(BR)}$ | Breakdown Voltage | | |
| $V_{(CL)}$ | Clamping Voltage | | |
| $I_{pp}$ | Peak Pulse Current | | |
| $\alpha_T$ | Temperature Coefficient of $V_{(BR)}$ | | |
| C | Capacitance | | |
| $t_{clamping}$ | Clamping Time (0 volt to $V_{(BR)}$) | Unidirectional Types | 1 ps max. |
| | | Bidirectional Types | 5 ns max. |
| $V_{FM}$ | Forward Voltage Drop for Unidirectional Types ($I_{FM}$ = 50 A) | | 3.5 V max. |

| Types | | $I_{RM}$ @ $V_{RM}$ max. | | $V_{(BR)}$* @ $I_R$ (V) | | | | $V_{(CL)}$ @ $I_{pp}$ max. 1 ms expo | | $V_{(CL)}$ @ $I_{pp}$ max. 8-20 µs expo | | $\alpha_T$ max. | C** typ $V_R$=0 f=1 MHz |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | (µA) | (V) | min. | nom. | max. | (mA) | (V) | (A) | (V) | (A) | ($10^{-4}$/°C) | (pF) |
| P P6KE6V8P | P P6KE6V8CP | 1000§ | 5.8 | 6.45 | 6.8 | 7.48 | 10 | 10.5 | 57 | 13.4 | 261 | 5.7 | 4000 |
| P6KE6V8A | P6KE6V8CA | 1000§ | 5.8 | 6.45 | 6.8 | 7.14 | 10 | 10.5 | 57 | 13.4 | 261 | 5.7 | 4000 |
| P P6KE7V5P | P P6KE7V5CP | 500§ | 6.4 | 7.13 | 7.5 | 8.25 | 10 | 11.3 | 53 | 14.5 | 241 | 6.1 | 3700 |
| P6KE7V5A | P6KE7V5CA | 500§ | 6.4 | 7.13 | 7.5 | 7.88 | 10 | 11.3 | 53 | 14.5 | 241 | 6.1 | 3700 |
| P P6KE8V2P | P6KE8V2CP | 200§ | 7.02 | 7.79 | 8.2 | 9.02 | 10 | 12.1 | 50 | 15.5 | 226 | 6.5 | 3400 |
| P6KE8V2A | P6KE8V2CA | 200§ | 7.02 | 7.79 | 8.2 | 8.61 | 10 | 12.1 | 50 | 15.5 | 226 | 6.5 | 3400 |
| P6KE9V1P | P6KE9V1CP | 50§ | 7.78 | 8.65 | 9.1 | 10 | 1 | 13.4 | 45 | 17.1 | 205 | 6.8 | 3100 |
| P6KE9V1A | P6KE9V1CA | 50§ | 7.78 | 8.65 | 9.1 | 9.55 | 1 | 13.4 | 45 | 17.1 | 205 | 6.8 | 3100 |
| P6KE10P | P6KE10CP | 10§ | 8.55 | 9.5 | 10 | 11 | 1 | 14.5 | 41 | 18.6 | 387 | 7.3 | 2800 |
| P6KE10A | P6KE10CA | 10§ | 8.55 | 9.5 | 10 | 10.5 | 1 | 14.5 | 41 | 18.6 | 387 | 7.3 | 2800 |
| P6KE11P | P6KE11CP | 5§ | 9.4 | 10.5 | 11 | 12.1 | 1 | 15.6 | 38 | 20.3 | 355 | 7.5 | 2500 |
| P6KE11A | P6KE11CA | 5§ | 9.4 | 10.5 | 11 | 11.6 | 1 | 15.6 | 38 | 20.3 | 355 | 7.5 | 2500 |
| P P6KE12P | P P6KE12CP | 5 | 10.2 | 11.4 | 12 | 13.2 | 1 | 16.7 | 36 | 21.7 | 332 | 7.8 | 2300 |
| P6KE12A | P6KE12CA | 5 | 10.2 | 11.4 | 12 | 12.6 | 1 | 16.7 | 36 | 21.7 | 332 | 7.8 | 2300 |
| P P6KE13P | P P6KE13CP | 5 | 11.1 | 12.4 | 13 | 14.3 | 1 | 18.2 | 33 | 23.6 | 305 | 8.1 | 2150 |
| P6KE13A | P6KE13CA | 5 | 11.1 | 12.4 | 13 | 13.7 | 1 | 18.2 | 33 | 23.6 | 305 | 8.1 | 2150 |
| P P6KE15P | P P6KE15CP | 5 | 12.8 | 14.3 | 15 | 16.5 | 1 | 21.2 | 28 | 27.2 | 265 | 8.4 | 1900 |
| P6KE15A | P6KE15CA | 5 | 12.8 | 14.3 | 15 | 15.8 | 1 | 21.2 | 28 | 27.2 | 265 | 8.4 | 1900 |
| P6KE16P | P6KE16CP | 5 | 13.6 | 15.2 | 16 | 17.6 | 1 | 22.5 | 27 | 28.9 | 249 | 8.6 | 1800 |
| P6KE16A | P6KE16CA | 5 | 13.6 | 15.2 | 16 | 16.8 | 1 | 22.5 | 27 | 28.9 | 249 | 8.6 | 1800 |
| P P6KE18P | P P6KE18CP | 5 | 15.3 | 17.1 | 18 | 19.8 | 1 | 25.2 | 24 | 32.5 | 222 | 8.8 | 1600 |
| P6KE18A | P6KE18CA | 5 | 15.3 | 17.1 | 18 | 18.9 | 1 | 25.2 | 24 | 32.5 | 222 | 8.8 | 1600 |
| P P6KE20P | P6KE20CP | 5 | 17.1 | 19 | 20 | 22 | 1 | 27.7 | 22 | 36.1 | 199 | 9.0 | 1500 |
| P6KE20A | P6KE20CA | 5 | 17.1 | 19 | 20 | 21 | 1 | 27.7 | 22 | 36.1 | 199 | 9.0 | 1500 |
| P6KE22P | P P6KE22CP | 5 | 18.8 | 20.9 | 22 | 24.2 | 1 | 30.6 | 20 | 39.3 | 183 | 9.2 | 1350 |
| P6KE22A | P6KE22CA | 5 | 18.8 | 20.9 | 22 | 23.1 | 1 | 30.6 | 20 | 39.3 | 183 | 9.2 | 1350 |
| P6KE24P | P6KE24CP | 5 | 20.5 | 22.8 | 24 | 26.4 | 1 | 33.2 | 18 | 42.8 | 168 | 9.4 | 1250 |
| P6KE24A | P6KE24CA | 5 | 20.5 | 22.8 | 24 | 25.2 | 1 | 33.2 | 18 | 42.8 | 168 | 9.4 | 1250 |
| P P6KE27P | P6KE27CP | 5 | 23.1 | 25.7 | 27 | 29.7 | 1 | 37.5 | 16 | 48.3 | 149 | 9.6 | 1150 |
| P6KE27A | P6KE27CA | 5 | 23.1 | 25.7 | 27 | 28.4 | 1 | 37.5 | 16 | 48.3 | 149 | 9.6 | 1150 |
| P P6KE30P | P6KE30CP | 5 | 25.6 | 28.5 | 30 | 33 | 1 | 41.5 | 14.5 | 53.5 | 134 | 9.7 | 1075 |
| P6KE30A | P6KE30CA | 5 | 25.6 | 28.5 | 30 | 31.5 | 1 | 41.5 | 14.5 | 53.5 | 134 | 9.7 | 1075 |
| P P6KE33P | P P6KE33CP | 5 | 28.2 | 31.4 | 33 | 36.3 | 1 | 45.7 | 13.1 | 59 | 122 | 9.8 | 1000 |
| P6KE33A | P6KE33CA | 5 | 28.2 | 31.4 | 33 | 34.7 | 1 | 45.7 | 13.1 | 59 | 122 | 9.8 | 1000 |
| P P6KE36P | P6KE36CP | 5 | 30.8 | 34.2 | 36 | 39.6 | 1 | 49.9 | 12 | 64.3 | 112 | 9.9 | 950 |
| P6KE36A | P6KE36CA | 5 | 30.8 | 34.2 | 36 | 37.8 | 1 | 49.9 | 12 | 64.3 | 112 | 9.9 | 950 |

* Pulse test $t_p \leq 50$ ms $\delta < 2$ %.

** Divide these values by 2 for bidirectional types.

For bidirectional types P6KE6V8CP → 11CA, IRM must be double that specified for unidirectional types.

For bidirectional types, electrical characteristics apply in both directions.

P : Preferred device.

| Types | | $I_{RM}$ @ $V_{RM}$ max. | | $V_{(BR)}$* (V) @ $I_R$ | | | | $V_{(CL)}$ @ $I_{pp}$ max. 1 ms expo | | $V_{CL}$ @ $I_{pp}$ max. 8-20 µs expo | | $\alpha_T$ max. | C** typ. $V_R$=0 f=1 MHz |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | (µA) | (V) | min. | nom. | max. | (mA) | (V) | (A) | (V) | (A) | ($10^{-4}$/°C) | (pF) |
| P P6KE39P | P P6KE39CP | 5 | 33.3 | 37.1 | 39 | 42.9 | 1 | 53.9 | 11.1 | 69.7 | 103 | 10.0 | 900 |
| P6KE39A | P6KE39CA | 5 | 33.3 | 37.1 | 39 | 41 | 1 | 53.9 | 11.1 | 69.7 | 103 | 10.0 | 900 |
| P6KE43P | P6KE43CP | 5 | 36.8 | 40.9 | 43 | 47.3 | 1 | 59.3 | 10.1 | 76.8 | 94 | 10.1 | 850 |
| P6KE43A | P6KE43CA | 5 | 36.8 | 40.9 | 43 | 45.2 | 1 | 59.3 | 10.1 | 76.8 | 94 | 10.1 | 850 |
| P6KE47P | P P6KE47CP | 5 | 40.2 | 44.7 | 47 | 51.7 | 1 | 64.8 | 9.3 | 84 | 86 | 10.1 | 800 |
| P6KE47A | P6KE47CA | 5 | 40.2 | 44.7 | 47 | 49.4 | 1 | 64.8 | 9.3 | 84 | 86 | 10.1 | 800 |
| P P6KE51P | P6KE51CP | 5 | 43.6 | 48.5 | 51 | 56.1 | 1 | 70.1 | 8.6 | 91 | 79 | 10.2 | 750 |
| P6KE51A | P6KE51CA | 5 | 43.6 | 48.5 | 51 | 53.6 | 1 | 70.1 | 8.6 | 91 | 79 | 10.2 | 750 |
| P P6KE56P | P6KE56CP | 5 | 47.8 | 53.2 | 56 | 61.6 | 1 | 77 | 7.8 | 100 | 72 | 10.3 | 700 |
| P6KE56A | P6KE56CA | 5 | 47.8 | 53.2 | 56 | 58.8 | 1 | 77 | 7.8 | 100 | 72 | 10.3 | 700 |
| P6KE62P | P6KE62CP | 5 | 53 | 58.9 | 62 | 68.2 | 1 | 85 | 7.1 | 111 | 65 | 10.4 | 650 |
| P6KE62A | P6KE62CA | 5 | 53 | 58.9 | 62 | 65.1 | 1 | 85 | 7.1 | 111 | 65 | 10.4 | 650 |
| P P6KE68P | P6KE68CP | 5 | 58.1 | 64.6 | 68 | 74.8 | 1 | 92 | 6.5 | 121 | 59.5 | 10.4 | 625 |
| P6KE68A | P6KE68CA | 5 | 58.1 | 64.6 | 68 | 71.4 | 1 | 92 | 6.5 | 121 | 59.5 | 10.4 | 625 |
| P6KE75P | P6KE75CP | 5 | 64.1 | 71.3 | 75 | 82.5 | 1 | 103 | 5.8 | 134 | 53.5 | 10.5 | 575 |
| P6KE75A | P6KE75CA | 5 | 64.1 | 71.3 | 75 | 78.8 | 1 | 103 | 5.8 | 134 | 53.5 | 10.5 | 575 |
| P P6KE82P | P6KE82CP | 5 | 70.1 | 77.9 | 82 | 90.2 | 1 | 113 | 5.3 | 146 | 49 | 10.5 | 550 |
| P6KE82A | P6KE82CA | 5 | 70.1 | 77.9 | 82 | 86.1 | 1 | 113 | 5.3 | 146 | 49 | 10.5 | 550 |
| P6KE91P | P6KE91CP | 5 | 77.8 | 86.5 | 91 | 100 | 1 | 125 | 4.8 | 162 | 44.5 | 10.6 | 525 |
| P6KE91A | P6KE91CA | 5 | 77.8 | 86.5 | 91 | 95.5 | 1 | 125 | 4.8 | 162 | 44.5 | 10.6 | 525 |
| P6KE100P | P6KE100CP | 5 | 85.5 | 95 | 100 | 110 | 1 | 137 | 4.4 | 178 | 40.5 | 10.6 | 500 |
| P6KE100A | P6KE100CA | 5 | 85.5 | 95 | 100 | 105 | 1 | 137 | 4.4 | 178 | 40.5 | 10.6 | 500 |
| P6KE110P | P6KE110CP | 5 | 94 | 105 | 110 | 121 | 1 | 152 | 3.9 | 195 | 37 | 10.7 | 470 |
| P6KE110A | P6KE110CA | 5 | 94 | 105 | 110 | 116 | 1 | 152 | 3.9 | 195 | 37 | 10.7 | 470 |
| P6KE120P | P6KE120CP | 5 | 102 | 114 | 120 | 132 | 1 | 165 | 3.6 | 212 | 34 | 10.7 | 450 |
| P6KE120A | P6KE120CA | 5 | 102 | 114 | 120 | 126 | 1 | 165 | 3.6 | 212 | 34 | 10.7 | 450 |
| P P6KE130P | P6KE130CP | 5 | 111 | 124 | 130 | 143 | 1 | 179 | 3.4 | 230 | 31.5 | 10.7 | 420 |
| P6KE130A | P6KE130CA | 5 | 111 | 124 | 130 | 137 | 1 | 179 | 3.4 | 230 | 31.5 | 10.7 | 420 |
| P6KE150P | P6KE150CP | 5 | 128 | 143 | 150 | 165 | 1 | 207 | 2.9 | 265 | 27.2 | 10.8 | 400 |
| P6KE150A | P6KE150CA | 5 | 128 | 143 | 150 | 158 | 1 | 207 | 2.9 | 265 | 27.2 | 10.8 | 400 |
| P6KE160P | P P6KE160CP | 5 | 136 | 152 | 160 | 176 | 1 | 219 | 2.7 | 282 | 25.5 | 10.8 | 380 |
| P6KE160A | P6KE160CA | 5 | 136 | 152 | 160 | 168 | 1 | 219 | 2.7 | 282 | 25.5 | 10.8 | 380 |
| P6KE170P | P6KE170CP | 5 | 145 | 161 | 170 | 187 | 1 | 234 | 2.6 | 301 | 24 | 10.8 | 370 |
| P6KE170A | P6KE170CA | 5 | 145 | 161 | 170 | 179 | 1 | 234 | 2.6 | 301 | 24 | 10.8 | 370 |
| P P6KE180P | P6KE180CP | 5 | 154 | 171 | 180 | 198 | 1 | 246 | 2.4 | 317 | 22.7 | 10.8 | 360 |
| P6KE180A | P6KE180CA | 5 | 154 | 171 | 180 | 189 | 1 | 246 | 2.4 | 317 | 22.7 | 10.8 | 360 |
| P P6KE200P | P6KE200CP | 5 | 171 | 190 | 200 | 220 | 1 | 274 | 2.2 | 353 | 20.4 | 10.8 | 350 |
| P6KE200A | P6KE200CA | 5 | 171 | 190 | 200 | 210 | 1 | 274 | 2.2 | 353 | 20.4 | 10.8 | 350 |
| P6KE220P | P6KE220CP | 5 | 188 | 209 | 220 | 242 | 1 | 301 | 2 | 388 | 18.6 | 10.8 | 330 |
| P6KE220A | P6KE220CA | 5 | 188 | 209 | 220 | 231 | 1 | 301 | 2 | 388 | 18.6 | 10.8 | 330 |
| P P6KE250P | P6KE250CP | 5 | 213 | 237 | 250 | 275 | 1 | 344 | 2 | 442 | 19 | 11 | 310 |
| P6KE250A | P6KE250CA | 5 | 213 | 237 | 250 | 263 | 1 | 344 | 2 | 442 | 19 | 11 | 310 |
| P6KE280P | P6KE280CP | 5 | 239 | 266 | 280 | 308 | 1 | 384 | 2 | 494 | 18 | 11 | 300 |
| P6KE280A | P6KE280CA | 5 | 239 | 266 | 280 | 294 | 1 | 384 | 2 | 494 | 18 | 11 | 300 |
| P6KE300P | P6KE300CP | 5 | 256 | 285 | 300 | 330 | 1 | 414 | 1.6 | 529 | 14 | 11 | 290 |
| P6KE300A | P6KE300CA | 5 | 256 | 285 | 300 | 315 | 1 | 414 | 1.6 | 529 | 14 | 11 | 290 |
| P6KE320P | P6KE320CP | 5 | 273 | 304 | 320 | 352 | 1 | 438 | 1.6 | 564 | 14 | 11 | 280 |
| P6KE320A | P6KE320CA | 5 | 273 | 304 | 320 | 336 | 1 | 438 | 1.6 | 564 | 14 | 11 | 280 |
| P6KE350P | P6KE350CP | 5 | 299 | 332 | 350 | 385 | 1 | 482 | 1.6 | 618 | 14 | 11 | 270 |
| P6KE350A | P6KE350CA | 5 | 299 | 332 | 350 | 368 | 1 | 482 | 1.6 | 618 | 14 | 11 | 270 |
| P P6KE400P | P P6KE400CP | 5 | 342 | 380 | 400 | 440 | 1 | 548 | 1.3 | 706 | 11 | 11 | 360 |
| P6KE400A | P6KE400CA | 5 | 342 | 380 | 400 | 420 | 1 | 548 | 1.3 | 706 | 11 | 11 | 360 |
| P P6KE440P | P6KE440CP | 5 | 376 | 418 | 440 | 484 | 1 | 603 | 1.3 | 776 | 11 | 11 | 350 |
| P6KE440A | P6KE440CA | 5 | 376 | 418 | 440 | 462 | 1 | 603 | 1.3 | 776 | 11 | 11 | 350 |

* Pulse test $t_p \leq 50$ ms $\delta < 2$ %.

** Divide these values by 2 for bidirectional types.

For bidirectional types, electrical characteristics apply in both directions.

P : Preferred device.

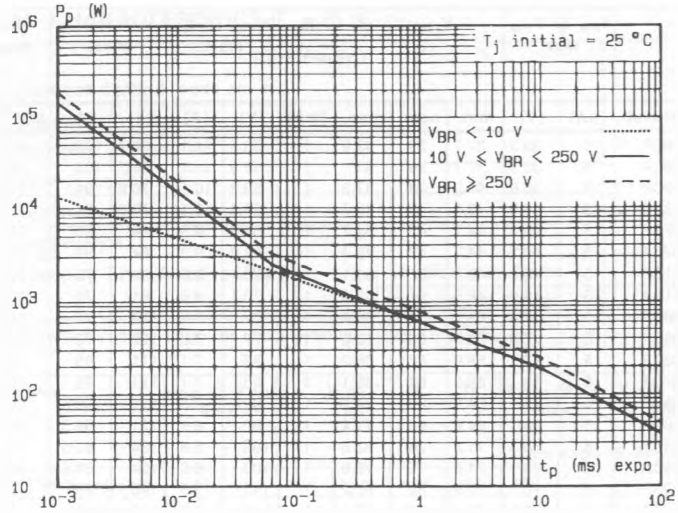



Fig.1 - Peak pulse power versus exponential pulse duration.

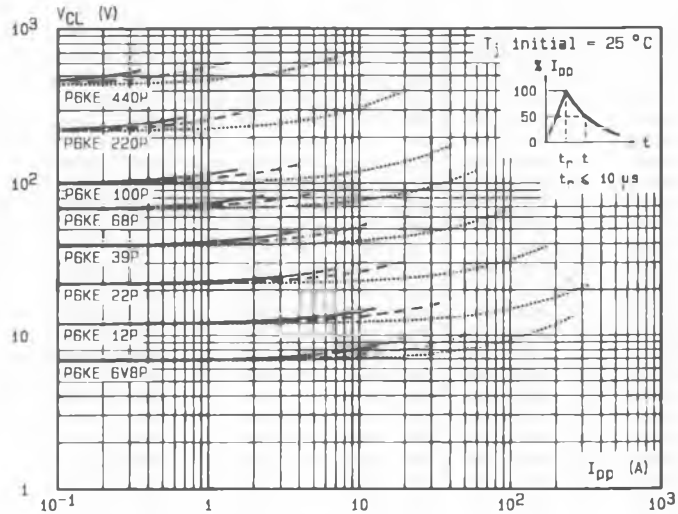



Fig.2 - Clamping voltage versus peak pulse current.
exponential waveform t = 20 µs ·····
t = 1 ms – – –
t = 10 ms ——

Note : The curves of the figure 2 are specified for a junction temperature of 25 °C before surge. The given results may be extrapolated for other junction temperatures by using the following formula : $\Delta V_{(BR)} = \alpha_{T(V_{(BR)})} \times [T_j - 25] \times V_{(BR)}$
For intermediate voltages, extrapolate the given results.

D88P6KEP4

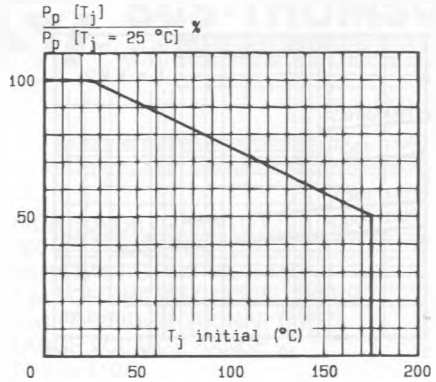



Fig.3 - Allowable power dissipation versus junction temperature.

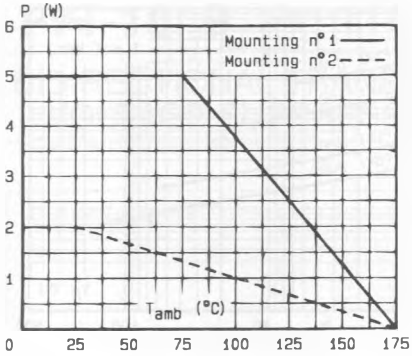



Fig.4 - Power dissipation versus ambient temperature.

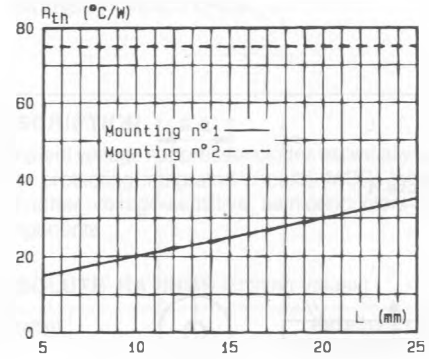
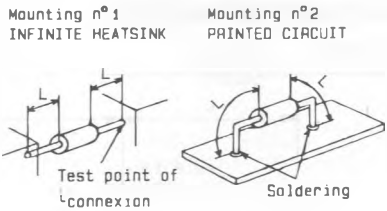



Fig.5 - Thermal resistance versus lead length.



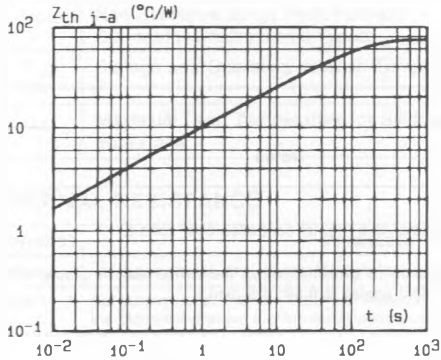




Fig.6 - Transient thermal impedance junction-ambient for mounting n°2 versus pulse duration (L = 10 mm).

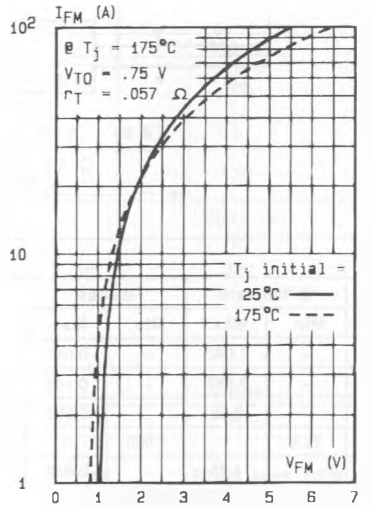



Fig.7 - Peak forward current versus peak forward voltage drop (typical values for unidirectional types).

D88P6KEP5

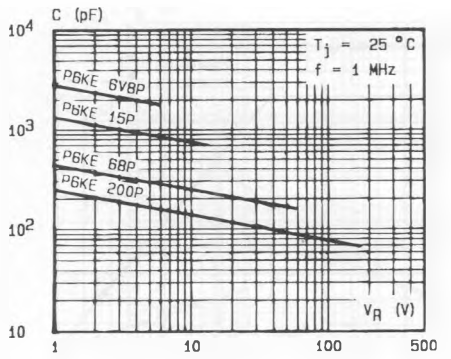



Fig.8a - Capacitance versus reverse applied voltage for unidirectional types (typical values).

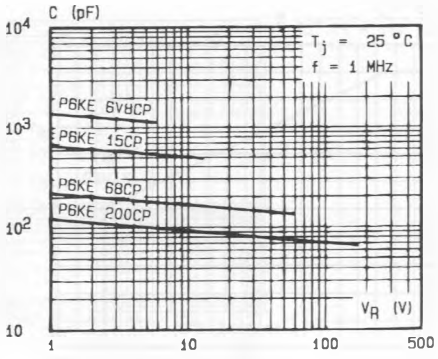
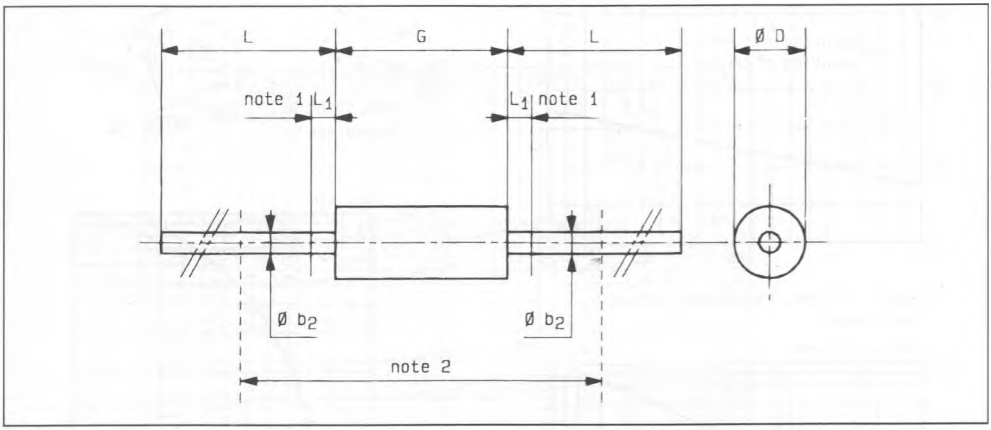



Fig.8b - Capacitance versus reverse applied voltage for bidirectional types (typical values).

D88P6KEP6

## PACKAGE MECHANICAL DATA

CB-417 Plastic




| Ref. | Millimeters | | Inches | | Notes |
|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | |
| Ø $b_2$ | – | 1.092 | – | 0.043 | 1 - The lead diameter Ø $b_2$ is not controlled over zone $L_1$.<br>2 - The minimum axial lengh within which the device may be placed with its leads bent at right angles is 0.59" (15 mm). |
| Ø D | – | 3.683 | – | 0.145 | |
| G | – | 8.89 | – | 0.350 | |
| L | 25.4 | – | 1.000 | – | |
| $L_1$ | – | 1.25 | – | 0.049 | |

Cooling method : by convection (method A).
Marking : type number ; white band indicates cathode for unidirectional types.
Weight : 0.6 g.