



## CEK02N7G

700V ▲ 5.75Ω ▲ 0.4A ▲ Si MOSFET

SILICON Si MOSFET ▲ THT type

N-channel enhancement mode

UL94V-0 rated flame retardant epoxy

TO92 package

Ammo tape

**Rugged and reliable**

### MAXIMUM RATINGS

| Parameter (T <sub>C</sub> = 25°C, unless otherwise noted) |                                   | Characteristics |
|---|-----------------------------------|-----------------|
| Drain-Source Voltage                                      | V <sub>DS</sub>                   | 700V            |
| Gate-Source Voltage                                       | V <sub>GS</sub>                   | ±30V            |
| Continuous Drain Current                                  | I <sub>D</sub>                    | 0.4A            |
| Pulsed Drain Current <sup>Note 1</sup>                    | I <sub>DM</sub>                   | 1.6A            |
| Maximum Power Dissipation                                 | P <sub>D</sub>                    | 3.1W            |
| Operating and Storage Temperature Range                   | T <sub>J</sub> , T <sub>STG</sub> | -55°C to +150°C |

### THERMAL CHARACTERISTICS

| Parameter  | Symbol             | Limit  |
|--|--------------------|--------|
| Thermal Resistance, Junction-to-Lead <sup>Note 2</sup> | R <sub>TH_JL</sub> | 40°C/W |

### APPLICATIONS

| Industrial Inverters | Motors & Drives | Renewable Energy | SMPS | UPS |
|----------------------|-----------------|------------------|------|-----|
|                      |                 |                  |      |     |

### PIN DESCRIPTION

| Circuit Diagram | Outline - Front View | Pin No.     | Description             |
|-----------------|----------------------|-------------|-------------------------|
|                 |                      | 1<br>2<br>3 | Gate<br>Drain<br>Source |

## ELECTRICAL CHARACTERISTICS ▲ $T_c = 25^\circ\text{C}$ , unless otherwise noted

| Item  | Condition  | Symbol       | Min. | Typ. | Max. | Unit     |
|---|--|--------------|------|------|------|----------|
| <b>Off Characteristics</b>                                    |  |              |      |      |      |          |
| Drain-Source Breakdown Voltage                                | $V_{GS} = 0V, I_D = 250\mu A$                                    | $BV_{DSS}$   | 700  |      |      | V        |
| Zero Gate Voltage Drain Current                               | $V_{DS} = 700V, V_{GS} = 0V$                                     | $I_{DSS}$    |      |      | 25   | $\mu A$  |
| Gate Body Leakage Current, Forward                            | $V_{GS} = 30V, V_{DS} = 0V$                                      | $I_{GSSF}$   |      |      | 100  | nA       |
| Gate Body Leakage Current, Reverse                            | $V_{GS} = -30V, V_{DS} = 0V$                                     | $I_{GSSR}$   |      |      | -100 | nA       |
| <b>On Characteristics</b>                                     |  |              |      |      |      |          |
| Gate Threshold Voltage  | $V_{GS} = V_{DS}, I_D = 250\mu A$                                | $V_{GS(th)}$ | 2    |      | 4    | V        |
| Static Drain-Source On-Resistance                             | $V_{GS} = 10V, I_D = 0.2A$                                       | $R_{DS(ON)}$ |      | 5.75 | 6.75 | $\Omega$ |
| <b>Dynamic Characteristics</b> <sup>Note 3</sup>              |  |              |      |      |      |          |
| Input Capacitance   | $V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$                            | $C_{ISS}$    |      | 325  |      | pF       |
| Output Capacitance  | $V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$                            | $C_{OSS}$    |      | 70   |      | pF       |
| Reverse Transfer Capacitance                                  | $V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$                            | $C_{RSS}$    |      | 20   |      | pF       |
| <b>Switching Characteristics</b> <sup>Note 3</sup>            |  |              |      |      |      |          |
| Turn-On Delay Time  | $V_{DD} = 300V, V_{GS} = 10V, I_D = 0.4A, R_{G(ext)} = 18\Omega$ | $t_{D(ON)}$  |      | 21   |      | ns       |
| Turn-On Rise Time   | $V_{DD} = 300V, V_{GS} = 10V, I_D = 0.4A, R_{G(ext)} = 18\Omega$ | $t_R$        |      | 14   |      | ns       |
| Turn-Off Delay Time   | $V_{DD} = 300V, V_{GS} = 10V, I_D = 0.4A, R_{G(ext)} = 18\Omega$ | $t_{D(OFF)}$ |      | 34   |      | ns       |
| Turn-Off Fall Time  | $V_{DD} = 300V, V_{GS} = 10V, I_D = 0.4A, R_{G(ext)} = 18\Omega$ | $t_F$        |      | 27   |      | ns       |
| Total Gate Charge   | $V_{DS} = 480V, V_{GS} = 10V, I_D = 0.4A$                        | $Q_G$        |      | 12   |      | nC       |
| Gate Source Charge  | $V_{DS} = 480V, V_{GS} = 10V, I_D = 0.4A$                        | $Q_{GS}$     |      | 2    |      | nC       |
| Gate Drain Charge   | $V_{DS} = 480V, V_{GS} = 10V, I_D = 0.4A$                        | $Q_{GD}$     |      | 7    |      | nC       |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b> |  |              |      |      |      |          |
| Drain-Source Diode Forward Current                            |  | $I_S$        |      |      | 0.4  | A        |
| Drain-Source Diode Forward Voltage <sup>Note 2</sup>          | $V_{GS} = 0V, I_S = 0.2A$  | $V_{SD}$     |      |      | 1.5  | V        |

### Notes

- 1: Repetitive Rating: Pulse width limited by maximum junction temperature
- 2: Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
- 3: Guaranteed by design, not subject to production testing.

## REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 1 • Output Characteristics

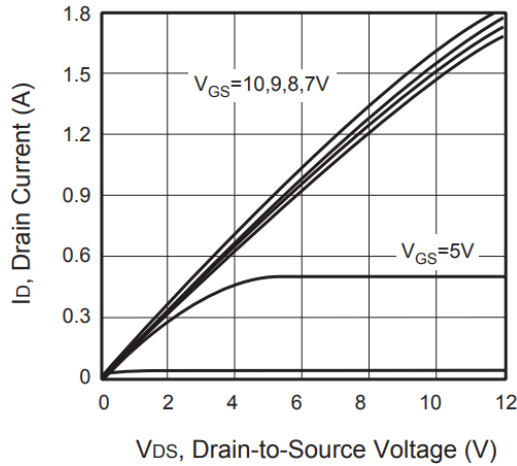


Fig. 2 • Transfer Characteristics

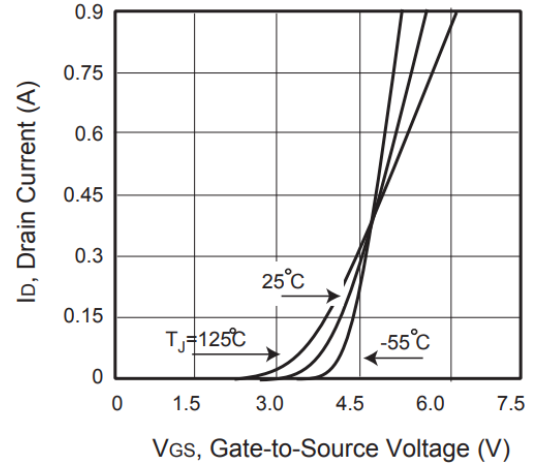


Fig. 3 • Capacitance

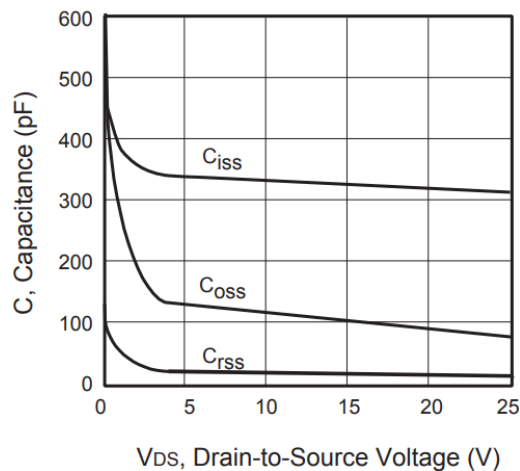


Fig. 4 • On-Resistance Variation with Temperature

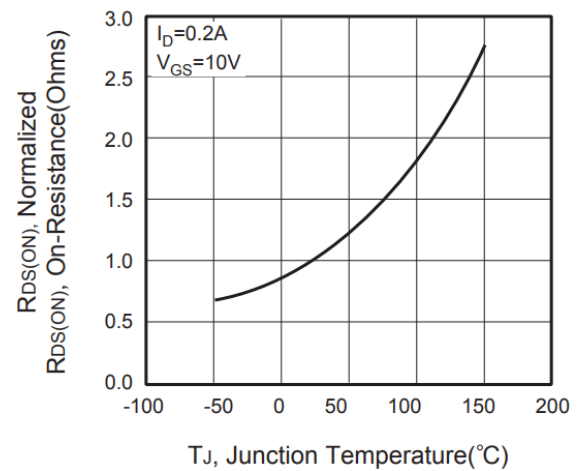


Fig. 5 • Gate Threshold Variation with Temperature

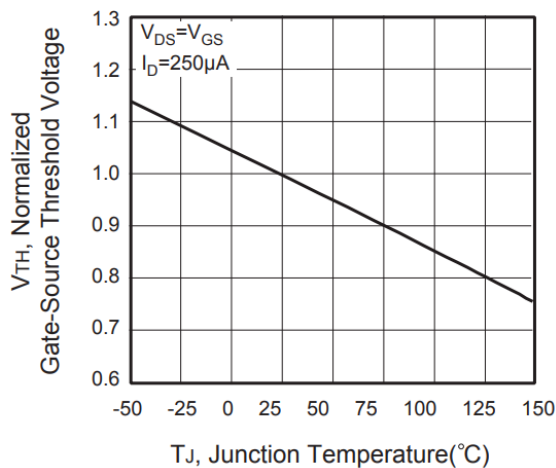
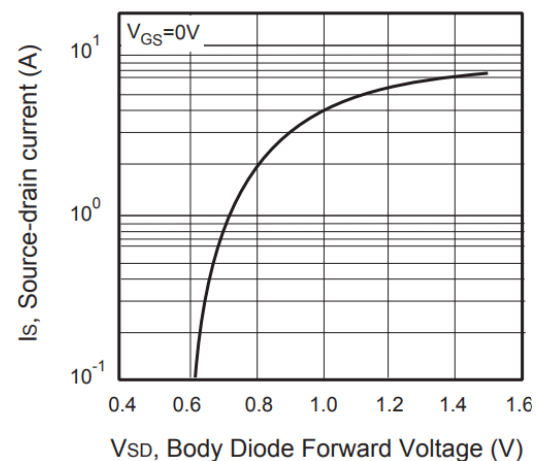


Fig. 6 • Body Diode Forward Voltage Variation with Source Current



## REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 7 • Gate Charge

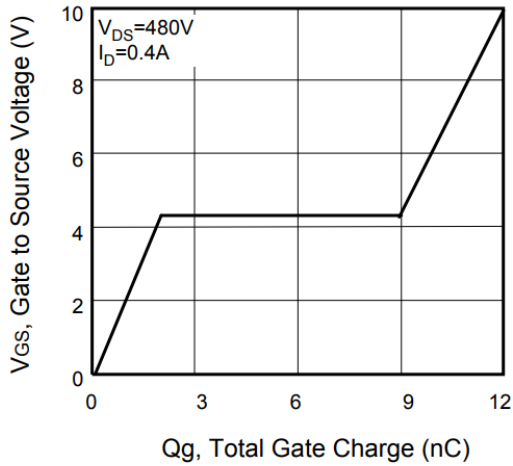


Fig. 8 • Maximum Safe Operating Area

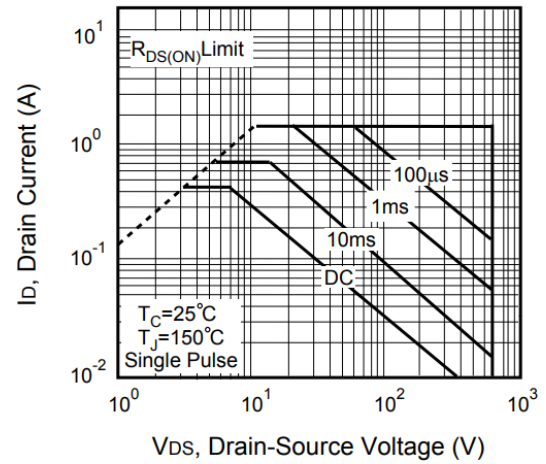


Fig. 9 • Switching Test Circuit

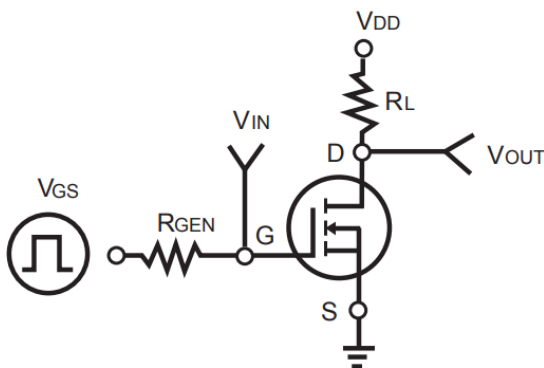


Fig. 10 • Switching Waveforms

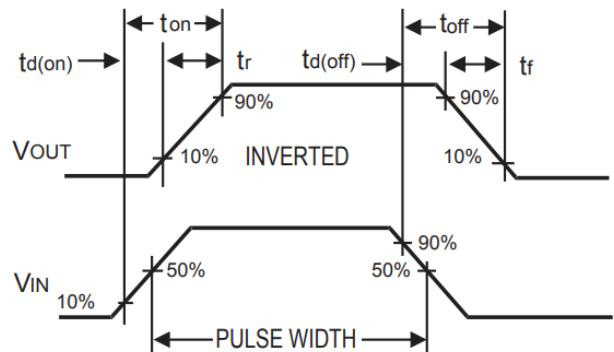
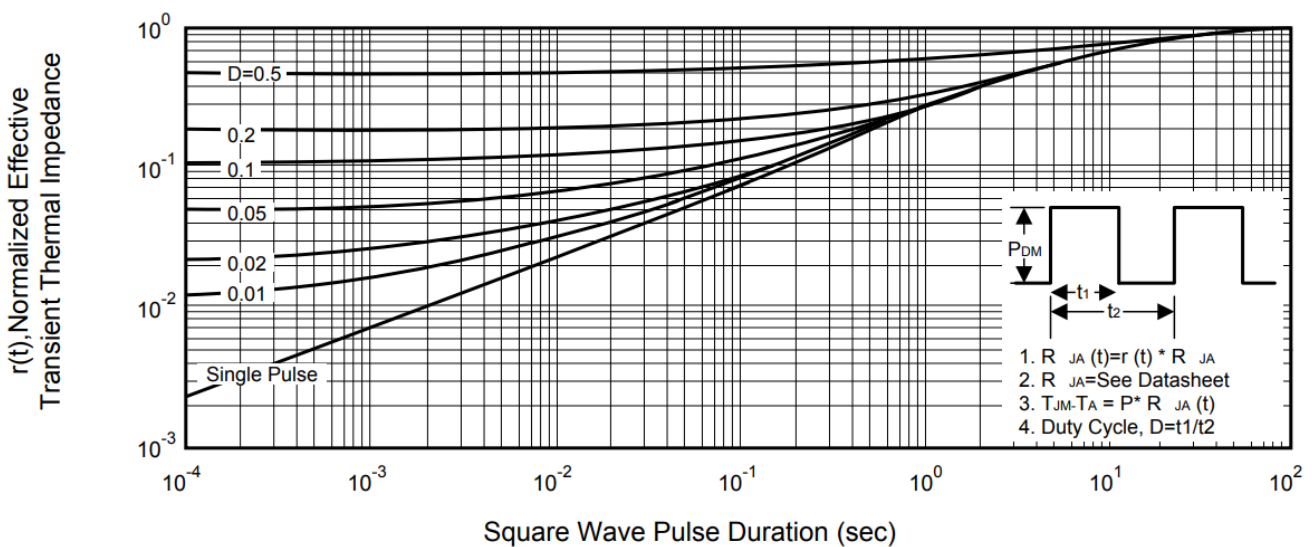
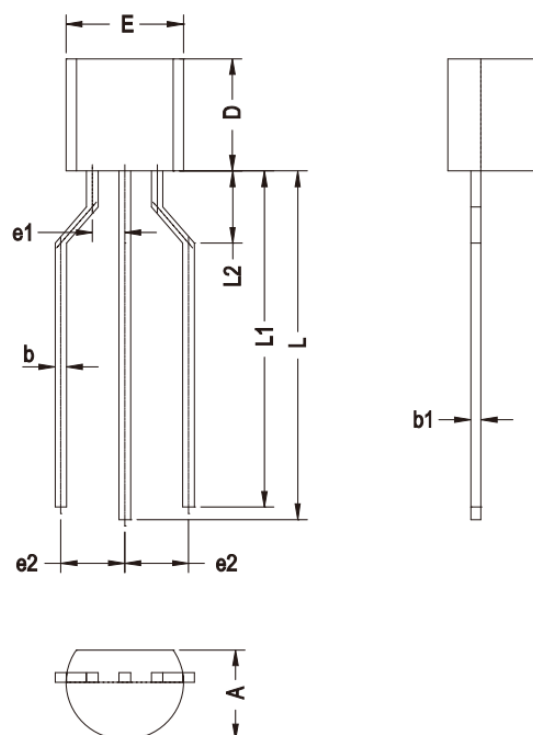


Fig. 11 • Normalized Thermal Transient Impedance Curve



## PACKAGE OUTLINE



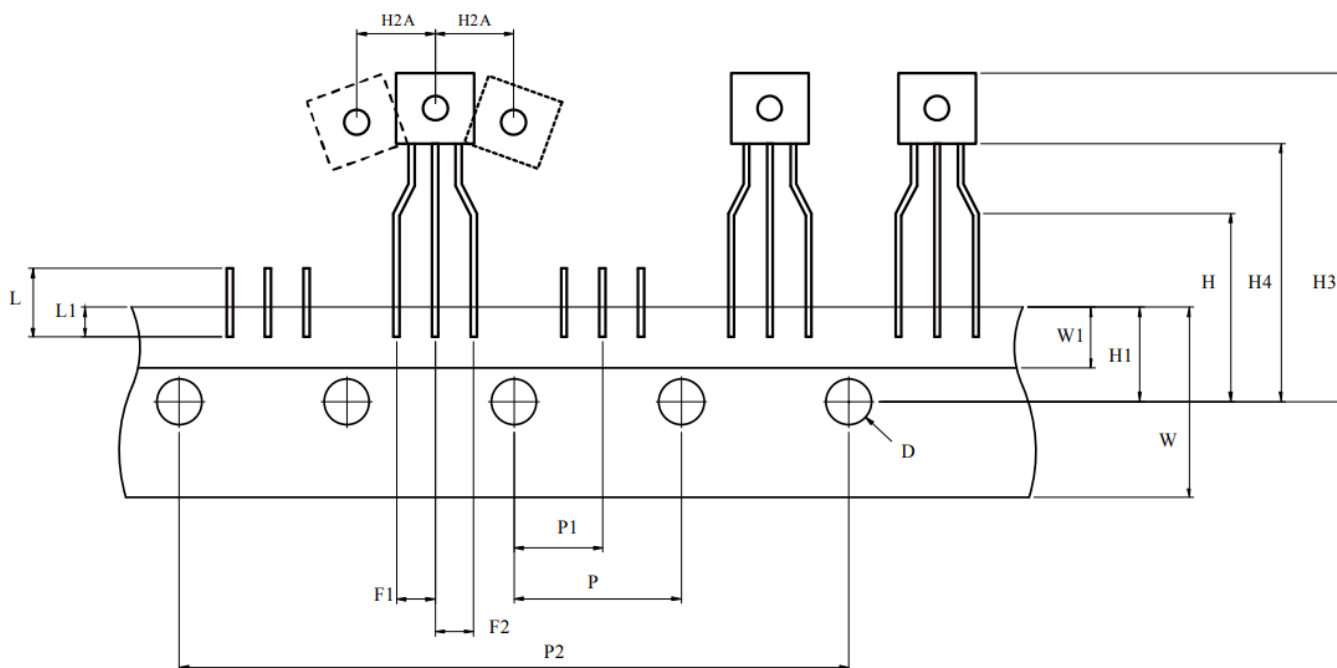
| Sym | Millimeters<br>(Min.) | Millimeters<br>(Typ.) | Millimeters<br>(Max.) |
|-----|-----------------------|-----------------------|-----------------------|
| A   | 3.460                 | 3.660                 | 3.860                 |
| b   | 0.360                 | 0.460                 | 0.560                 |
| b1  | 0.350                 | 0.430                 | 0.510                 |
| D   | 4.380                 | 4.580                 | 4.780                 |
| E   | 4.430                 | 4.640                 | 4.850                 |

| Sym | Millimeters<br>(Min.) | Millimeters<br>(Typ.) | Millimeters<br>(Max.) |
|-----|-----------------------|-----------------------|-----------------------|
| e1  | 1.270 BSC             |                       |                       |
| e2  | 2.500 BSC             |                       |                       |
| L   | 14.250                | 14.560                | 14.870                |
| L1  | 12.500                | 13.500                | 14.500                |
| L2  | 2.800                 | 2.900                 | 3.000                 |

## ORDERING INFORMATION

| Part Number | Package | Packing   | Ammo Qty. | Inner Box Qty. | Outer Box Qty. |
|-------------|---------|-----------|-----------|----------------|----------------|
| CEK02N7G    | TO-92   | Ammo Tape | 2,000pcs  | 2,000pcs       | 32,000pcs      |

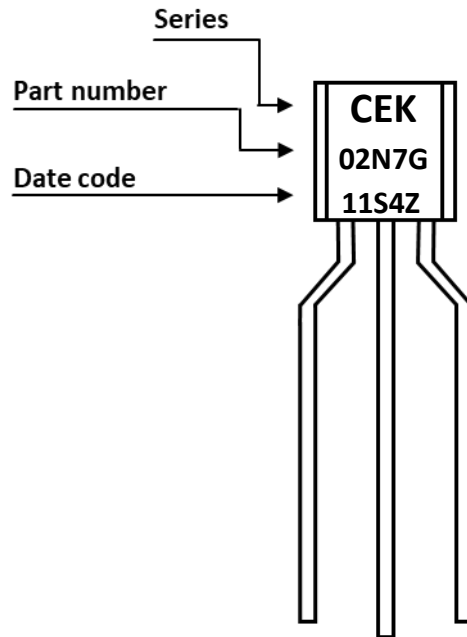
## AMMO TAPING DIMENSIONS ▲ All dimensions in mm



| Package | D     | F1, F2         | F1 – F2 | H     | H1    | H2A              | H3          | H4    |
|---------|-------|----------------|---------|-------|-------|------------------|-------------|-------|
| TO92    | 4.00  | 2.50           | ±0.30   | 16.00 | 9.00  | 0.50             | 27.00       | 20.00 |
|         | ±0.20 | +0.20<br>-0.10 | -       | ±0.50 | ±0.50 | Max.             | Max         | Max.  |
|         | L     | L1             | P       | P1    | P2    | W                | W1          | W2    |
|         | 11.00 | 2.50           | 12.70   | 6.35  | 50.80 | 17.50 ~<br>19.00 | 5.00 ~ 7.00 | 0.50  |
|         | Max.  | Min.           | ±0.20   | ±0.40 | ±0.50 | -                | -           | Max.  |

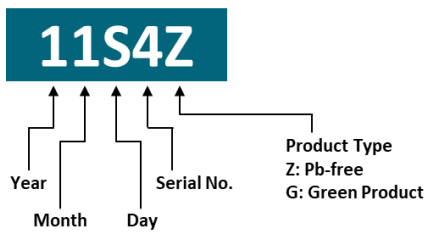
**Note:** All dimensions meet EIA-481-D requirements.

## PART MARKING



## DATE CODE

Example: 11S4Z



Coding list for „Day“

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  |
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
| B  | C  | D  | E  | F  | G  | H  | I  | J  | K  |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| L  | M  | N  | O  | P  | Q  | R  | S  | T  | U  |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| V  |    |    |    |    |    |    |    |    |    |
| 31 |    |    |    |    |    |    |    |    |    |

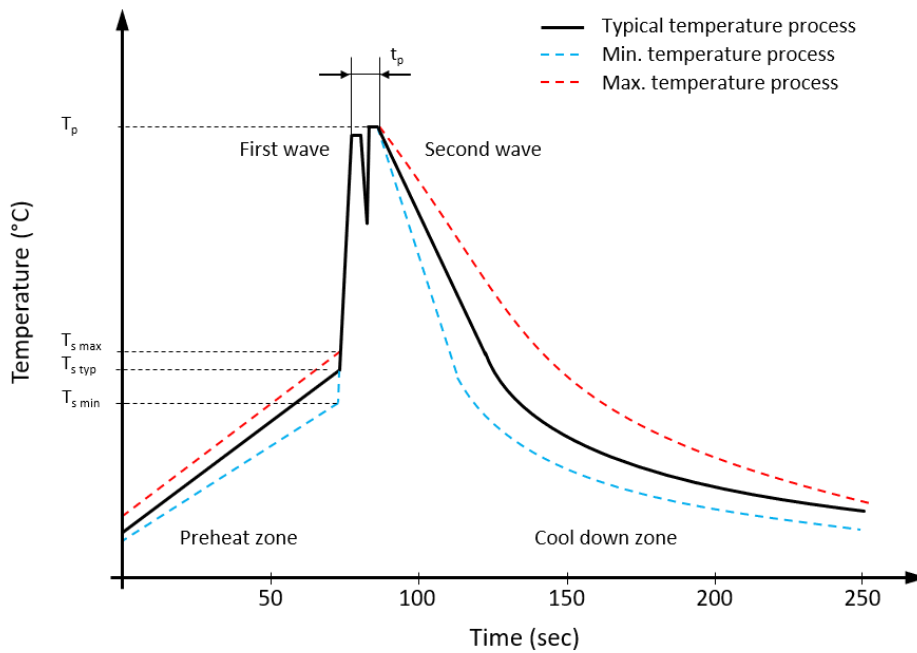
Coding list for „Month“

|     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|
| 1   | 2   | 3   | 4   | 5   | 6   |
| Jan | Feb | Mar | Apr | May | Jun |
| 7   | 8   | 9   | A   | B   | C   |
| Jul | Aug | Sep | Oct | Nov | Dec |

Coding list for „Year“

|      |      |      |      |      |
|------|------|------|------|------|
| 0    | 1    | 2    | 3    | 4    |
| 2020 | 2021 | 2022 | 2023 | 2024 |
| 5    | 6    | 7    | 8    | 9    |
| 2025 | 2026 | 2027 | 2028 | 2029 |

## RECOMMENDED WAVE SOLDERING PROFILE ▲ THT PACKAGE



### Classification wave soldering profile ▲ Refer to EN 61760-1: 2006

| Profile Features                                     |              | Value ▲ Sn-Pb Assembly                     | Value ▲ Pb-free Assembly                   |
|--|--------------|--|--|
| Preheat temperature min.                             | $T_{s\ min}$ | 100 °C                                     | 100 °C                                     |
| Preheat temperature typical                          | $T_{s\ typ}$ | 120 °C                                     | 120 °C                                     |
| Preheat temperature max.                             | $T_{s\ max}$ | 130 °C                                     | 130 °C                                     |
| Preheat time $t_s$ from $T_{s\ min}$ to $T_{s\ max}$ | $t_s$        | 70 seconds                                 | 70 seconds                                 |
| Peak temperature                                     | $T_p$        | 235 °C to 260 °C                           | 245 °C to 260 °C                           |
| Time of actual peak temperature                      | $t_p$        | Max. 10 seconds<br>Max. 5 second each wave | Max. 10 seconds<br>Max. 5 second each wave |
| Ramp-down rate min.                                  |              | ~ 2 °C/second                              | ~ 2 °C/second                              |
| Ramp-down rate typical                               |              | ~ 3.5 °C/second                            | ~ 3.5 °C/second                            |
| Ramp-down rate max.                                  |              | ~ 5 °C/second                              | ~ 5 °C/second                              |
| Time 25°C to 25°C                                    |              | 4 minutes                                  | 4 minutes                                  |



## REVISION TABLE

| Revision | Date       | Status          | Notes               |
|----------|------------|-----------------|---------------------|
| 001      | 30/09/2022 | Initial release | Initial publication |
|          |            |                 |                     |
|          |            |                 |                     |
|          |            |                 |                     |
|          |            |                 |                     |
|          |            |                 |                     |

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