

| | | |
|---|---------------|--|
| V_{DSS} , -30V R_{DS(ON)} , 14mΩ (max.) @ V_{GS}=-10V R_{DS(ON)} , 24mΩ (max.) @ V_{GS}=-4.5V I_D , -44A | TO-252 | |
| | | |

| | |
|--|---|
| Description | Features |
| <p>The SGP3011D uses advanced trench technology MOSFETs to provide excellent R_{DS(ON)} and low gate charge.</p> <p>The complementary Power MOSFETs may be used in H-bridge, Inverters and other applications.</p> | <ul style="list-style-type: none"> • Low On-Resistance • Low Input Capacitance • Low Miller Charge • Low Input/Output Leakage • Pb-free lead plating; RoHS compliant |
| | Applications |
| | <ul style="list-style-type: none"> • Motor / Body Load Control • Automotive Systems • Load Switch |

Ordering Information

| Ordering Code | RoHS Status | Package | Package Code | Packing | Quantity |
|---------------|--------------|---------|--------------|-------------|----------|
| SGP3011D | Halogen-Free | TO-252 | D | Tape & Reel | 2,500 |

Absolute Maximum Ratings (T_A=25°C unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|--|------------------|-----------------------|------|
| Drain-Source Voltage | V _{DS} | -30 | V |
| Gate-Source Voltage | V _{GS} | ±20 | V |
| Drain Current-Continuous | I _D | T _C =25°C | -44 |
| | | T _C =100°C | -28 |
| Drain Current-Pulsed ^{Note 1} | I _{DM} | -150 | A |
| Avalanche Current | I _{AS} | 28 | A |
| Avalanche Energy, L=0.1mH | E _{AS} | 39 | mJ |
| Maximum Power Dissipation | P _D | T _C =25°C | 44 |
| | | T _C =100°C | 18 |
| Storage Temperature Range | T _{STG} | -55 to +175 | °C |
| Operating Junction Temperature Range | T _J | -55 to +175 | °C |

Thermal Resistance Ratings

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|------------------|--------------|------|------|------|------|
| Maximum Junction-to-Ambient ^{Note 2} | R _{θJA} | Steady State | - | - | 62 | °C/W |
| Maximum Junction-to-Case | R _{θJC} | Steady State | - | - | 2.8 | °C/W |

Electrical Characteristics (T_J=25°C unless otherwise noted)

| OFF CHARACTERISTICS | | | | | | |
|---------------------------------|-------------------|--|------|------|------|------|
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V, I _{DS} =-250μA | -30 | - | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =-24V, V _{GS} =0V | - | - | -1 | μA |
| Gate-Body Leakage | I _{GSS} | V _{GS} =±20V, V _{DS} =0V | - | - | ±100 | nA |

| ON CHARACTERISTICS | | | | | | |
|----------------------------------|---------------------|--|------|------|------|------|
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
| Gate Threshold Voltage | V _{GS(TH)} | V _{DS} =V _{GS} , I _{DS} =-250μA | -1 | -1.5 | -2.5 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =-10V, I _{DS} =-20A | - | - | 14 | mΩ |
| | | V _{GS} =-4.5V, I _{DS} =-10A | - | - | 24 | |

| DYNAMIC CHARACTERISTICS | | | | | | |
|------------------------------|------------------|--|------|------|------|------|
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
| Input Capacitance | C _{iss} | V _{DS} =-15V, V _{GS} =0V, f=1MHz | - | 2170 | - | pF |
| Output Capacitance | C _{oss} | | - | 303 | - | |
| Reverse Transfer Capacitance | C _{rss} | | - | 232 | - | |
| Forward Transconductance | g _{fs} | V _D =-5V, I _D =-30A | - | 29 | - | S |

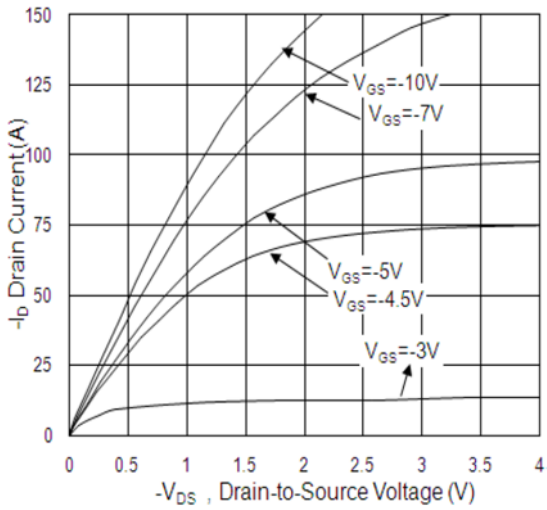
| SWITCHING CHARACTERISTICS | | | | | | |
|-------------------------------|---------------------|--|------|------|------|------|
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
| Turn-On Delay Time | T _{d(on)} | V _{DD} =-15V, V _{GS} =-10V, R _G =3.3Ω, I _D =-15A | - | 8 | - | ns |
| Rise Time | t _r | | - | 73.7 | - | |
| Turn-Off Delay Time | T _{d(off)} | | - | 61.8 | - | |
| Fall Time | t _f | | - | 24.4 | - | |
| Total Gate Charge at -4.5V | Q _g | V _{DS} =-15V, V _{GS} =-4.5V, I _D =-15A | - | 21 | - | nC |
| Gate to Source Gate Charge | Q _{gs} | | - | 8.5 | - | |
| Gate to Drain "Miller" Charge | Q _{gd} | | - | 7.1 | - | |

| DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS | | | | | | |
|--|-----------------|--|------|------|------|------|
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
| Drain-Source Diode Forward Voltage | V _{SD} | V _{GS} =0V, I _S =-1A | - | - | -1.2 | V |
| Continuous Source Current | I _S | V _G =V _D =0V, Force Current | - | - | -49 | A |
| Pulsed Source Current | I _{SM} | | - | - | -150 | A |
| Body Diode Reverse Recovery Time | t _{rr} | V _{DD} =-15V, I _F =-15A, di/dt=100A/μs | - | 18 | - | ns |
| Body Diode Reverse Recovery Charge | Q _{rr} | V _{DD} =-15V, I _F =-15A, di/dt=100A/μs | - | 8 | - | nC |

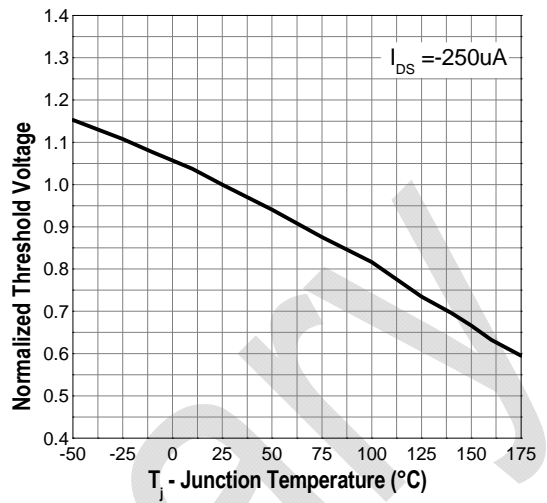
- Notes:**
- Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
 - R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design. R_{θJA} shown below for single device operation on FR-4 in still air.

Typical Operating Characteristics

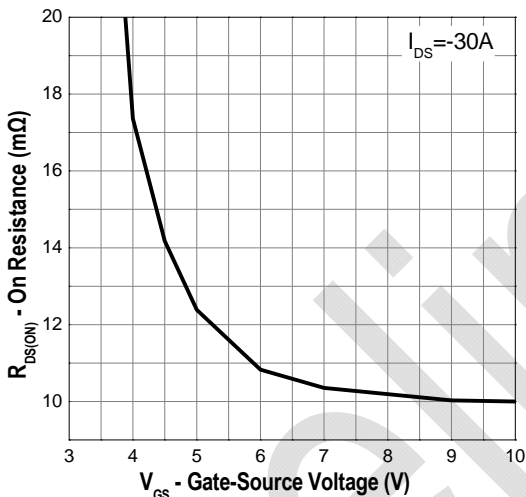
Output Characteristics



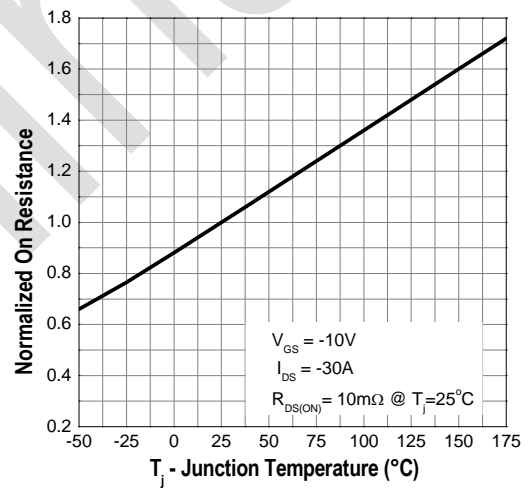
Gate Threshold Voltage



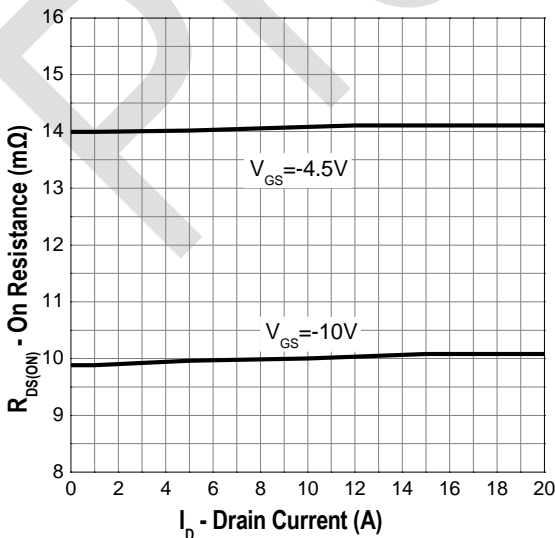
Gate-Source On Resistance



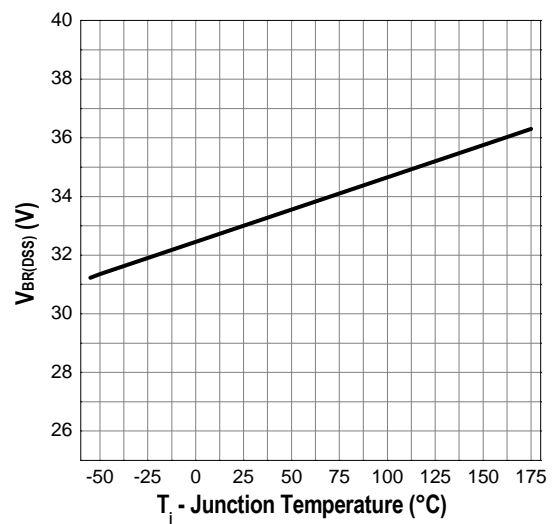
Drain-Source On Resistance



Drain-Source On Resistance

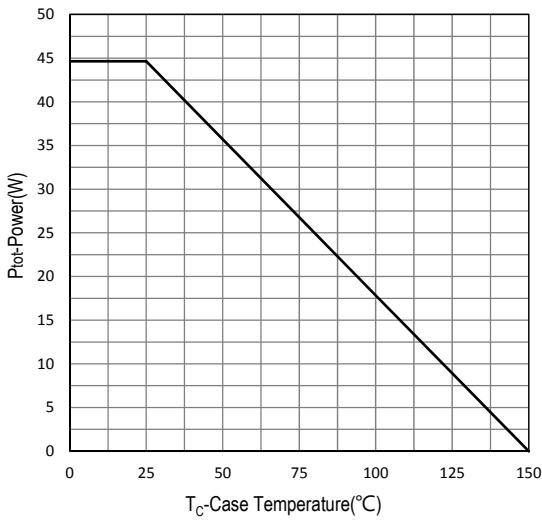


Drain-source Breakdown Voltage

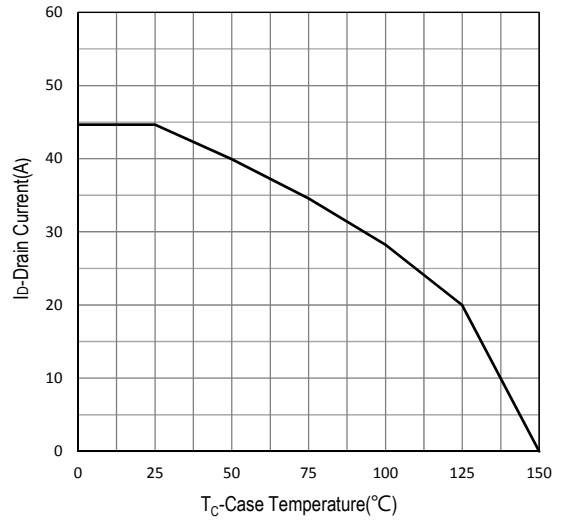


Typical Operating Characteristics (Cont.)

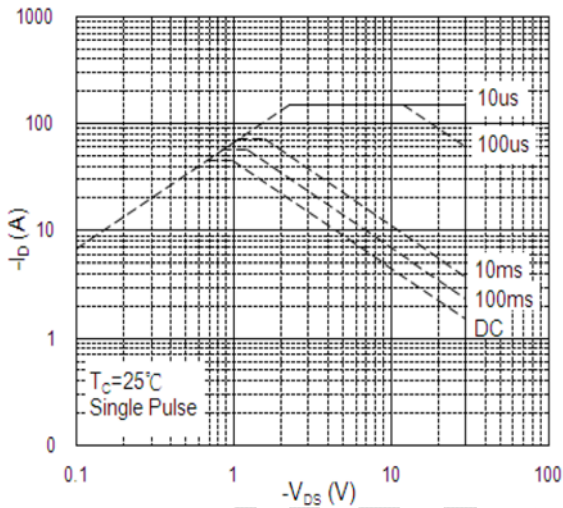
Power Dissipation



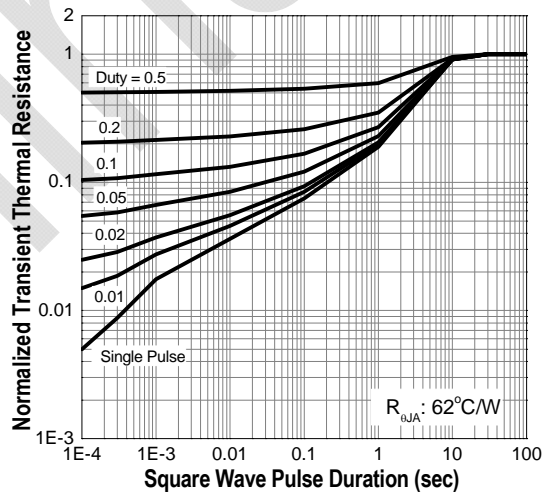
Drain Current



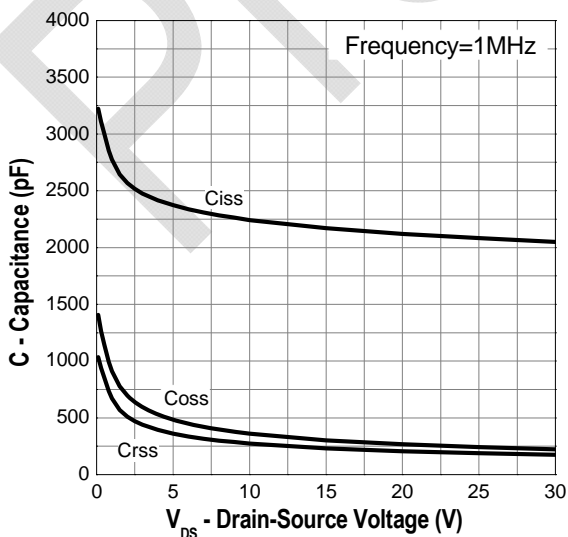
Safe Operation Area



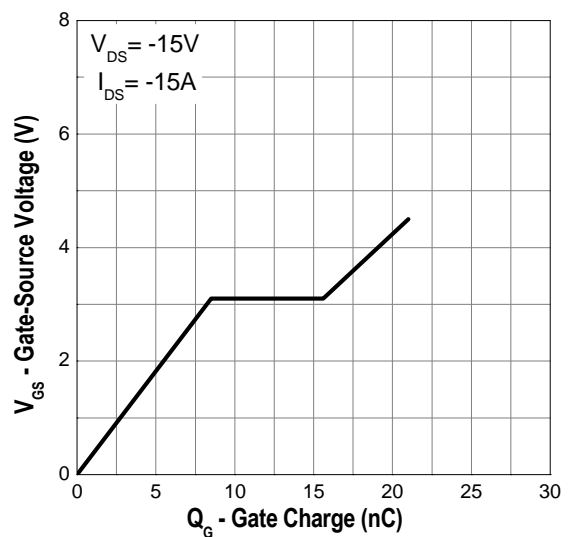
Transient Thermal Impedance



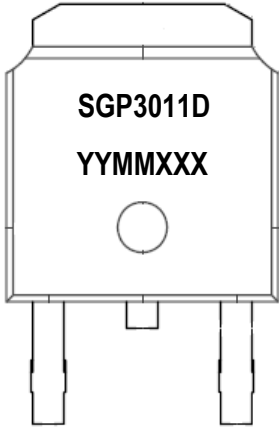
Capacitance



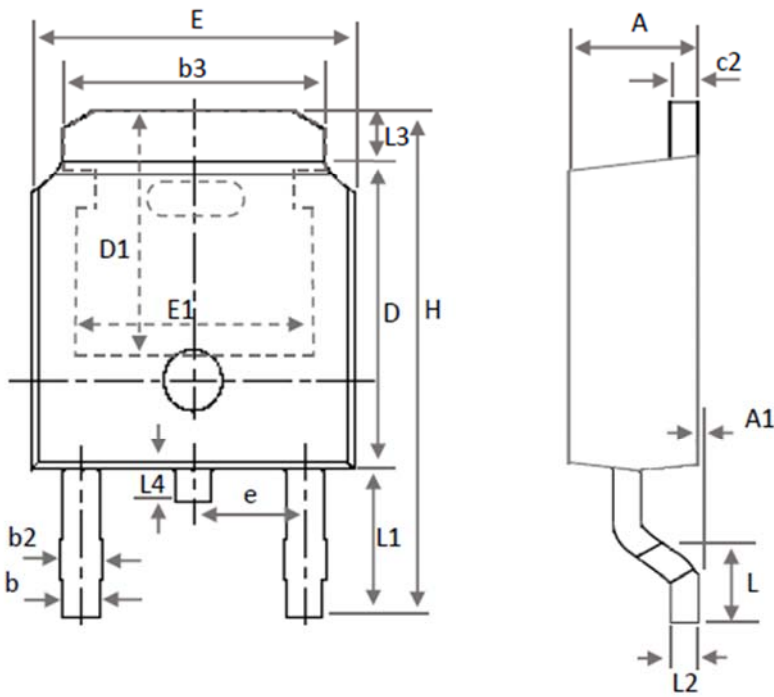
Gate Charge



Marking Information

| TO-252 (D) | Marking Rule |
|--|---|
| <p>Laser Marking</p>  <p>The diagram shows a TO-252 (D) MOSFET package. On the top surface, there is a laser marking consisting of two lines of text: 'SGP3011D' on the top line and 'YYMMXXX' on the bottom line. The package has three leads extending from the bottom.</p> | <p><u>Line 1</u> : Device SGP3011D</p> <p><u>Line 2</u> : Date Code YYMMXXX</p> <p>YY : Year Code MM : Month Code XXX : Serial Number</p> |

Package of Dimension

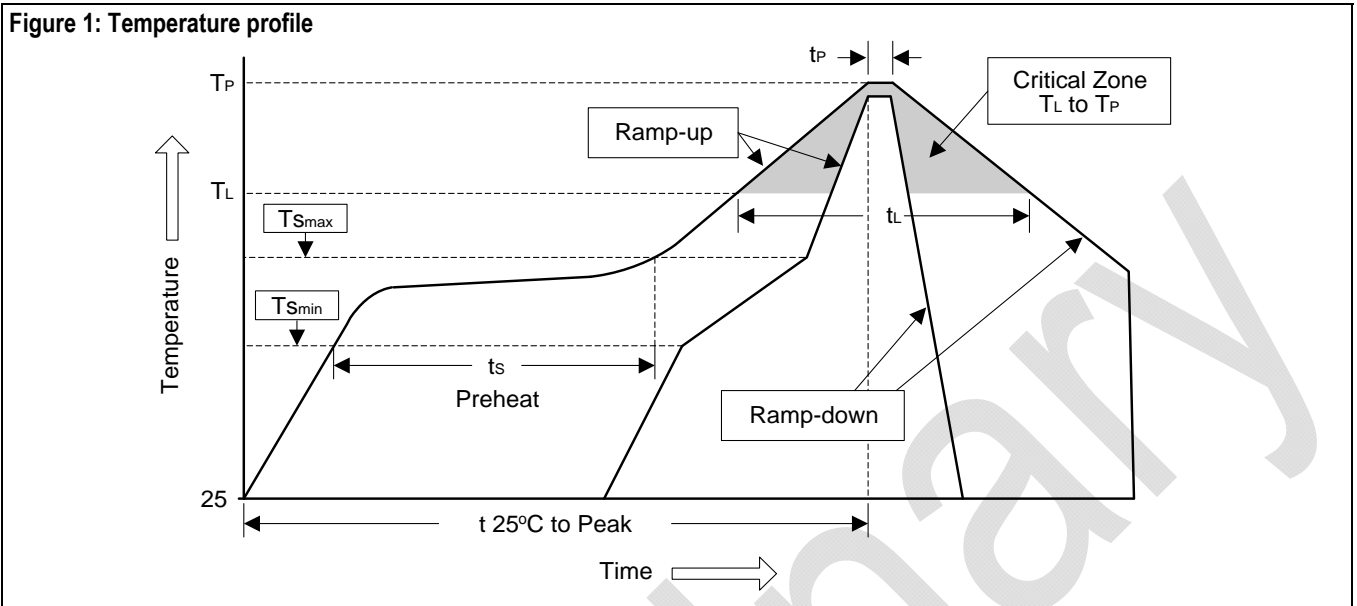


| Symbol | Min | Nor | Max |
|--------|------------|------|-------|
| E | 6.35 | 6.54 | 6.731 |
| L | 1.40 | 1.59 | 1.78 |
| L1 | 2.743 Ref. | | |
| L2 | 0.508 BSC | | |
| L3 | 0.89 | 1.08 | 1.27 |
| L4 | 0.60 | 0.81 | 1.01 |
| D | 5.97 | 6.10 | 6.223 |
| H | 9.40 | 9.91 | 10.41 |
| b | 0.64 | 0.77 | 0.89 |
| b2 | 0.76 | 0.95 | 1.14 |
| b3 | 4.95 | 5.21 | 5.46 |
| e | 2.286 BSC | | |
| A | 2.18 | 2.29 | 2.39 |
| A1 | 0.00 | 0.07 | 0.13 |
| c2 | 0.46 | 0.68 | 0.89 |
| D1 | 5.21 | - | - |
| E1 | 4.32 | - | - |

Soldering Methods for Silicongear's Products

1. Storage environment: Temperature=10°C to 35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|--|-------------------------|------------------|
| Average ramp-up rate (TL to TP) | <3°C/sec | <3°C/sec |
| Preheat | | |
| - Temperature Min (T _{Smin}) | 100°C | 150°C |
| - Temperature Max (T _{Smax}) | 150°C | 200°C |
| - Time (min to max) (ts) | 60 to 120 sec | 60 to 180 sec |
| T _{Smax} to TL | | |
| - Ramp-up Rate | <3°C/sec | <3°C/sec |
| Time maintained above: | | |
| - Temperature (TL) | 183°C | 217°C |
| - Time (t _L) | 60 to 150 sec | 60 to 150 sec |
| Peak Temperature (TP) | 240°C +0/-5°C | 260°C +0/-5°C |
| Time within 5°C of actual Peak Temperature (t _P) | 10 to 30 sec | 20 to 40 sec |
| Ramp-down Rate | <6°C/sec | <6°C/sec |
| Time 25°C to Peak Temperature | <6 minutes | <8 minutes |

3. Flow (wave) soldering (solder dipping)

| Products | Peak Temperature | Dipping Time |
|------------------|------------------|--------------|
| Pb devices. | 245°C ±5°C | 5sec ±1sec |
| Pb-Free devices. | 260°C +0/-5°C | 5sec ±1sec |

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