## General Description

The WSD3070DN is the highest performance trench N-ch MOSFETs with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The WSD3070DN meet the RoHS and Green Product requirement , 100% EAS guaranteed with full function reliability approved.

## Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

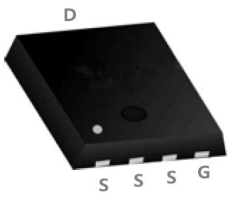
## Product Summery

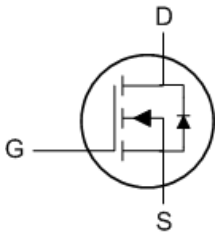
| BVDSS | RDSON | ID |
|---|---|---|
| 25V | 2.5mΩ | 70A |

## Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- Load Switch

## DFN3.3X3.3 Pin Configuration




## Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 25 | V |
| $V_{GS}$ | Gate-Source Voltage | ±12 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 70 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 55 | A |
| $I_D$@$T_A$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 20 | A |
| $I_D$@$T_A$=70℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 16 | A |
| $I_{DM}$@$T_C$=25℃ | Pulsed Drain Current[2] | 200 | A |
| EAS | Avalanche Energy ,Single Pulse (L=0.5mH)[3] | 100 | mJ |
| $I_{AS}$ | Avalanche Current ,Single pulse(L=0.5mH)[3] | 20 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 62.5 | W |
| $P_D$@$T_A$=25℃ | Total Power Dissipation[4] | 1.78 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |

## Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] | --- | 70 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | --- | 2.5 | ℃/W |

## Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 25 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | BVDSS Temperature Coefficient | Reference to 25℃ , $I_D$=1mA | --- | 0.028 | --- | V/℃ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=4.5V , $I_D$=20A | --- | 2.5 | 3.4 | mΩ |
| | | $V_{GS}$=2.5V , $I_D$=20A | --- | 3.0 | 4.0 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 0.5 | 0.8 | 1.1 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -6.16 | --- | mV/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=24V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=24V , $V_{GS}$=0V , $T_J$=55℃ | --- | --- | 5 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=5V , $I_D$=40A | --- | 74 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 0.85 | 1.1 | Ω |
| $Q_g$ | Total Gate Charge (4.5V) | VDS=15V, VGS=10V, IDS=20A | --- | 96 | 134 | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 5.5 | 7.7 | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 16 | 22 | |
| $T_{d(on)}$ | Turn-On Delay Time | VDD=15V, RL=15Ω , IDS=1A, VGEN=10V, RG=6Ω | --- | 16.6 | 31 | ns |
| $T_r$ | Rise Time | | --- | 12.2 | 24 | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 135 | 244 | |
| $T_f$ | Fall Time | | --- | 48 | 87 | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=15V , $V_{GS}$=0V , f=1MHz | --- | 4920 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 510 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 350 | --- | |

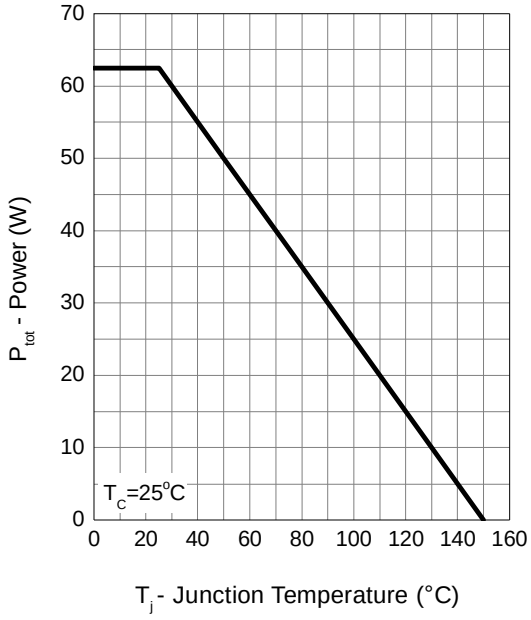
## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,6] | $V_G$=$V_D$=0V , Force Current | --- | --- | 20 | A |
| $I_{SM}$ | Pulsed Source Current[2,6] | | --- | --- | 70 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1.1 | V |
| $t_{rr}$ | Reverse Recovery Time | IF=40A , dI/dt=100A/μs , $T_J$=25℃ | --- | 14.8 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 3.9 | --- | nC |

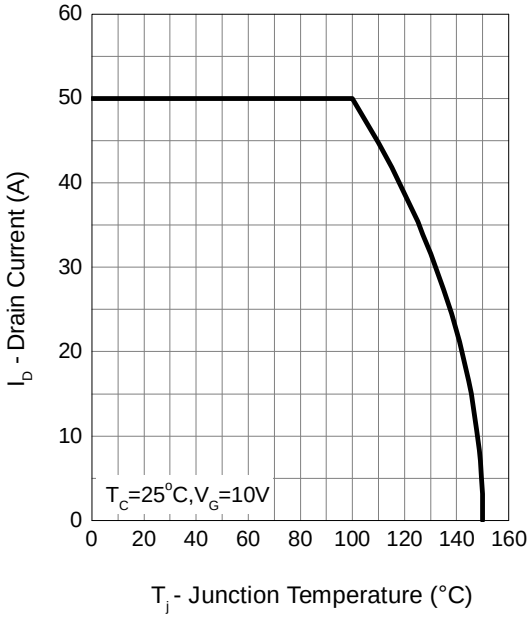
Note d：Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
Note e：Guaranteed by design, not subject to production testing.

## Typical Operating Characteristics

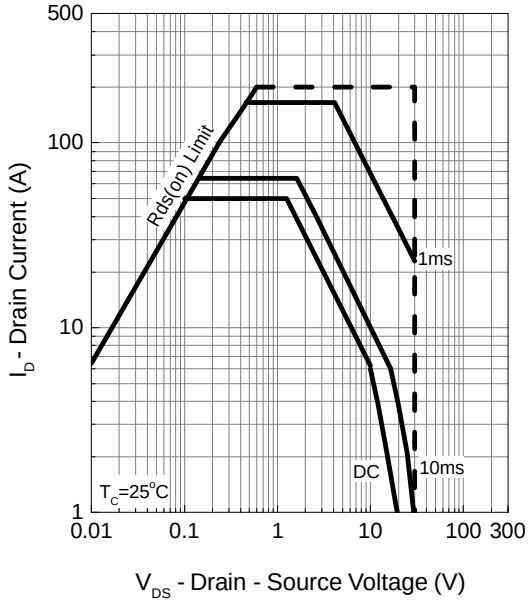
### Power Dissipation



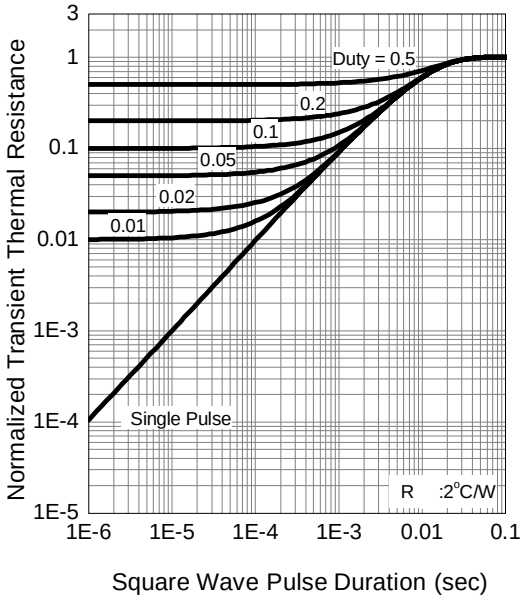

### Drain Current




### Safe Operation Area

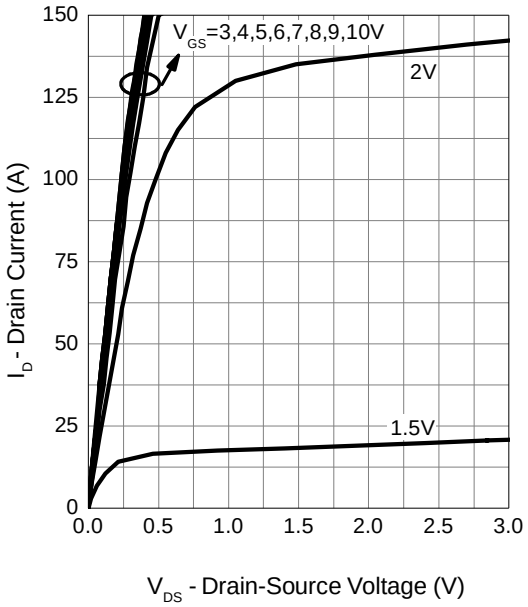



### Thermal Transient Impedance

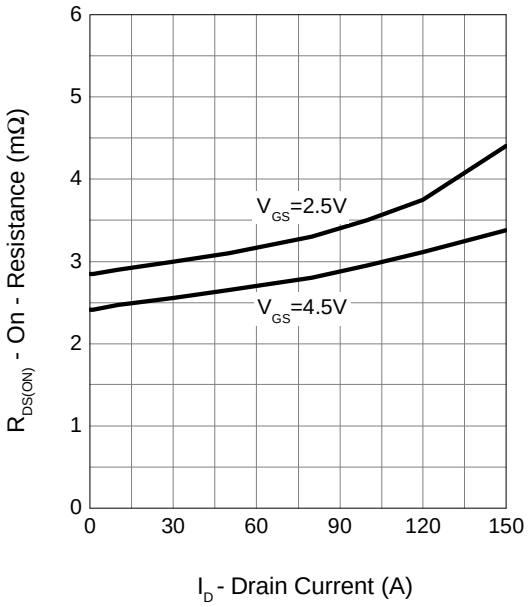


## Typical Operating Characteristics (Cont.)

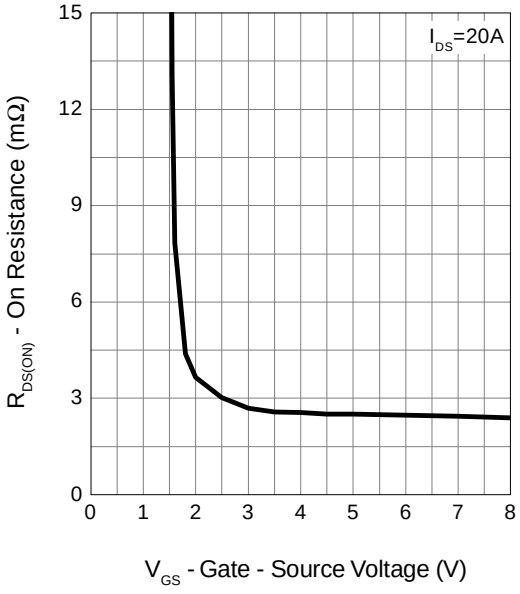
**Output Characteristics**



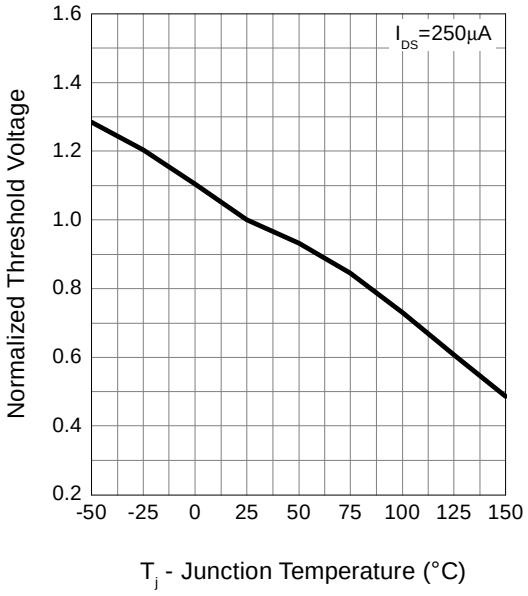

**Drain-Source On Resistance**




**Gate-Source On Resistance**

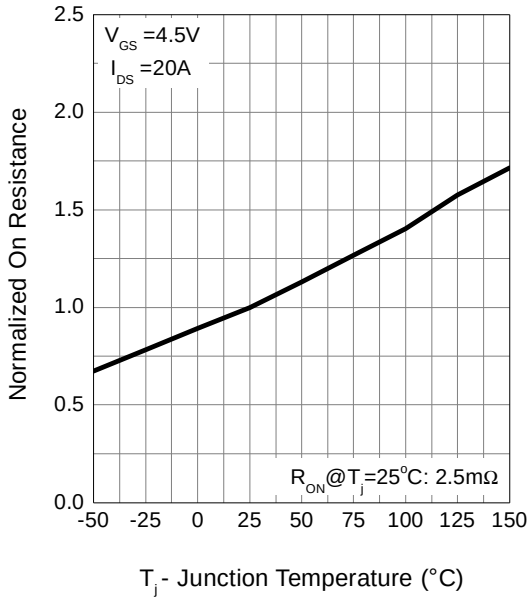



**Gate Threshold Voltage**

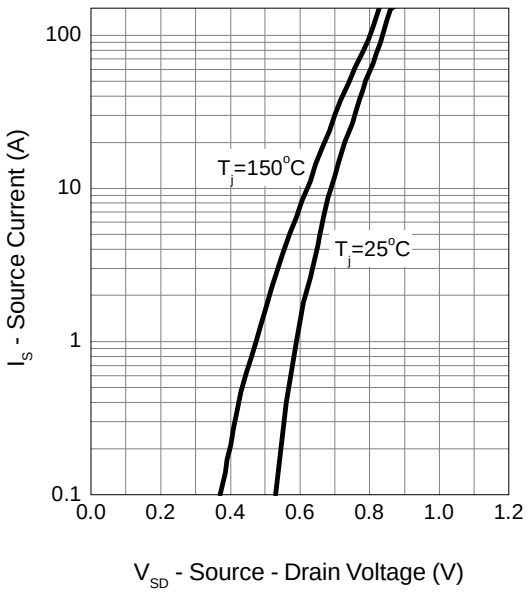


## Typical Operating Characteristics (Cont.)

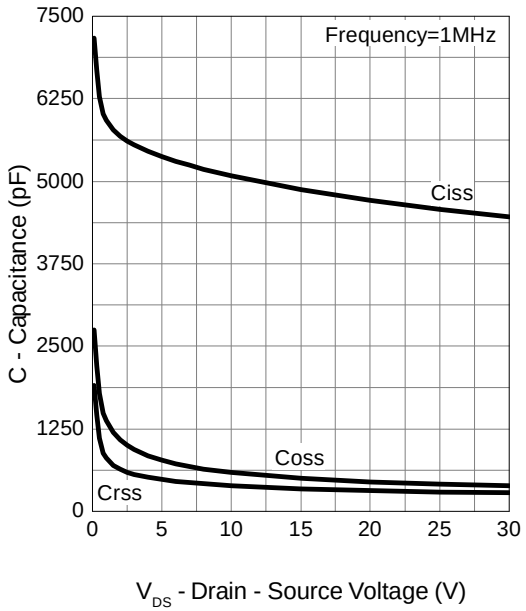
**Drain-Source On Resistance**



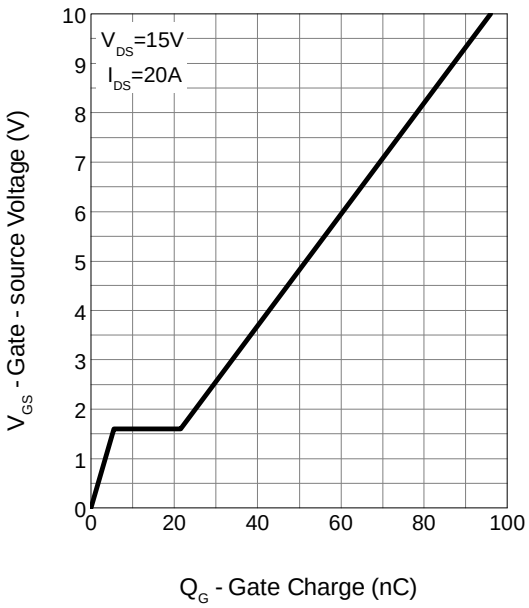

**Source-Drain Diode Forward**



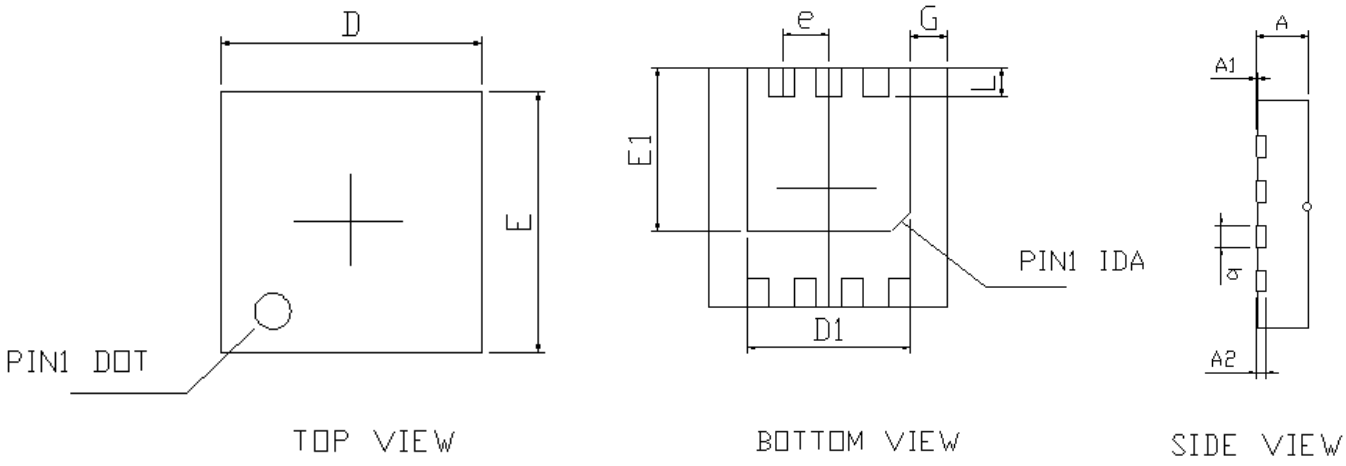

**Capacitance**




**Gate Charge**

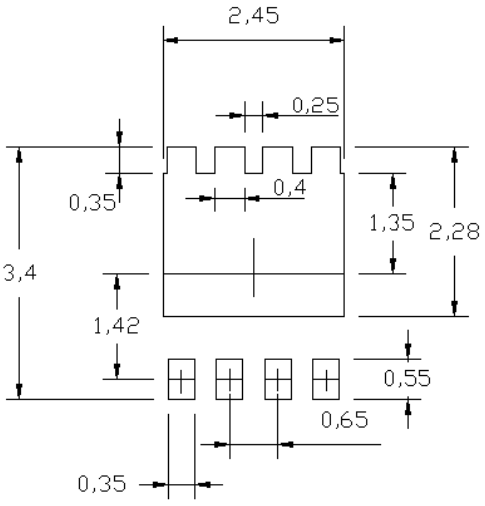


## DFN3.3x3.3

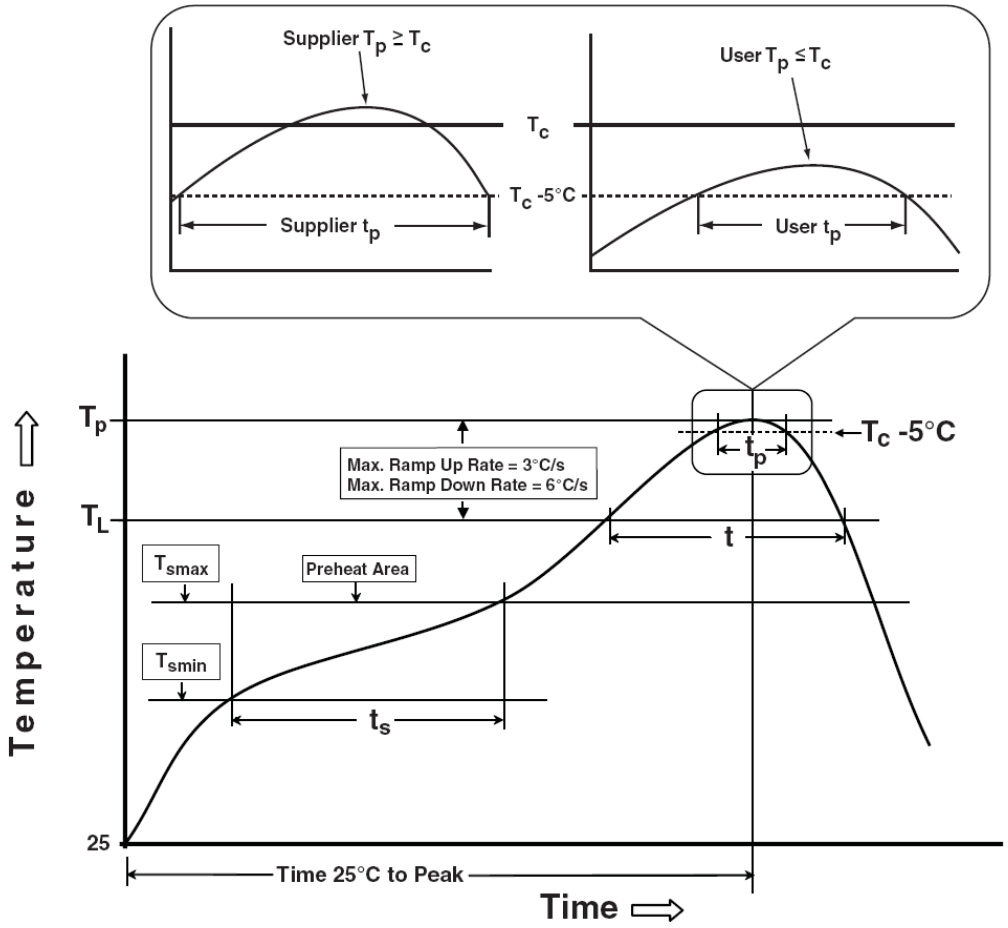



| SYMBOLS | DFN3.3x3.3 | | | |
|---|---|---|---|---|
| | MILLIMETERS | | INCHES | |
| | MIN. | MAX. | MIN. | MAX. |
| A | 0.700 | 0.800 | 0.028 | 0.032 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A2 | 0.100 | 0.250 | 0.004 | 0.010 |
| b | 0.240 | 0.350 | 0.009 | 0.014 |
| D | 3.150 | 3.400 | 0.124 | 0.134 |
| D1 | 2.100 | 2.350 | 0.083 | 0.093 |
| E | 3.150 | 3.400 | 0.124 | 0.134 |
| E1 | 2.150 | 2.350 | 0.850 | 0.093 |
| e | 0.600 | 0.700 | 0.024 | 0.028 |
| G | 0.475 | 0.575 | 0.019 | 0.023 |
| L | 0.350 | 0.450 | 0.014 | 0.018 |

RECOMMENDED LAND PATTERN



## Classification Profile



## Classification Reflow Profiles

| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|---|---|---|
| **Preheat & Soak**<br>Temperature min ($T_{smin}$)<br>Temperature max ($T_{smax}$)<br>Time ($T_{smin}$ to $T_{smax}$) ($t_s$) | 100 °C<br>150 °C<br>60-120 seconds | 150 °C<br>200 °C<br>60-120 seconds |
| Average ramp-up rate ($T_{smax}$ to $T_P$) | 3 °C/second max. | 3°C/second max. |
| Liquidous temperature ($T_L$)<br>Time at liquidous ($t_L$) | 183 °C<br>60-150 seconds | 217 °C<br>60-150 seconds |
| Peak package body Temperature ($T_p$)* | See Classification Temp in table 1 | See Classification Temp in table 2 |
| Time ($t_P$)** within 5°C of the specified classification temperature ($T_c$) | 20** seconds | 30** seconds |
| Average ramp-down rate ($T_p$ to $T_{smax}$) | 6 °C/second max. | 6 °C/second max. |
| Time 25°C to peak temperature | 6 minutes max. | 8 minutes max. |
| * Tolerance for peak profile Temperature ($T_p$) is defined as a supplier minimum and a user maximum.<br>** Tolerance for time at peak profile temperature ($t_p$) is defined as a supplier minimum and a user maximum. | | |

Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

| Package Thickness | Volume $mm^3$ <350 | Volume $mm^3$ ³350 |
|---|---|---|
| <2.5 mm | 235 °C | 220 °C |
| ≥2.5 mm | 220 °C | 220 °C |

Table 2. Pb-free Process – Classification Temperatures (Tc)

| Package Thickness | Volume $mm^3$ <350 | Volume $mm^3$ 350-2000 | Volume $mm^3$ >2000 |
|---|---|---|---|
| <1.6 mm | 260 °C | 260 °C | 260 °C |
| 1.6 mm – 2.5 mm | 260 °C | 250 °C | 245 °C |
| ≥2.5 mm | 250 °C | 245 °C | 245 °C |

## Reliability Test Program

| Test item | Method | Description |
|---|---|---|
| SOLDERABILITY | JESD-22, B102 | 5 Sec, 245°C |
| HTRB | JESD-22, A108 | 1000 Hrs, 80% of VDS max @ Tjmax |
| HTGB | JESD-22, A108 | 1000 Hrs, 100% of VGS max @ Tjmax |
| PCT | JESD-22, A102 | 168 Hrs, 100%RH, 2atm, 121°C |
| TCT | JESD-22, A104 | 500 Cycles, -65°C~150°C |

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