



SP6019D

Synchronous Rectifier Driver

DESCRIPTION

The fundamental of SP6019D synchronous rectifier (SR) driver IC is based on our U.S. patented methods that utilize the principle of “prediction” logic circuit. The IC deliberates previous cycle timing to control the SR in present cycle by “predictive” algorithm that makes adjustments to the turn-off time, in order to achieve maximum efficiency and avoid cross-conduction at the same time. SP6019D is specially suitable for Forward and DC/DC Module.

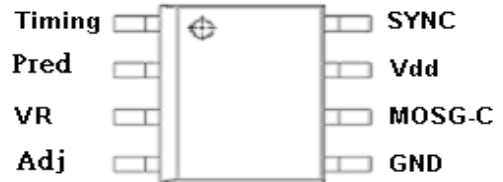
FEATURES

- Offers efficiency improvement over Schottky Diode (depends on drive configuration of the SR).
- Drives all Power MOSFET.
- Prediction gate timing control.
- Minimum MOSFET body diode conduction.
- Operating at high switching frequency.
- Synchronize to transformer secondary voltage waveform.
- Linear setting of timing function.
- SOP-8 and TDFN3X3 8LC Package

APPLICATION

- Servers & workstations
- Storage area network power supplies
- Telecommunication converters
- Embedded systems
- Industrial & commercial systems using high current processors
- DC/DC Power Module

PIN CONFIGURATION (SOP-8)



PART MARKING

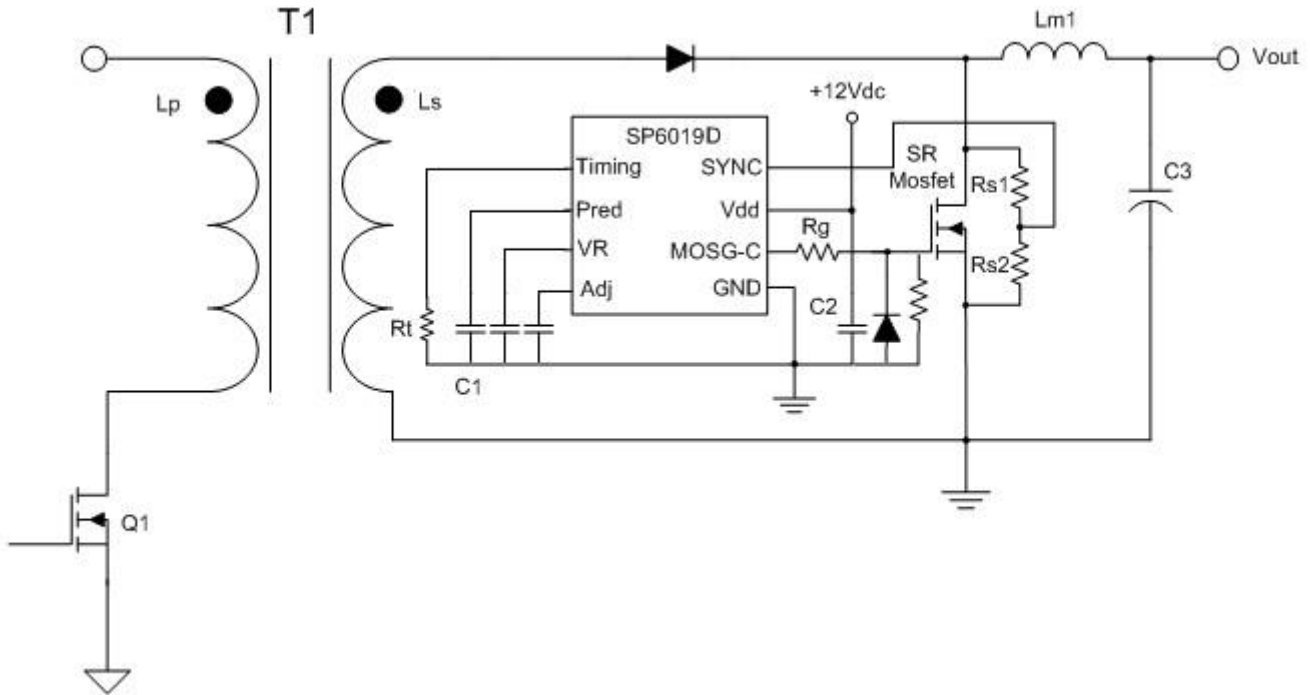




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TYPICAL APPLICATION CIRCUIT



PIN DESCRIPTION

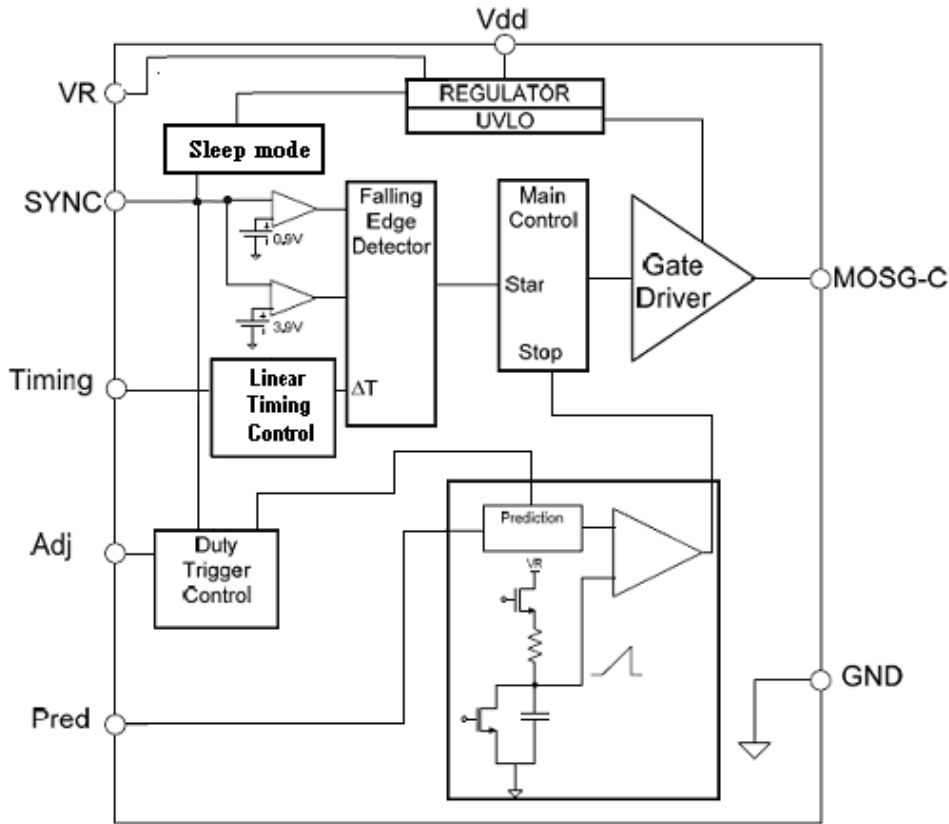
| Pin | Symbol | Description |
|-----|--------|---|
| 1 | Timing | Discontinuous current filter timing adjustment resistor connection. |
| 2 | Pred | Capacitor to store previous cycle timing for SR MOSFET. |
| 3 | VR | Voltage Regulator. |
| 4 | Adj | Trigger point adjustment for Dynamic state. |
| 5 | GND | Ground connection. |
| 6 | MOSG-C | Catch MOSFET gate drive. |
| 7 | Vdd | DC supply voltage. |
| 8 | SYNC | Synchronized signal from the V_{DS} of SR MOSFET. |
| 9 | GND | Ground, Exposed Pad |



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BLOCK DIAGRAM



ORDERING INFORMATION

| Part Number | Package | Part Marking |
|--------------|---------|--------------|
| SP6019DS8RGB | SOP-8 | SP6019D |
| SP6019DS8TGB | SOP-8 | SP6019D |

※ SP6019DS8RGB : Tape Reel ; Pb – Free ; Halogen - Free

※ SP6019DS8TGB : Tube ; Pb – Free ; Halogen – Free

ABSOLUTE MAXIMUM RATINGS (TA=25°C, unless otherwise specified.)

The following ratings designate persistent limits beyond which damage to the device may occur.

| Symbol | Parameter | Value | Unit |
|-------------------|--|------------|------|
| V _{dd} | DC Supply Voltage | 16 | V |
| I _{OUT} | Peak Source Current (Pulsed) | 2.0 | A |
| | Peak Sink Current (Pulsed) | 2.0 | A |
| P _D | Power Dissipation @ T _A =85°C SOP-8 (*) | 0.25 | W |
| P _D | Power Dissipation @ T _A =85°C TDN8 (*) | 1.8 | W |
| T _J | Operating Junction Temperature Range | -40 to 125 | °C |
| T _{STG} | Storage Temperature Range | -40 to 150 | °C |
| T _{LEAD} | Lead Soldering Temperature for 5 sec. | 260 | °C |



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THERMAL RESISTANCE

| Symbol | Parameter | Value | Unit |
|-----------------|--|-------|---------------|
| $R_{\theta JC}$ | Thermal Resistance Junction – Case SOP-8 (*) | 45 | $^{\circ}C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction - Case TDN8 (*) | 8 | $^{\circ}C/W$ |

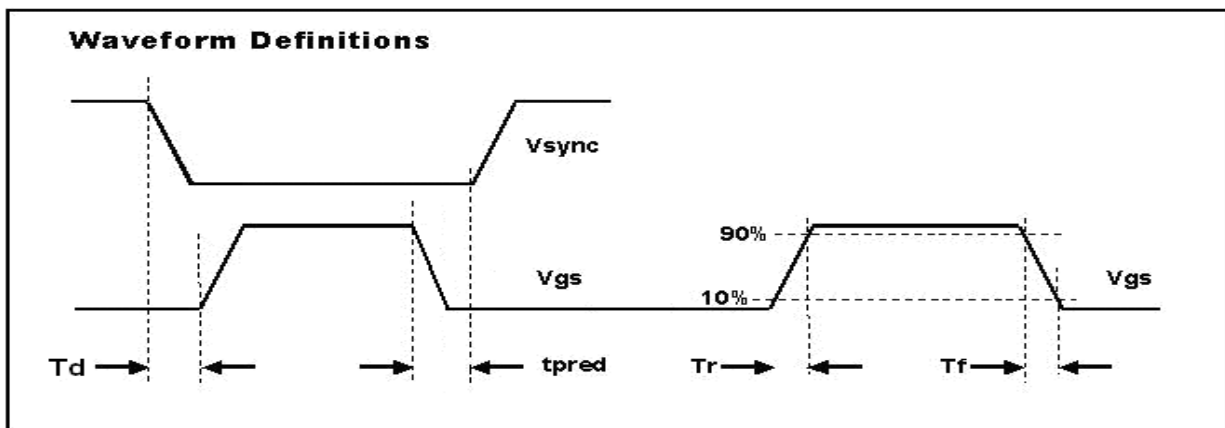
(*) The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.

ELECTRICAL CHARACTERISTICS

($T_A=25^{\circ}C$, $V_{dd}=12V$, Freq. =50 KHz, Duty Cycle=50%, unless otherwise specified.)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|-------------------------|--|------|------|------|------|
| SUPPLY INPUT | | | | | | |
| IDD | Supply current | No load | | 0.15 | | mA |
| | | $V_{SYNC}=0V$, V_{dd} on Idd peak < 2A | | 3 | 4 | mA |
| Vdd | Supply voltage | Idd peak < 2A | | | 16 | V |
| Vdd on | Enable voltage | | 7.8 | 8.2 | 8.6 | V |
| Vdd hysteresis | Enable voltage | | | 0.25 | 0.5 | V |
| Vovp | Over voltage protection | | 15.5 | 16.5 | 17.5 | V |
| Vovp hystersis | | | | 0.3 | | V |
| SYNC REFERENCE (SYNC) | | | | | | |
| Vshth | SYNC high threshold | | 3.5 | 3.9 | | V |
| Vslth | SYNC low threshold | | | 0.9 | 1.2 | V |
| Vsync | SYNC wake-up voltage | I _{sync} =3mA | 9 | | 16 | V |
| I _{sync} | SYNC input current | | | | 3 | mA |
| Voltage Regulator REFERENCE (VR) | | | | | | |
| VR | voltage | | 5.2 | | 5.4 | V |
| I _{VR} | VR Output Current | | | | 50 | mA |
| ON TIME DUTY SETUP (PIN 6) | | | | | | |
| T _{on-time} | | | | 26 | 32 | us |
| MOSFET GATE DRIVER (MOSG-C) | | | | | | |
| Voh | Output high voltage | I _o = -200mA | 10.5 | 11.0 | | V |
| Vol | Output low voltage | I _o = 200mA | | 0.5 | 0.8 | V |
| Td | Propagation delay | No load | 25 | 50 | 155 | ns |
| Tpred | | No load | | 120 | | ns |
| Tr | Rise time | Load = 1nF (*) | | 10 | 25 | ns |
| Tf | Fall time | Load = 1nF (*) | | 10 | 25 | ns |
| Dynamic Protect | | | | | | |
| Dt | Dynamic variable | Pin 4 open | | 600 | | ns |
| T _{on-min} | MOSG-C on time | PWM adjusts time > Dt | | 0.5 | | us |

(*) Tr & Tf are measured among 10% and 90% of starting and final voltage.

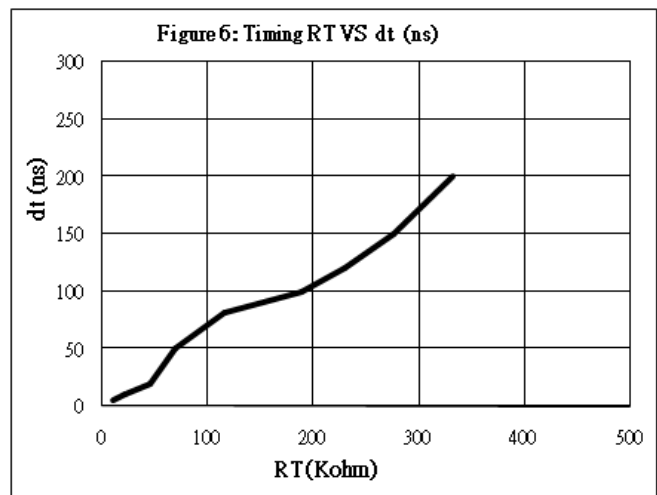
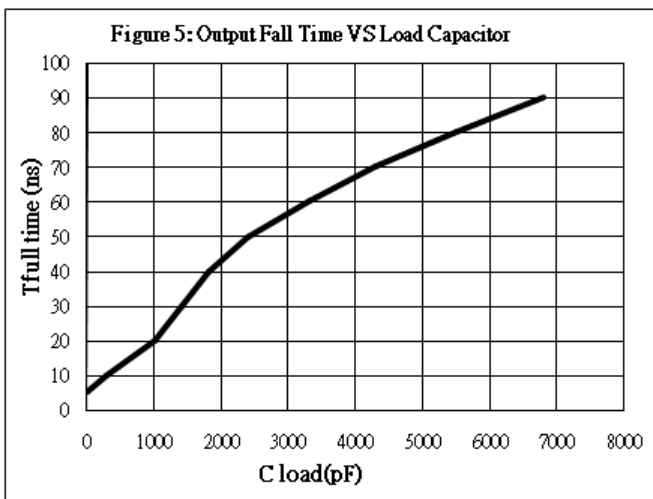
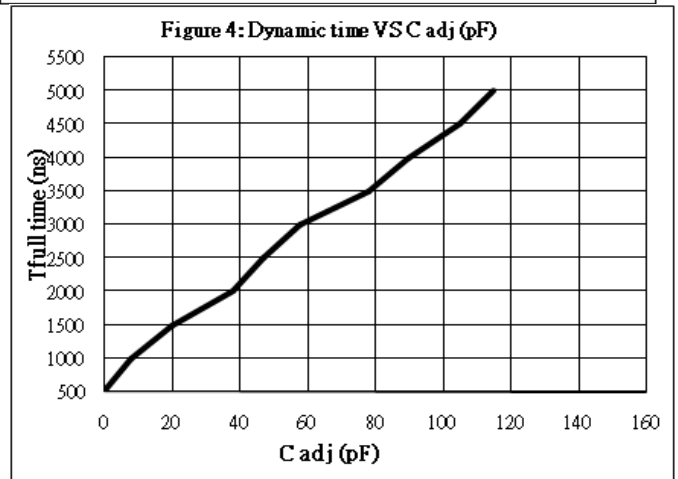
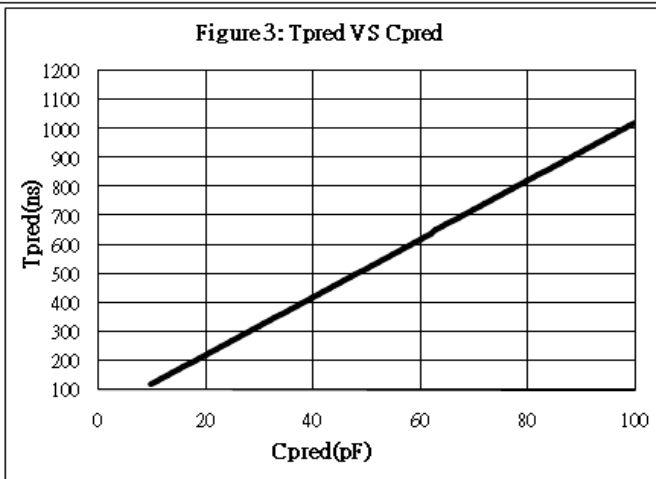
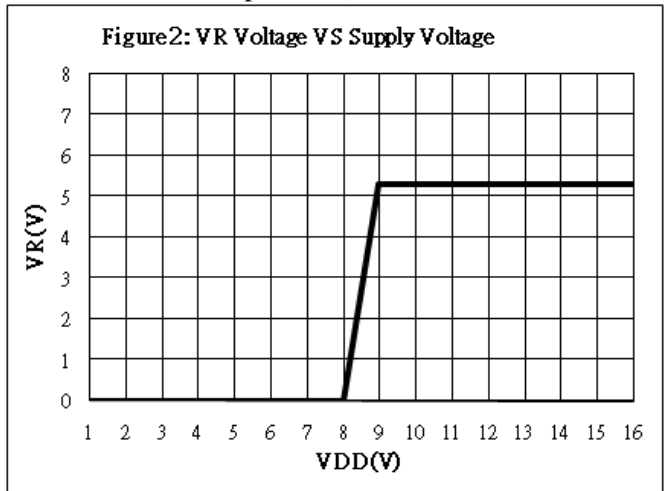
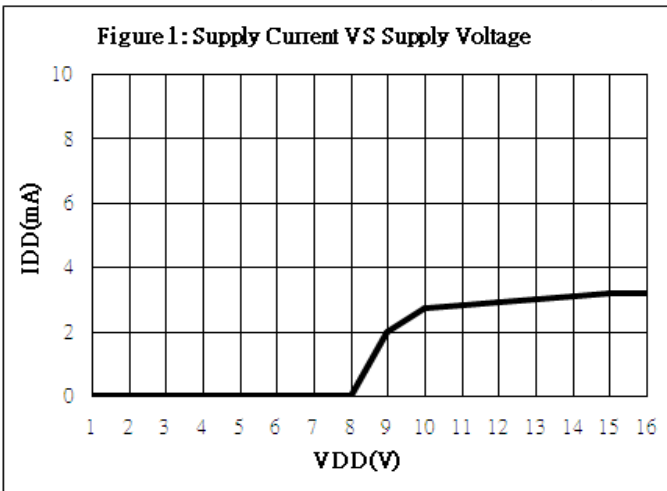




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PERFORMANCE CHARACTERISTICS ($T_A=25^{\circ}\text{C}$, unless otherwise specified.)



*Fig. 1 : No Load ; No SYNC

*Fig. 3 : Frequency = 100 kHz

*Fig. 4~5 : Frequency = 65 kHz.

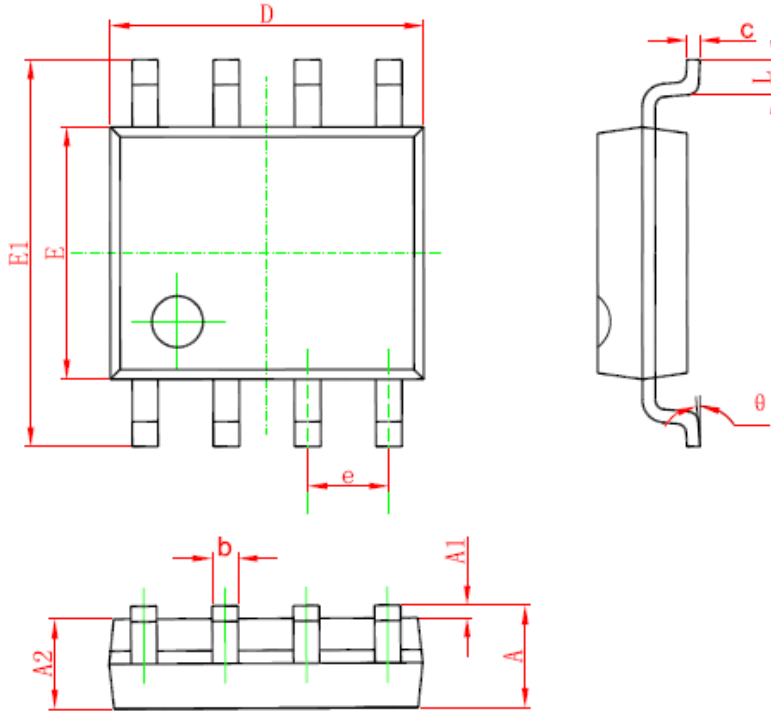
*Fig. 6 : The falling time of negative edge from 3.9V to 0.9V



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SOP- 8 PACKAGE OUTLINE



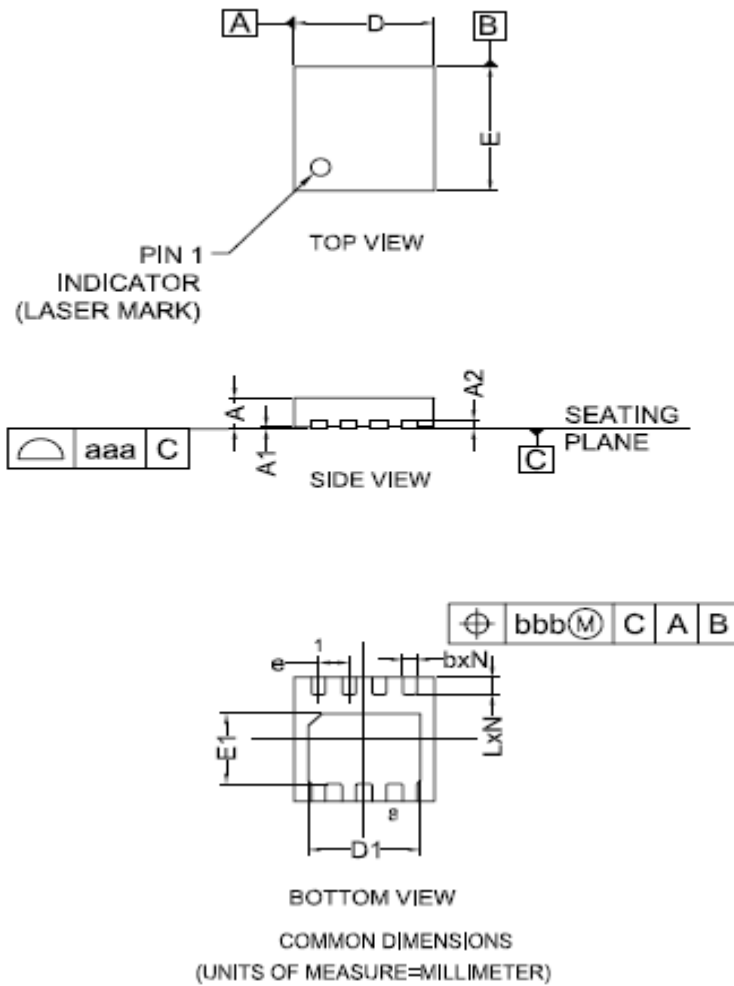
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270 (BSC) | | 0.050 (BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |



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TDFN3X3- 8LC PACKAGE OUTLINE



| SYMBOL | MIN | TYP | MAX |
|--------|---------|------|------|
| A | 0,70 | 0,75 | 0,80 |
| A1 | 0,00 | 0,02 | 0,05 |
| A2 | 0,203 | | |
| b | 0,25 | 0,30 | 0,35 |
| D | 2,90 | 3,00 | 3,10 |
| D1 | 2,35 | 2,40 | 2,45 |
| E | 2,90 | 3,00 | 3,10 |
| E1 | 1,65 | 1,70 | 1,75 |
| e | 0,65BSC | | |
| L | 0,37 | 0,42 | 0,47 |
| N | 8 | | |
| aaa | 0,08 | | |
| bbb | 0,10 | | |

- NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES)
 2. COPLANARITY APPLIES TO THE EXPOSED PAD AS THE TERMINALS.



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