

## General Description

The WSF4022 is the highest performance trench Dual N-Ch MOSFET with extreme high cell density, which provide excellent  $R_{DS(on)}$  and gate charge for most of the synchronous buck converter applications.

The WSF4022 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

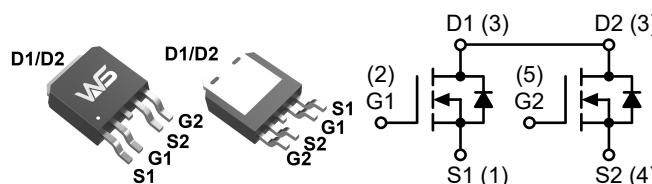
## Product Summary

| $B_{VDS}$ | $R_{DS(on)}$ | $I_D$ |
|-----------|--------------|-------|
| 40V       | 16m $\Omega$ | 20A   |

## Applications

- For Fan Pre-driver H-Bridge.
- Motor Control.
- Synchronous Rectification.

## TO-252-4L Pin Configuration



## Absolute Maximum Ratings @TA=25°C unless otherwise noted

| Symbol            | Parameter                                  | Rating                    | Units   |
|-------------------|--|---------------------------|---------|
| $V_{DS}$          | Drain-Source Voltage                       | 40                        | V       |
| $V_{GS}$          | Gate-Source Voltage                        | $\pm 20$                  | V       |
| $I_D$             | Drain Current (Continuous) *AC             | $T_C=25^\circ\text{C}$    | 20*     |
| $I_D$             | Drain Current (Continuous) *AC             | $T_A=25^\circ\text{C}$    | 12.2    |
| $I_D$             | Drain Current (Continuous) *AC             | $T_A=70^\circ\text{C}$    | 10.2    |
| $I_{DM}^a$        | Pulsed Drain Current                       | $T_C=25^\circ\text{C}$    | 80*     |
| $E_{AS}^b$        | Single Pulse Avalanche Energy              | $L=0.5\text{mH}$          | 25      |
| $I_{AS}^b$        | Avalanche Current                          | $L=0.5\text{mH}$          | 17.8    |
| $P_D$             | Maximum Power Dissipation                  | $T_C=25^\circ\text{C}$    | 39.4    |
| $P_D$             | Maximum Power Dissipation                  | $T_C=100^\circ\text{C}$   | 19.7    |
| $P_D$             | Power Dissipation                          | $T_A=25^\circ\text{C}$    | 6.4     |
| $P_D$             | Power Dissipation                          | $T_A=70^\circ\text{C}$    | 4.2     |
| $T_J$             | Maximum Junction Temperature               |                           | 175     |
| $T_{STG}$         | Operating Temperature/ Storage Temperature |                           | -55~175 |
| $R_{\theta JA}^b$ | Thermal Resistance Junction-Ambient        | Steady State <sup>c</sup> | 60      |
| $R_{\theta JC}$   | Thermal Resistance Junction to Case        |                           | 3.8     |

Note \*: Limited by package.

Note a: Pulse width limited by max. junction temperature.

Note b: UIS tested and pulse width limited by maximum junction temperature 175°C (initial temperature  $T_J=25^\circ\text{C}$ ).

Note c: Surface Mounted on 1in2 pad area,  $t=999\text{sec}$ .

**Electrical Characteristics** @T<sub>A</sub>=25°C unless otherwise noted

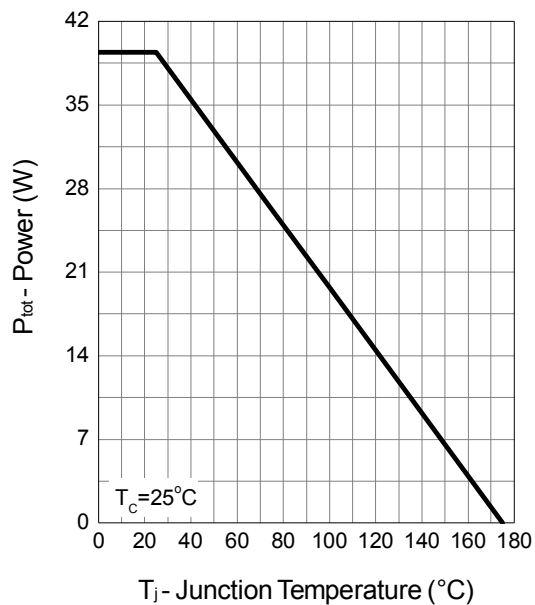
| Symbol                           | Parameter                        | Conditions  | Min. | Typ. | Max. | Unit |
|----------------------------------|----------------------------------|---|------|------|------|------|
| Static                           |                                  |   |      |      |      |      |
| V <sub>(BR)DSS</sub>             | Drain-Source Breakdown Voltage   | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA  | 40   |      |      | V    |
| I <sub>DSS</sub>                 | Zero Gate Voltage Drain Current  | V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V   |      |      | 1    | μA   |
| I <sub>DSS</sub>                 | Zero Gate Voltage Drain Current  | V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V, T <sub>J</sub> =85°C   |      |      | 30   | μA   |
| I <sub>GSS</sub>                 | Gate Leakage Current             | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V  |      |      | ±100 | nA   |
| V <sub>GS(th)</sub>              | Gate Threshold Voltage           | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>DS</sub> = 250μA   | 1.1  | 1.6  | 2.5  | V    |
| R <sub>DS(on)</sub> <sup>d</sup> | Drain-Source On-state Resistance | V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A   |      | 16   | 21   | mΩ   |
|                                  |                                  | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 5A   |      | 18   | 25   | mΩ   |
| Gate Charge <sup>e</sup>         |                                  |   |      |      |      |      |
| Q <sub>g</sub>                   | Total Gate Charge                | V <sub>DS</sub> =20V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A  |      | 7.5  |      | nC   |
| Q <sub>gs</sub>                  | Gate-Source Charge               |   |      | 3.24 |      | nC   |
| Q <sub>gd</sub>                  | Gate-Drain Charge                |   |      | 2.75 |      | nC   |
| Dynamic <sup>e</sup>             |                                  |   |      |      |      |      |
| C <sub>iss</sub>                 | Input Capacitance                | V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, f=1MHz   |      | 815  |      | pF   |
| C <sub>oss</sub>                 | Output Capacitance               |   |      | 95   |      | pF   |
| C <sub>rss</sub>                 | Reverse Transfer Capacitance     |   |      | 60   |      | pF   |
| t <sub>d (on)</sub>              | Turn-on Delay Time               | V <sub>DD</sub> =20V, V <sub>GEN</sub> =10V,<br>I <sub>DS</sub> =1A, R <sub>G</sub> =6Ω, R <sub>L</sub> =20Ω. |      | 7.8  |      | ns   |
| t <sub>r</sub>                   | Turn-on Rise Time                |   |      | 6.9  |      | ns   |
| t <sub>d(off)</sub>              | Turn-off Delay Time              |   |      | 22.4 |      | ns   |
| t <sub>f</sub>                   | Turn-off Fall Time               |   |      | 4.8  |      | ns   |
| Diode                            |                                  |   |      |      |      |      |
| V <sub>SD</sub> <sup>d</sup>     | Diode Forward Voltage            | I <sub>SD</sub> =1A, V <sub>GS</sub> =0V  |      | 0.75 | 1.1  | V    |
| t <sub>rr</sub>                  | Input Capacitance                | I <sub>DS</sub> =10A, dI <sub>SD</sub> /dt=100A/μs  |      | 13   |      | ns   |
| Q <sub>rr</sub>                  | Output Capacitance               |   |      | 8.7  |      | nC   |

Note d: Pulse test ; pulse width ≤ 300μs, duty cycle ≤ 2%.

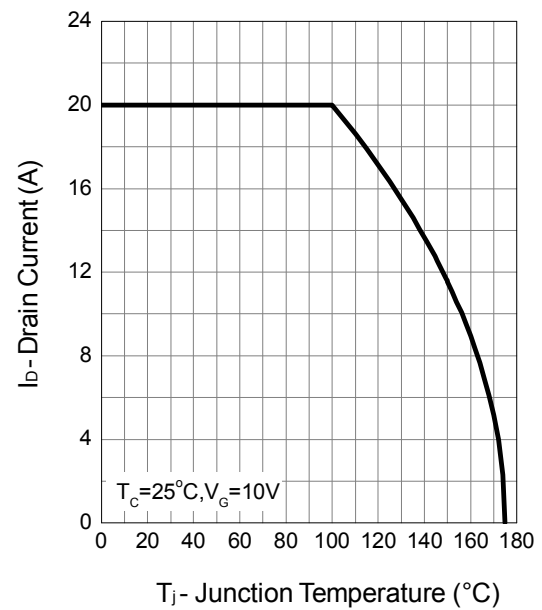
Note e: Guaranteed by design, not subject to production testing.

## Typical Characteristics

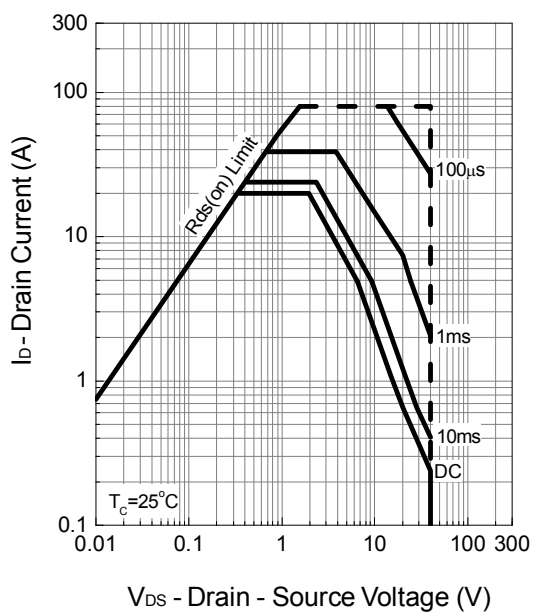
**Power Dissipation**



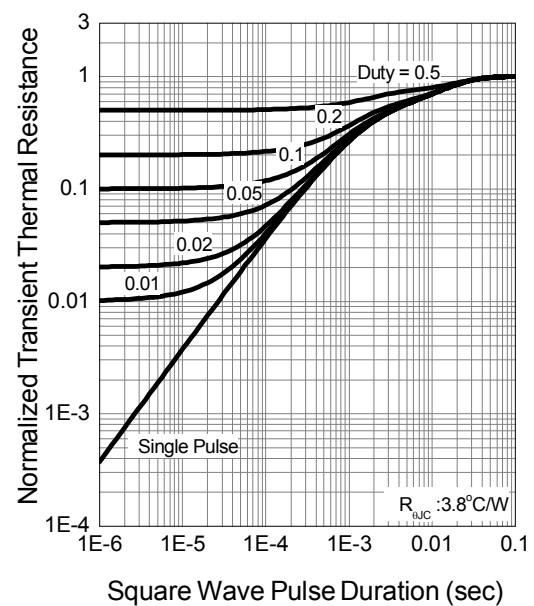
**Drain Current**



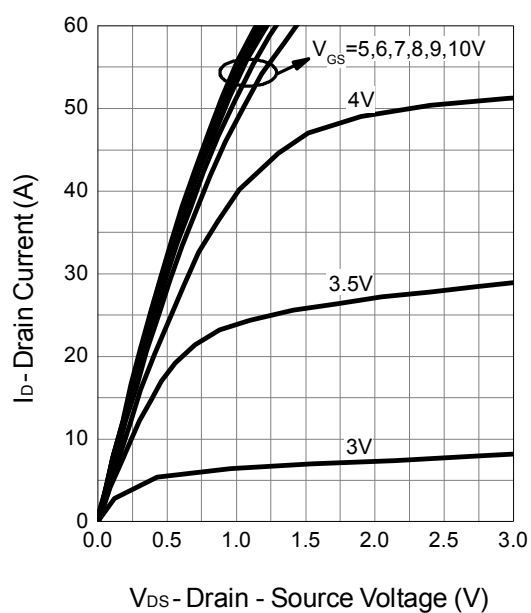
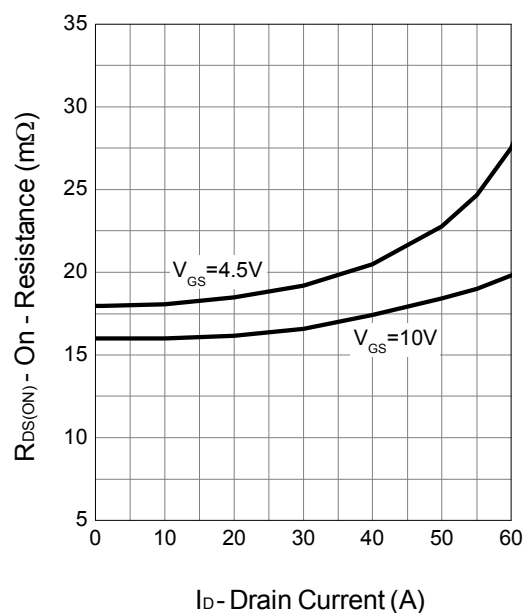
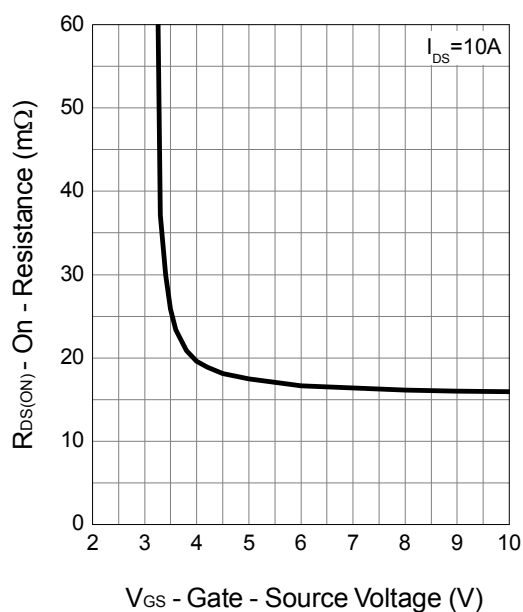
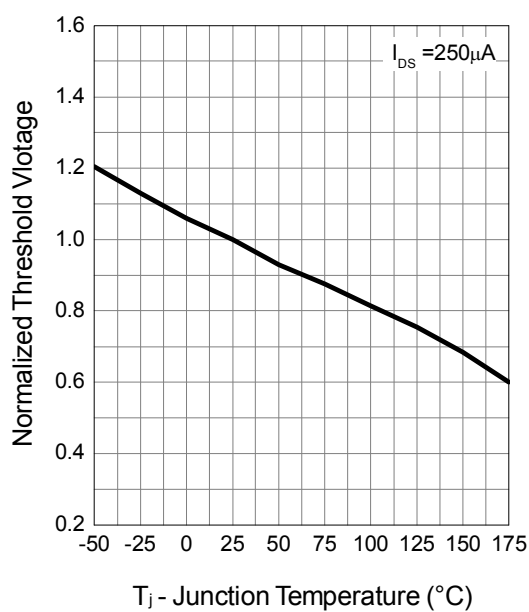
**Safe Operation Area**



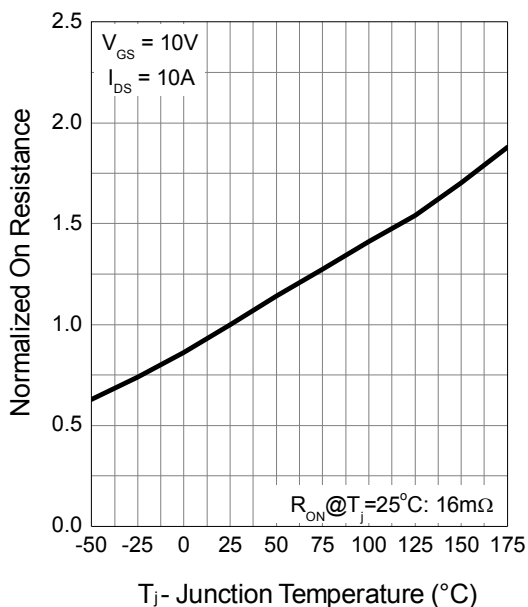
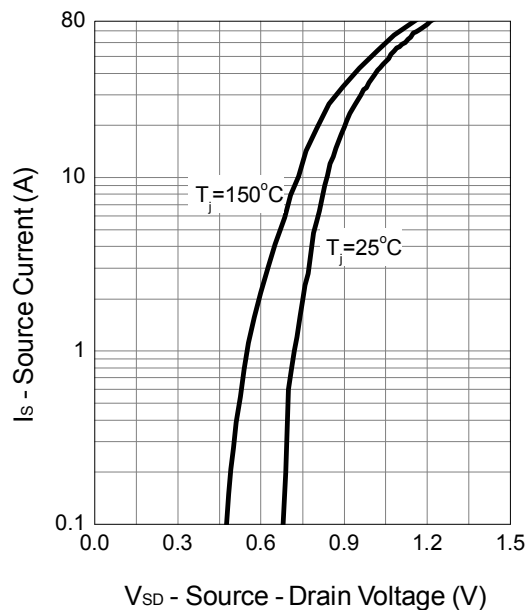
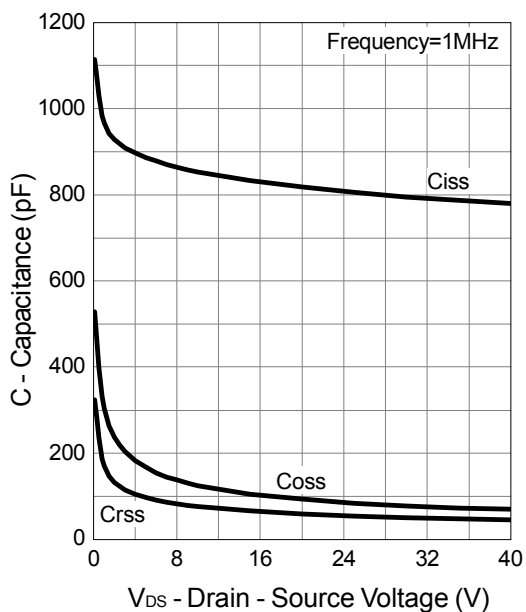
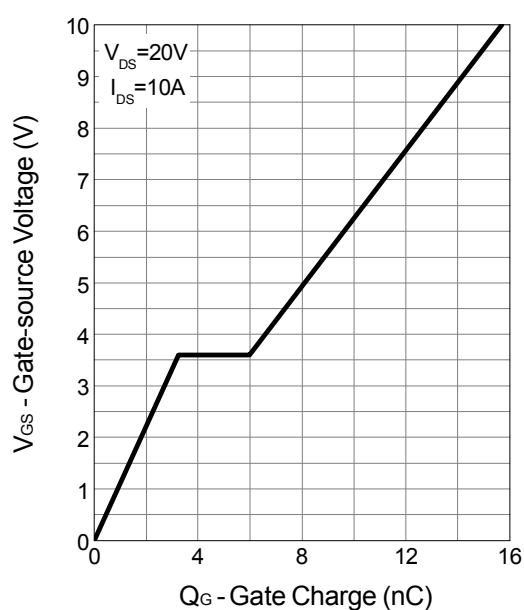
**Thermal Transient Impedance**



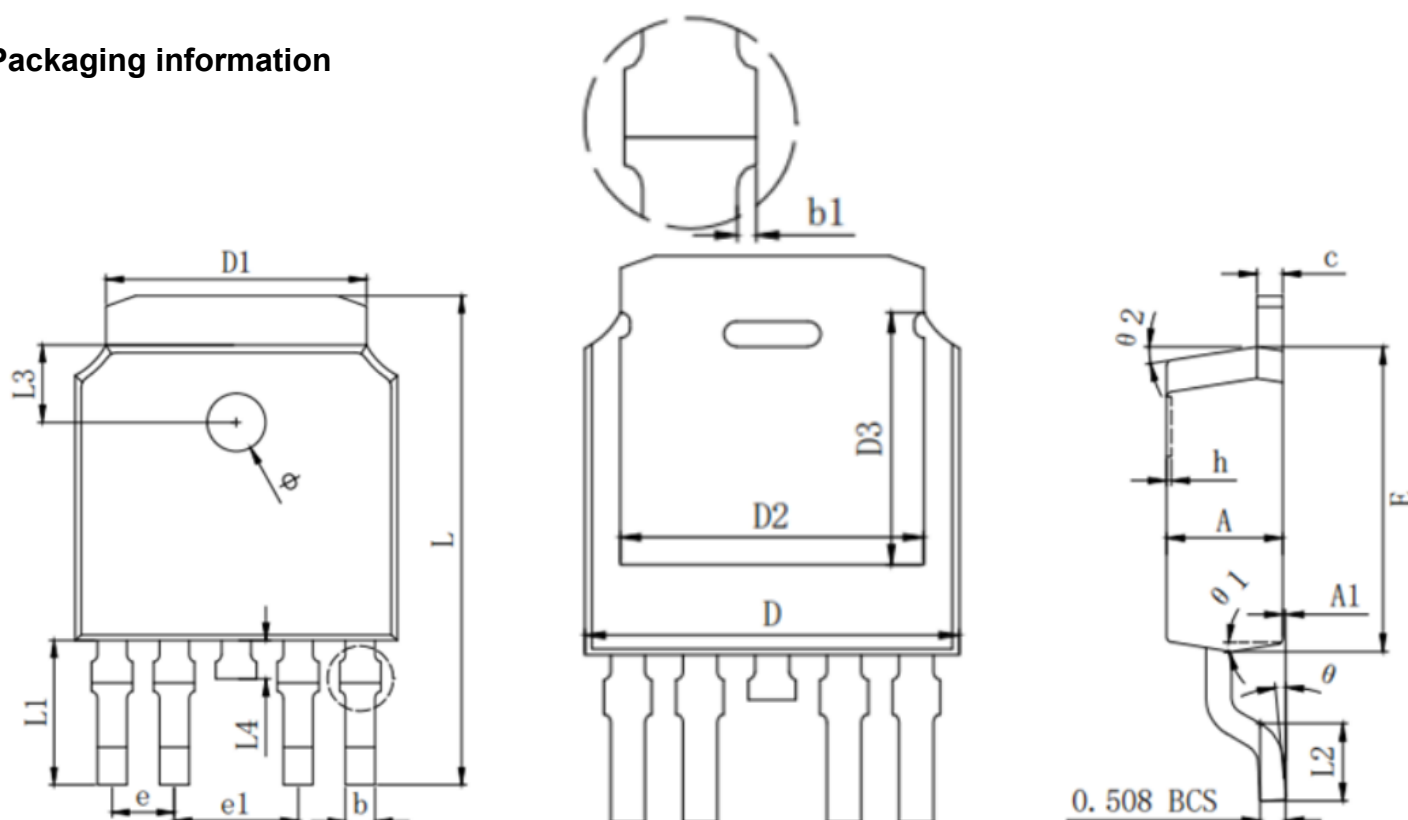
## Typical Characteristics

**Output Characteristics**

**Drain-Source On Resistance**

**Gate-Source On Resistance**

**Gate Threshold Voltage**


## Typical Characteristics

**Drain-Source On Resistance**

**Source-Drain Diode Forward**

**Capacitance**

**Gate Charge**


# Packaging information



| SYMBOLS | MILLIMETERS |        |        |
|---------|-------------|--------|--------|
|         | MIN.        | Typ.   | MAX.   |
| A       | 2.200       | 2.300  | 2.400  |
| A1      | 0.000       | -      | 0.127  |
| b       | 0.550       | 0.600  | 0.650  |
| b1      | 0.000       | -      | 0.120  |
| c(电镀后)  | 0.460       | 0.520  | 0.580  |
| D       | 6.500       | 6.600  | 6.700  |
| D1      | 5.334 REF   |        |        |
| D2      | 5.346 REF   |        |        |
| D3      | 4.490 REF   |        |        |
| E       | 6.000       | 6.100  | 6.200  |
| e       | 1.270 TYP   |        |        |
| e1      | 2.540 TYP   |        |        |
| h       | 0.000       | 0.100  | 0.200  |
| L       | 9.900       | 10.100 | 10.300 |
| L1      | 2.988 REF   |        |        |
| L2      | 1.400       | 1.550  | 1.700  |
| L3      | 1.600 REF   |        |        |
| L4      | 0.700       | 0.800  | 0.900  |
| Φ       | 1.100       | 1.200  | 1.300  |
| θ       | 0°          | -      | 8°     |
| θ 1     | 9° TYP      |        |        |
| θ 2     | 9° TYP      |        |        |

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