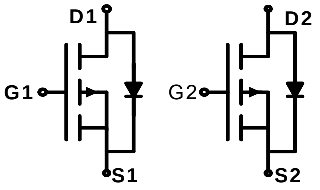
# FNK P-Channel Enhancement Mode Power MOSFET

## Description

The FNK4421 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.



Schematic diagram

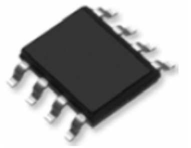
## General Features

- $V_{DS}$ = -20V,$I_D$ = -7A
  $R_{DS(ON)}$ < 25mΩ @ $V_{GS}$=-4.5V
  $R_{DS(ON)}$ < 33mΩ @ $V_{GS}$=-2.5V
- High power and current handing capability
- Lead free product is acquired
- Surface Mount Package

Marking and pin assignment

## Application

- Motor drive
- Load switch
- Power management



SOP-8 top view

### Package Marking And Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| 4421 | FNK4421 | SOP-8 | Ø330mm | 12mm | 2500 units |

### Absolute Maximum Ratings ($T_A$=25℃unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | -20 | V |
| Gate-Source Voltage | $V_{GS}$ | ±12 | V |
| Drain Current-Continuous | $I_D$ | -7 | A |
| Drain Current-Pulsed (Note 1) | $I_{DM}$ | -28 | A |
| Maximum Power Dissipation | $P_D$ | 3.0 | W |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 150 | ℃ |

### Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Ambient (Note 2) | $R_{θJA}$ | 42 | ℃/W |

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=-250μA | -20 | - | - | V |

| | | | | | | |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=-20V,$V_{GS}$=0V | - | - | -1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±12V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=-250μA | -0.6 | -0.8 | -1.4 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=-4.5V, $I_D$=-6.5A | - | 18.5 | 25 | mΩ |
| | | $V_{GS}$=-2.5V, $I_D$=-5A | - | 24.2 | 33 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=-5V,$I_D$=3A | - | 10 | - | S |
| **Dynamic Characteristics** (Note4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=-10V,$V_{GS}$=0V,<br>F=1.0MHz | - | 2100 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 450 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 300 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=-10V, ID=-1A,<br>$V_{GS}$=-4.5V,$R_{GEN}$=6Ω | - | 25 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 30 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 70 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 50 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=-10V,$I_D$=-6.5A,$V_{GS}$=-4.5V | - | 17 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 4.1 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 4.3 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=-7A | - | - | -1.2 | V |

## Notes:

**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** Surface Mounted on FR4 Board, t ≤ 10 sec.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production

## Typical Electrical and Thermal Characteristics

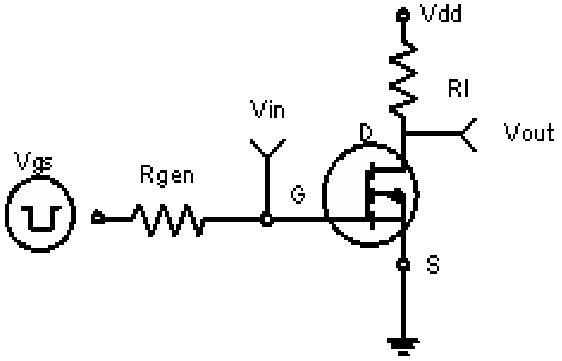


Figure 1 Switching Test Circuit

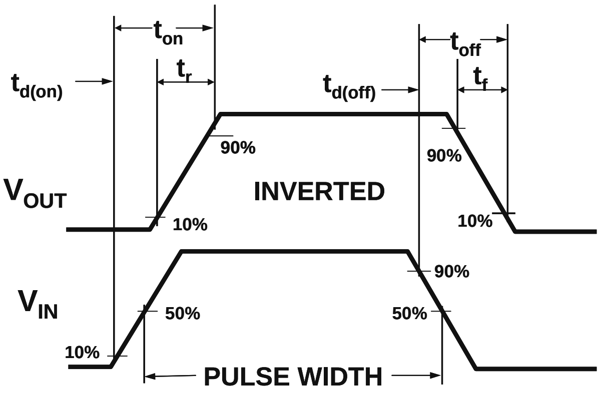


Figure 2 Switching Waveforms

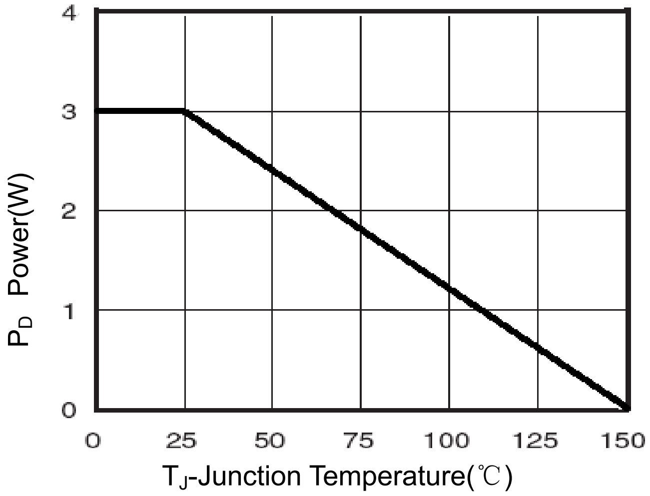


Figure 3 Power Dissipation

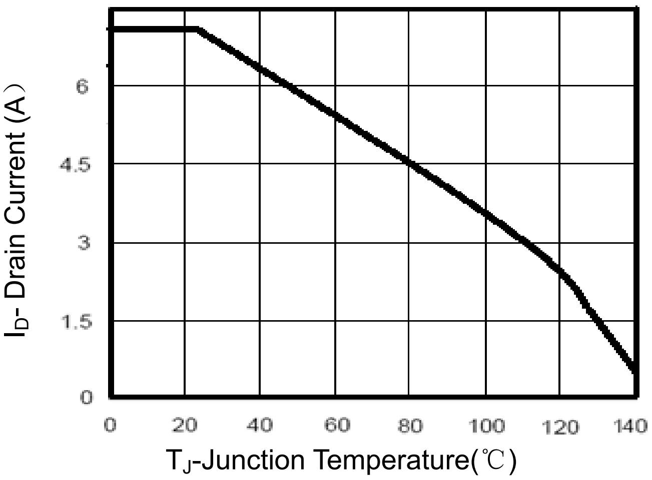


Figure 4 Drain Current

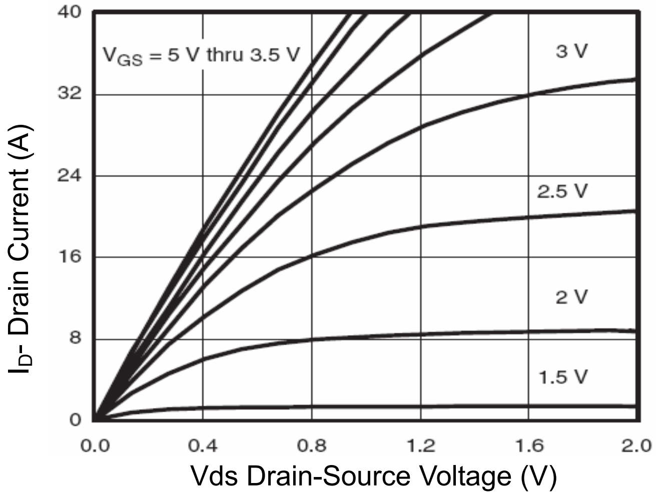


Figure 5 Output Characteristics

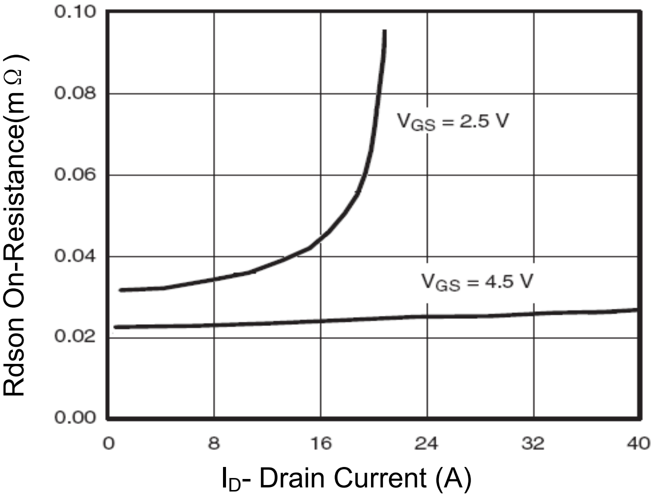


Figure 6 Drain-Source On-Resistance

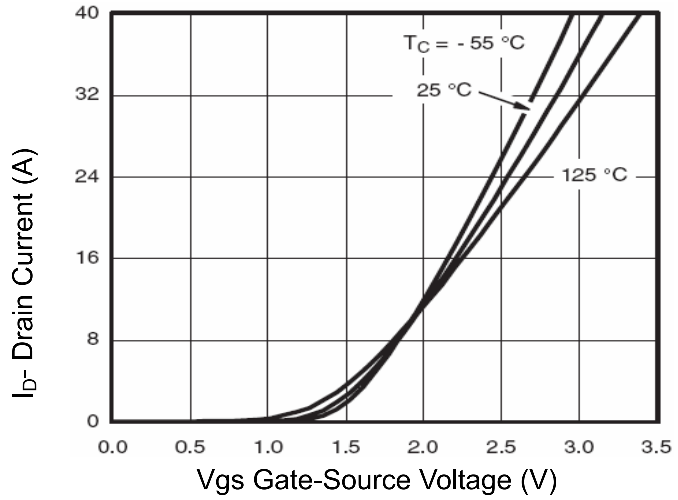


Figure 7 Transfer Characteristics

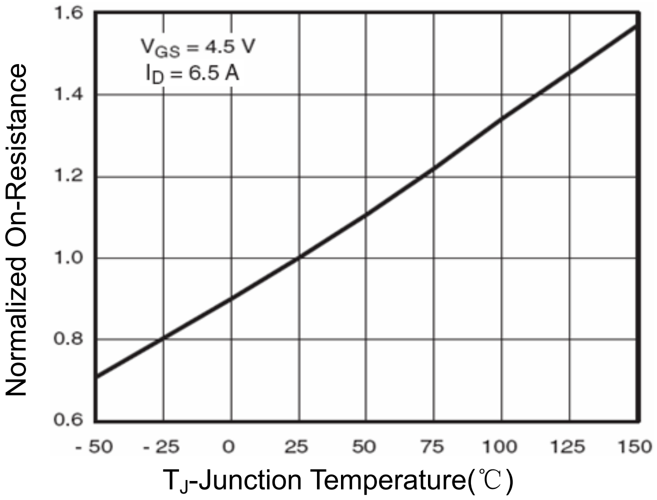


Figure 8 Drain-Source On-Resistance

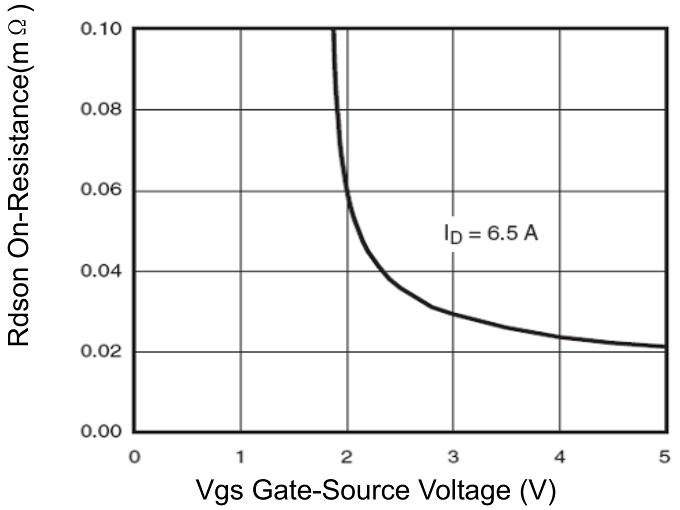


Figure 9 Rdson vs Vgs

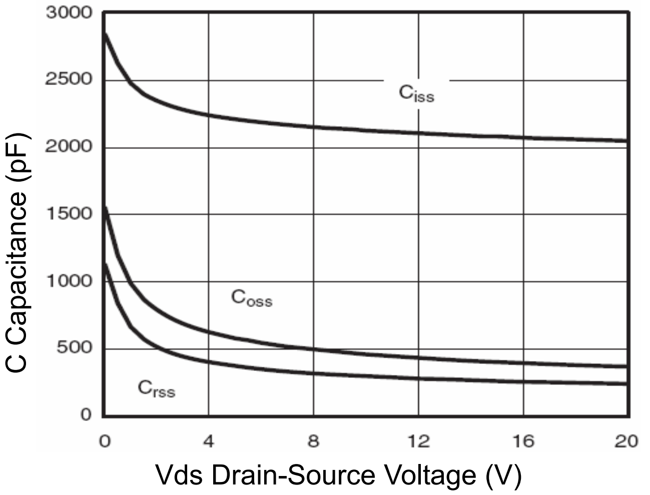


Figure 10 Capacitance vs Vds

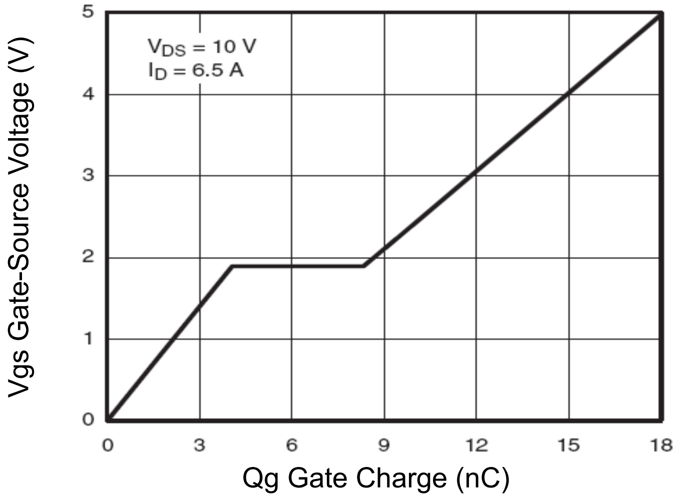


Figure 11 Gate Charge

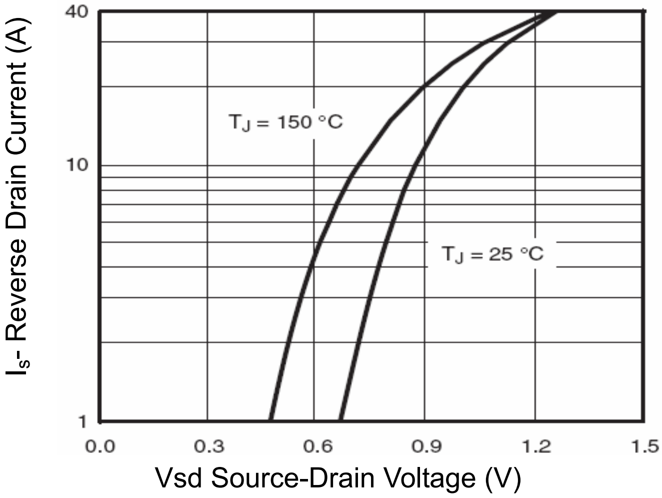


Figure 12 Source- Drain Diode Forward

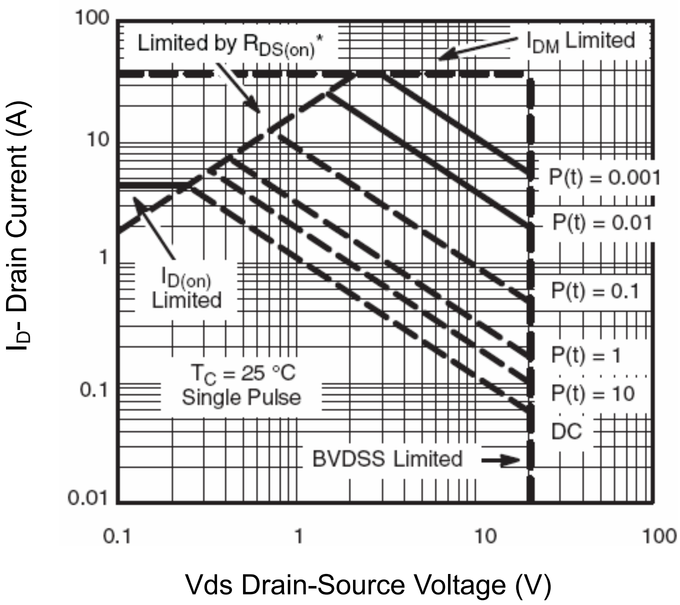


**Figure 13 Safe Operation Area**

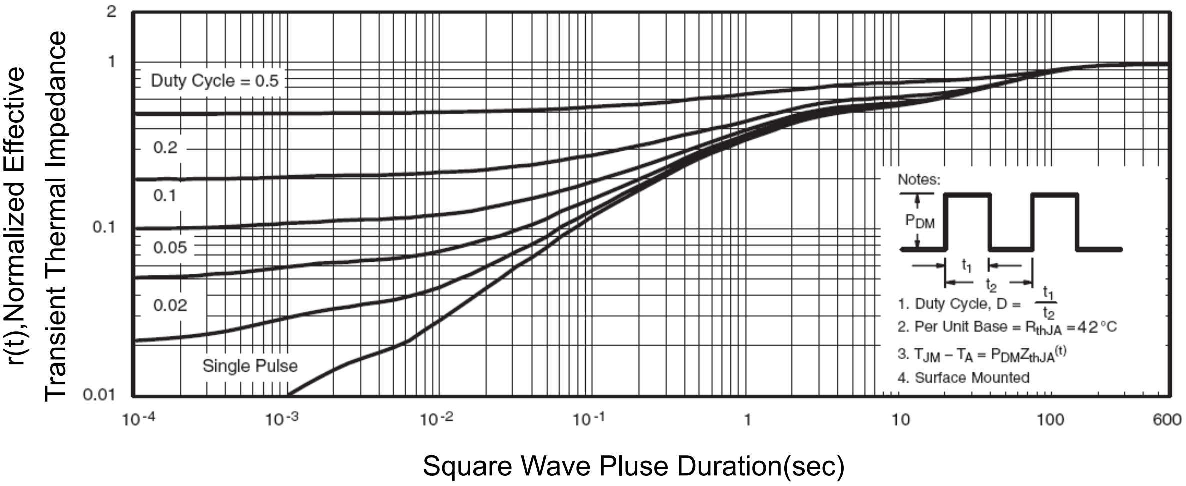
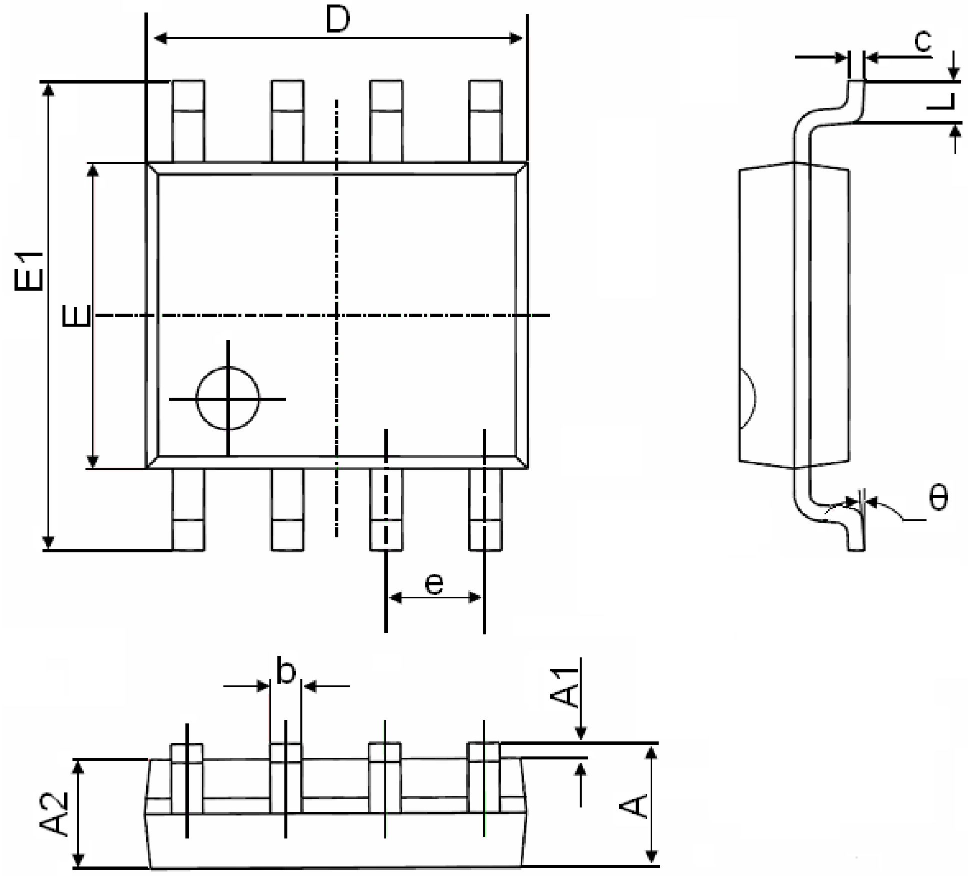


**Figure 14 Normalized Maximum Transient Thermal Impedance**

## SOP-8 Package Information



| 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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