

## Features

- $V_{DS} = 100V$ ,  $I_D = 310A$   
 $R_{DS(ON)} = 1.3m\Omega$  (typ.) @  $V_{GS} = 10V$   
 $R_{DS(ON)} = 1.8m\Omega$  (typ.) @  $V_{GS} = 6.0V$
- Low  $R_{DS(ON)}$
- Good stability and uniformity with high EAS High Current Capability
- Excellent package for good heat dissipation
- Fully characterized avalanche voltage and current

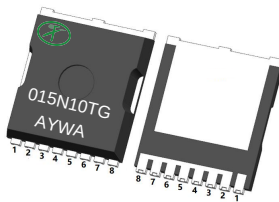
## Application

- Power management
- Hard switched and high frequency circuits
- Uninterruptible power supply

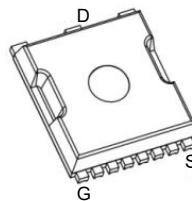


## Package

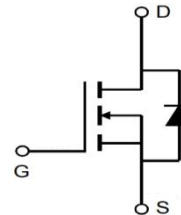
Top View



Top View



Schematic diagram



## Package Marking and Ordering Information

| Device Marking     | Device     | Device Package | Reel Size | Tape width | Quantity |
|--------------------|------------|----------------|-----------|------------|----------|
| TF015N10TG<br>AYWA | TF015N10TG | TOLL           | -         | -          | -        |

## Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise specified)

| Parameter                                                |                     | Symbol          | Value      | Unit         |
|----------------------------------------------------------|---------------------|-----------------|------------|--------------|
| Drain-Source Voltage                                     |                     | $V_{DS}$        | 100        | V            |
| Gate-Source Voltage                                      |                     | $V_{GS}$        | $\pm 20$   | V            |
| Continuous Drain Current                                 | $T_C = 25^\circ C$  | $I_D$           | 310        | A            |
|                                                          | $T_C = 100^\circ C$ |                 | 200        |              |
| Pulsed Drain Current <sup>1</sup>                        |                     | $I_{DM}$        | 1200       | A            |
| Single Pulse Avalanche Energy <sup>2</sup>               |                     | EAS             | 1190       | mJ           |
| Total Power Dissipation                                  | $T_C = 25^\circ C$  | $P_D$           | 380        | W            |
| Operating Junction and Storage Temperature Range         |                     | $T_J, T_{STG}$  | -55 to 150 | $^\circ C$   |
| Thermal Resistance from Junction-to-Ambient <sup>3</sup> |                     | $R_{\theta JA}$ | 43         | $^\circ C/W$ |
| Thermal Resistance from Junction-to-Case                 |                     | $R_{\theta JC}$ | 0.39       | $^\circ C/W$ |

Electrical Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

| Parameter                               |                       | Symbol               | Test Conditions                                                                        | Min. | Typ.  | Max. | Unit |
|-----------------------------------------|-----------------------|----------------------|----------------------------------------------------------------------------------------|------|-------|------|------|
| Static Characteristics                  |                       |                      |                                                                                        |      |       |      |      |
| Drain-Source Breakdown Voltage          |                       | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                           | 100  | -     | -    | V    |
| Gate-body Leakage current               |                       | I <sub>GSS</sub>     | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V                                           | -    | -     | ±100 | nA   |
| Zero Gate Voltage Drain Current         | T <sub>J</sub> =25°C  | I <sub>DSS</sub>     | V <sub>DS</sub> = 90V, V <sub>GS</sub> = 0V                                            | -    | -     | 1    | μA   |
|                                         | T <sub>J</sub> =100°C |                      |                                                                                        | -    | -     | 100  |      |
| Gate-Threshold Voltage                  |                       | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                             | 2.0  | 2.8   | 4.0  | V    |
| Drain-Source on-Resistance <sup>4</sup> |                       | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A                                            | -    | 1.3   | 1.8  | mΩ   |
|                                         |                       |                      | V <sub>GS</sub> = 6.0V, I <sub>D</sub> =20A                                            | -    | 1.8   | 2.5  |      |
| Dynamic Characteristics <sup>5</sup>    |                       |                      |                                                                                        |      |       |      |      |
| Input Capacitance                       |                       | C <sub>iss</sub>     | V <sub>DS</sub> = 50V, V <sub>GS</sub> =0V, f =1MHz                                    | -    | 14300 | -    | pF   |
| Output Capacitance                      |                       | C <sub>oss</sub>     |                                                                                        | -    | 2120  | -    |      |
| Reverse Transfer Capacitance            |                       | C <sub>rss</sub>     |                                                                                        | -    | 50    | -    |      |
| Gate Resistance                         |                       | R <sub>g</sub>       | f=1MHz                                                                                 | -    | 2.8   | -    | Ω    |
| Switching Characteristics <sup>5</sup>  |                       |                      |                                                                                        |      |       |      |      |
| Total Gate Charge                       |                       | Q <sub>g</sub>       | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 50V, I <sub>D</sub> = 20A                     | -    | 250   | -    | nC   |
| Gate-Source Charge                      |                       | Q <sub>gs</sub>      |                                                                                        | -    | 53    | -    |      |
| Gate-Drain Charge                       |                       | Q <sub>gd</sub>      |                                                                                        | -    | 77    | -    |      |
| Turn-on Delay Time                      |                       | t <sub>d(on)</sub>   | V <sub>GS</sub> =10V, V <sub>DD</sub> = 50V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = 20A | -    | 41    | -    | ns   |
| Rise Time                               |                       | t <sub>r</sub>       |                                                                                        | -    | 88    | -    |      |
| Turn-off Delay Time                     |                       | t <sub>d(off)</sub>  |                                                                                        | -    | 163   | -    |      |
| Fall Time                               |                       | t <sub>f</sub>       |                                                                                        | -    | 98    | -    |      |
| Body Diode Reverse Recovery Time        |                       | t <sub>rr</sub>      | I <sub>F</sub> =20A, di/dt = 100A/μs                                                   | -    | 106   | -    | ns   |
| Body Diode Reverse Recovery Charge      |                       | Q <sub>rr</sub>      |                                                                                        | -    | 245   | -    | nC   |
| Drain-Source Body Diode Characteristics |                       |                      |                                                                                        |      |       |      |      |
| Diode Forward Voltage <sup>4</sup>      |                       | V <sub>SD</sub>      | I <sub>S</sub> = 20A, V <sub>GS</sub> = 0V                                             | -    | -     | 1.2  | V    |
| Continuous Source Current               | T <sub>C</sub> =25°C  | I <sub>S</sub>       | -                                                                                      | -    | -     | 312  | A    |

Notes:

1. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ\text{C}$ .
2. The EAS data shows Max. rating . The test condition is  $V_{DD} = 90V, V_{GS} = 10V, L = 1mH, I_{AS} = 50A$ .
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
5. This value is guaranteed by design hence it is not included in the production test.

## Typical Characteristics

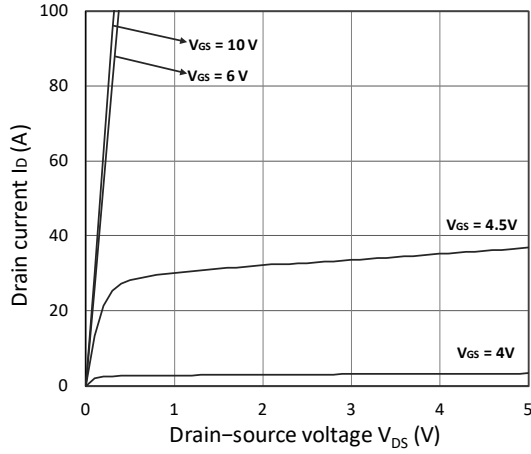


Figure 1. Output Characteristics

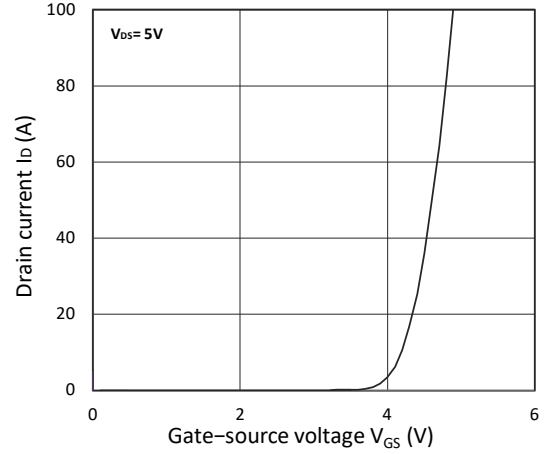


Figure 2. Transfer Characteristics

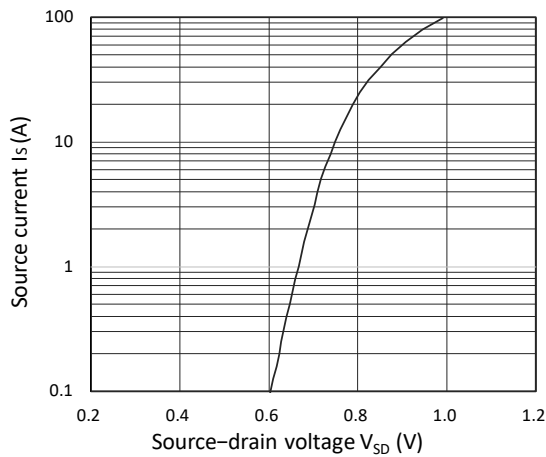


Figure 3. Forward Characteristics of Reverse

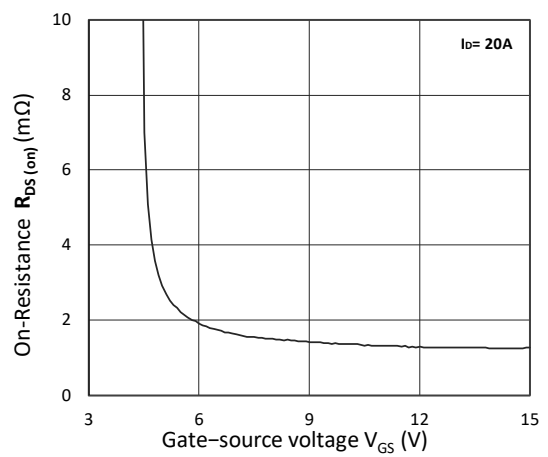


Figure 4.  $R_{DS(on)}$  vs.  $V_{GS}$

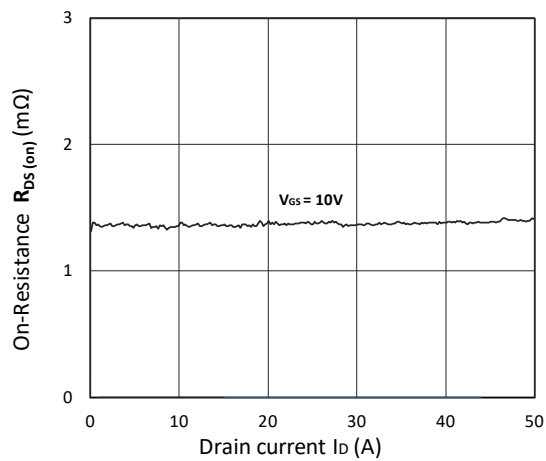


Figure 5.  $R_{DS(on)}$  vs.  $I_D$

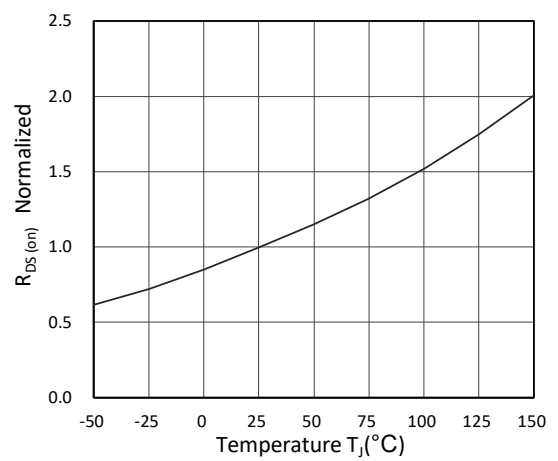


Figure 6. Normalized  $R_{DS(on)}$  vs. Temperature

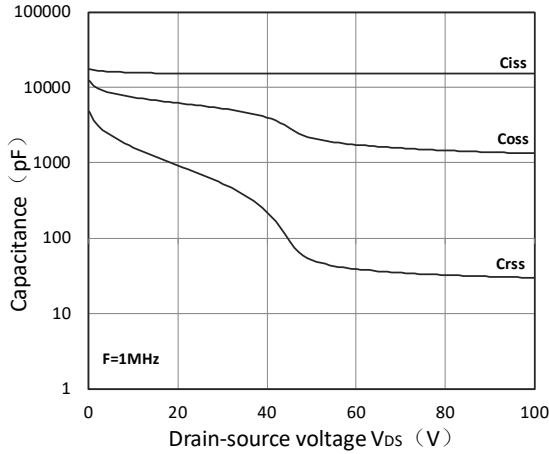


Figure 7. Capacitance Characteristics

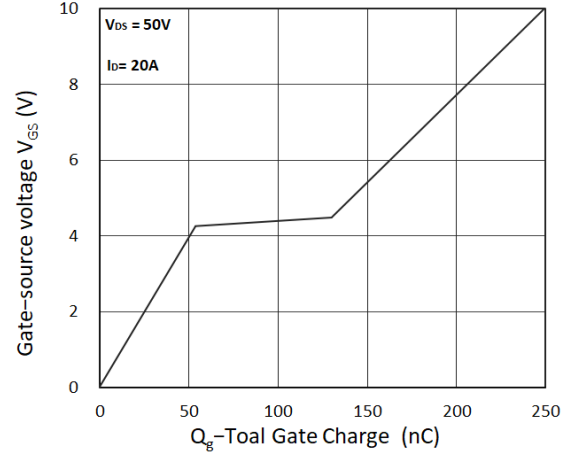


Figure 8. Gate Charge Characteristics

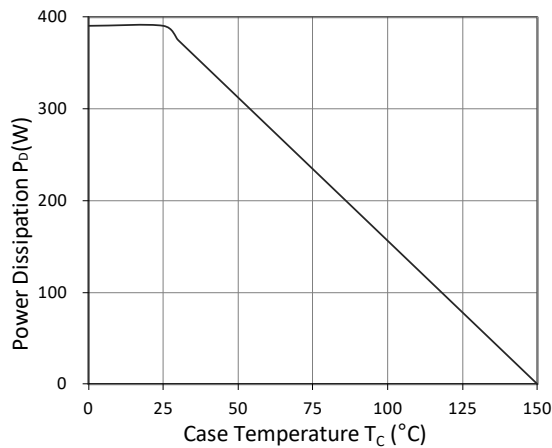


Figure 9. Power Dissipation

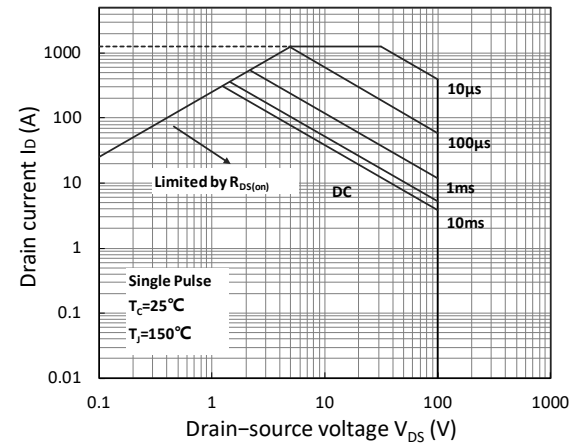


Figure 10. Safe Operating Area

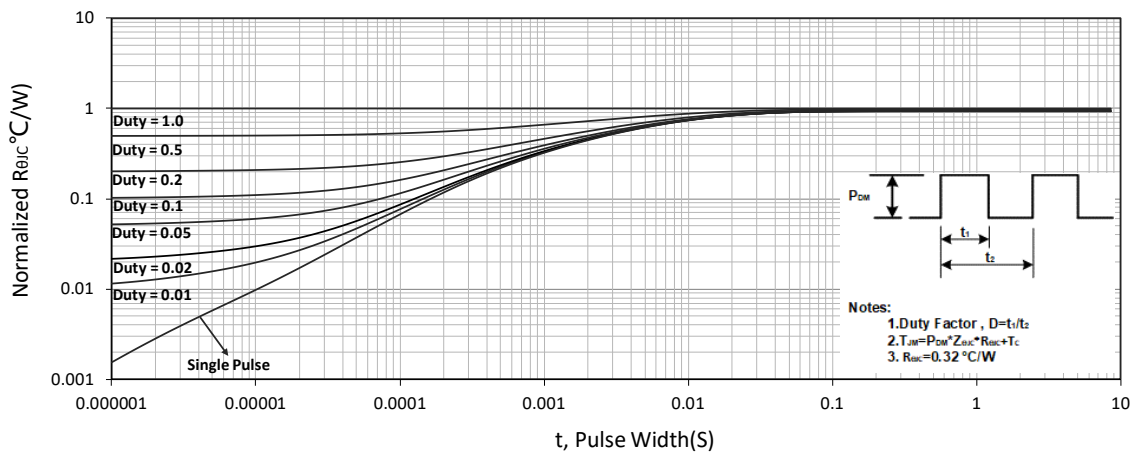


Figure 11. Normalized Maximum Transient Thermal Impedance

## Test Circuit

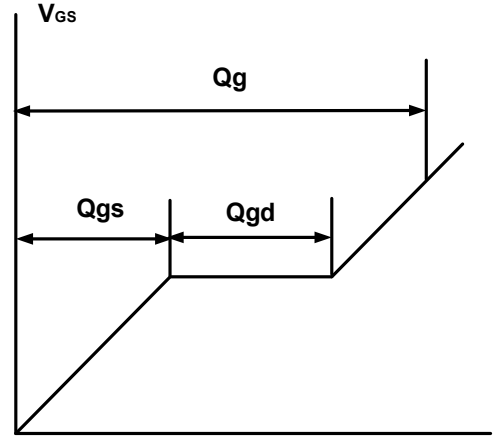
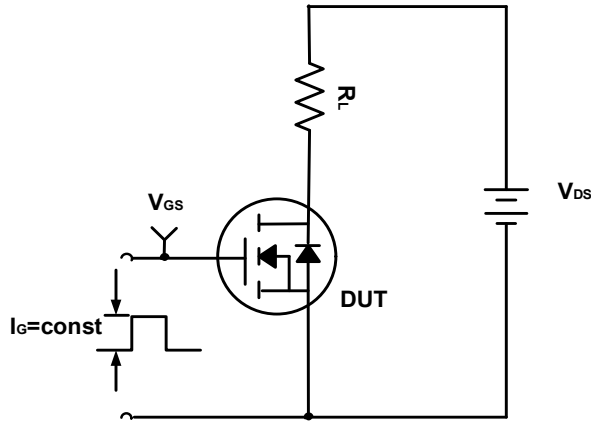


Figure A. Gate Charge Test Circuit & Waveforms

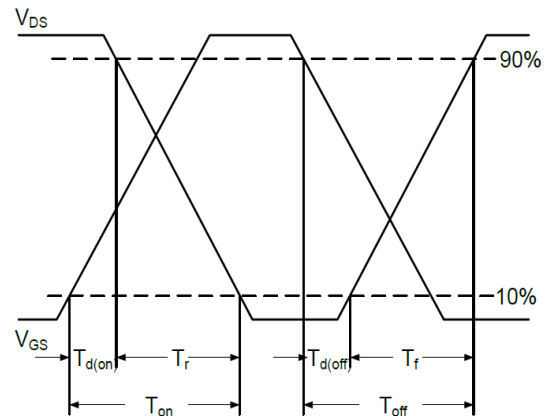
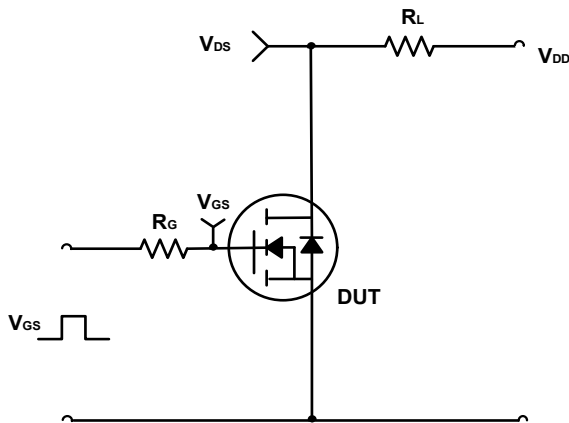


Figure B. Switching Test Circuit & Waveforms

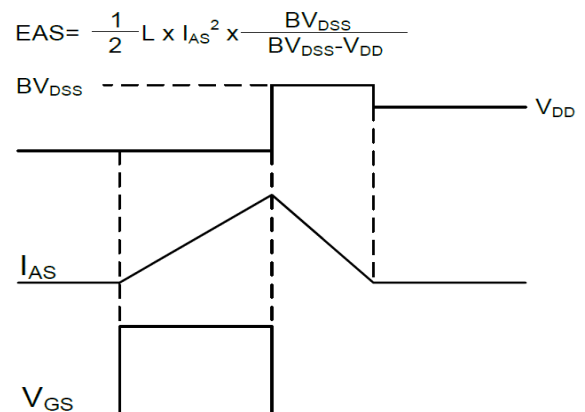
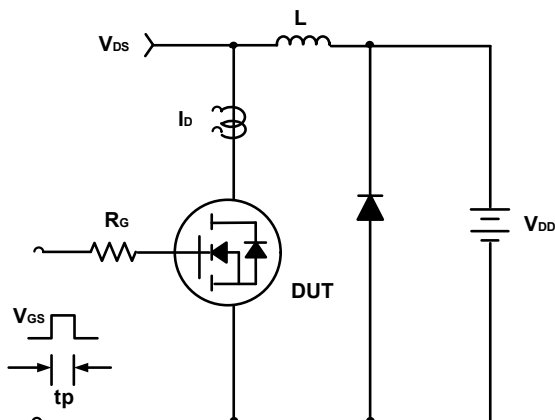
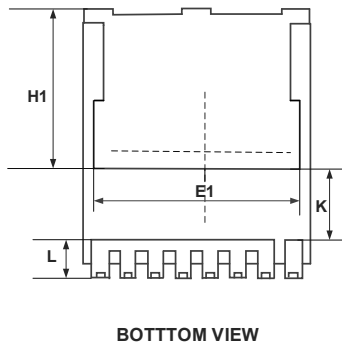
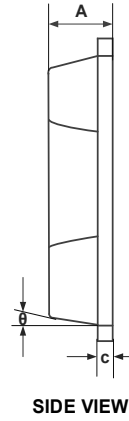
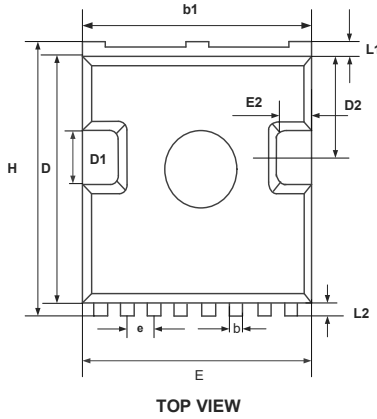


Figure C. Unclamped Inductive Switching Circuit & Waveforms

**Mechanical Dimensions for TOLL**



**COMMON DIMENSIONS**

| SYMBOL | MM        |       |
|--------|-----------|-------|
|        | MIN       | MAX   |
| A      | 2.20      | 2.40  |
| b      | 0.60      | 0.90  |
| b1     | 9.70      | 9.90  |
| c      | 0.40      | 0.60  |
| D      | 10.20     | 10.60 |
| D1     | 3.10      | 3.50  |
| D2     | 4.45      | 4.75  |
| E      | 9.70      | 10.10 |
| E1     | 7.80BSC   |       |
| E2     | 0.50      | 0.70  |
| e      | 1.200 BSC |       |
| H      | 11.45     | 11.90 |
| H1     | 6.75 BSC  |       |
| K      | 3.10 REF  |       |
| L      | 1.70      | 2.10  |
| L1     | 0.60      | 0.80  |
| L2     | 0.50      | 0.70  |
| θ      | 10° REF   |       |