

## P-Channel Enhancement Mode Power MOSFET

### Description

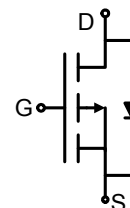
The HM4453C uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

### General Features

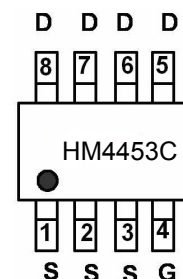
- $V_{DS} = -20V, I_D = -18A$   
 $R_{DS(ON)} < 12m\Omega @ V_{GS} = -4.5V$   
 $R_{DS(ON)} < 16m\Omega @ V_{GS} = -2.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface Mount Package

### Application

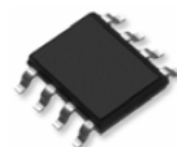
- Motor drive
- Load switch
- Power management



Schematic diagram



Marking and pin assignment



SOP-8 top view

### Package Marking And Ordering Information

| Device Marking | Device  | Device Package | Reel Size | Tape width | Quantity   |
|----------------|---------|----------------|-----------|------------|------------|
| HM4453C        | HM4453C | SOP-8          | Ø330mm    | 12mm       | 2500 units |

### Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

| Parameter  | Symbol         | Limit      | Unit       |
|--|----------------|------------|------------|
| Drain-Source Voltage                             | $V_{DS}$       | -20        | V          |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 12$   | V          |
| Drain Current-Continuous                         | $I_D$          | -18        | A          |
| Drain Current-Pulsed (Note 1)                    | $I_{DM}$       | -54        | A          |
| Maximum Power Dissipation                        | $P_D$          | 3.1        | W          |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 150 | $^\circ C$ |

### Thermal Characteristic

|  |                 |    |              |
|--|-----------------|----|--------------|
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 42 | $^\circ C/W$ |
|--|-----------------|----|--------------|

### Electrical Characteristics ( $T_A = 25^\circ C$ unless otherwise noted)

| Parameter                      | Symbol     | Condition                      | Min | Typ | Max | Unit |
|--------------------------------|------------|--------------------------------|-----|-----|-----|------|
| <b>Off Characteristics</b>     |            |                                |     |     |     |      |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS} = 0V, I_D = -250\mu A$ | -20 | -   | -   | V    |

|                                    |                     |   |      |      |      |    |
|------------------------------------|---------------------|---|------|------|------|----|
| Zero Gate Voltage Drain Current    | I <sub>DSS</sub>    | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V  | -    | -    | -1   | μA |
| Gate-Body Leakage Current          | I <sub>GSS</sub>    | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V  | -    | -    | ±100 | nA |
| On Characteristics (Note 3)        |                     |   |      |      |      |    |
| Gate Threshold Voltage             | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                   | -0.5 | -0.7 | -1   | V  |
| Drain-Source On-State Resistance   | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-6A   | -    | 9    | 12   | mΩ |
|                                    |                     | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-5A   |      | 13   | 16   | mΩ |
| Forward Transconductance           | g <sub>FS</sub>     | V <sub>DS</sub> =-15V, I <sub>D</sub> =-6A  | -    | 17   | -    | S  |
| Dynamic Characteristics (Note4)    |                     |   |      |      |      |    |
| Input Capacitance                  | C <sub>iss</sub>    | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                     | -    | 2100 | -    | PF |
| Output Capacitance                 | C <sub>oss</sub>    |   | -    | 498  | -    | PF |
| Reverse Transfer Capacitance       | C <sub>rss</sub>    |   | -    | 300  | -    | PF |
| Switching Characteristics (Note 4) |                     |   |      |      |      |    |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>DD</sub> =-10V, R <sub>L</sub> =10Ω,<br>V <sub>GS</sub> =-4.5V, R <sub>GEN</sub> =6Ω | -    | 25   | -    | nS |
| Turn-on Rise Time                  | t <sub>r</sub>      |   | -    | 30   | -    | nS |
| Turn-Off Delay Time                | t <sub>d(off)</sub> |   | -    | 70   | -    | nS |
| Turn-Off Fall Time                 | t <sub>f</sub>      |   | -    | 50   | -    | nS |
| Total Gate Charge                  | Q <sub>g</sub>      | V <sub>DS</sub> =-10V, I <sub>D</sub> =-6A, V <sub>GS</sub> =-4.5V                          | -    | 17   | -    | nC |
| Gate-Source Charge                 | Q <sub>gs</sub>     |   | -    | 4.1  | -    | nC |
| Gate-Drain Charge                  | Q <sub>gd</sub>     |   | -    | 4.3  | -    | nC |
| Drain-Source Diode Characteristics |                     |   |      |      |      |    |
| Diode Forward Voltage (Note 3)     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =-18A   | -    | -    | -1.2 | V  |

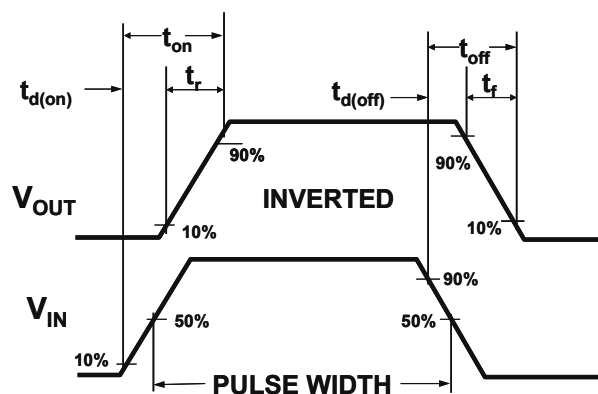
## Notes:

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

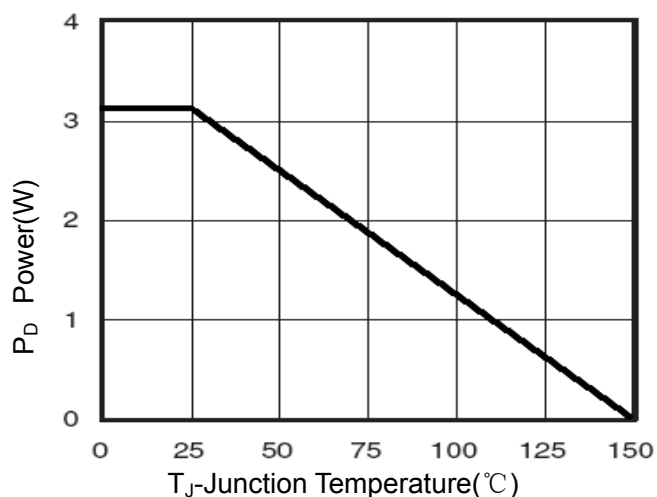
## Typical Electrical and Thermal Characteristics



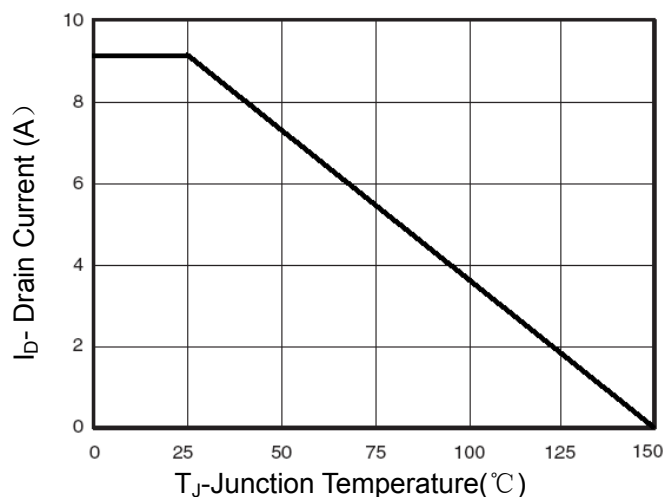
**Figure 1 Switching Test Circuit**



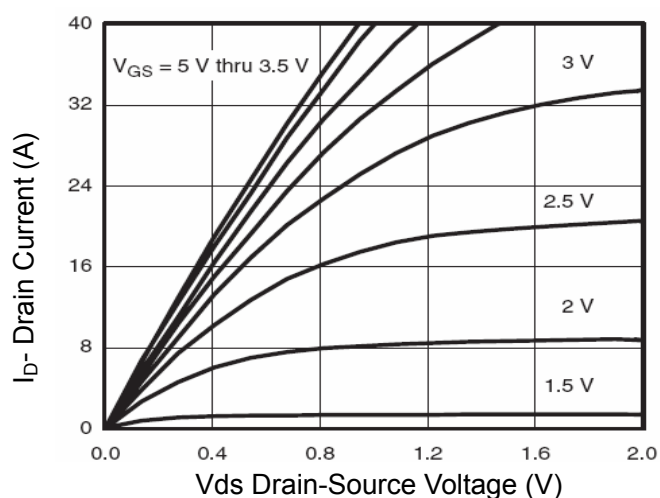
**Figure 2 Switching Waveforms**



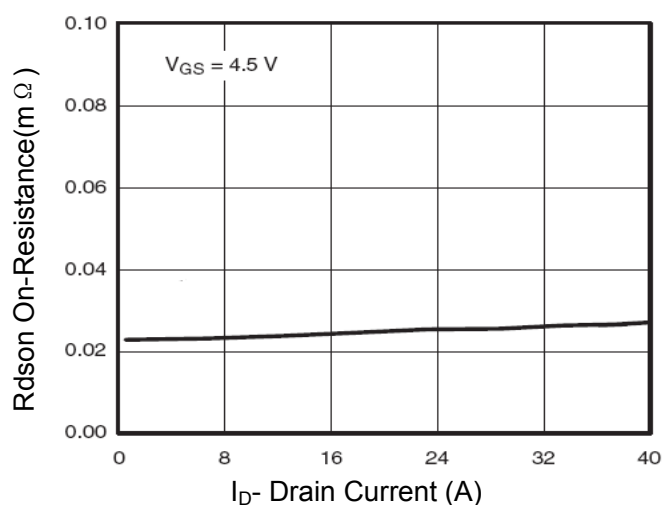
**Figure 3 Power Dissipation**



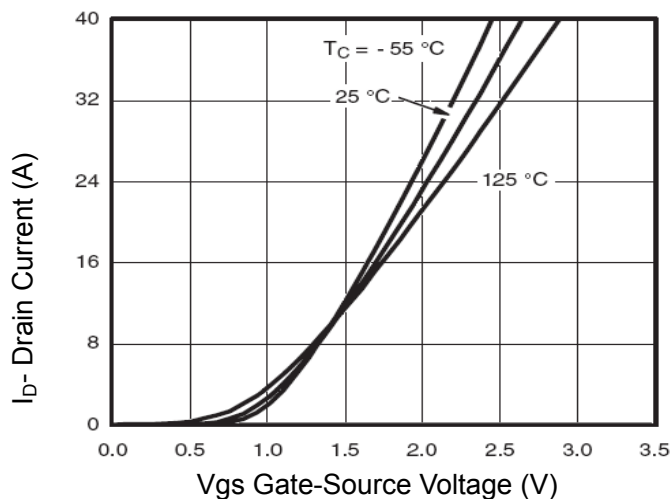
**Figure 4 Drain Current**



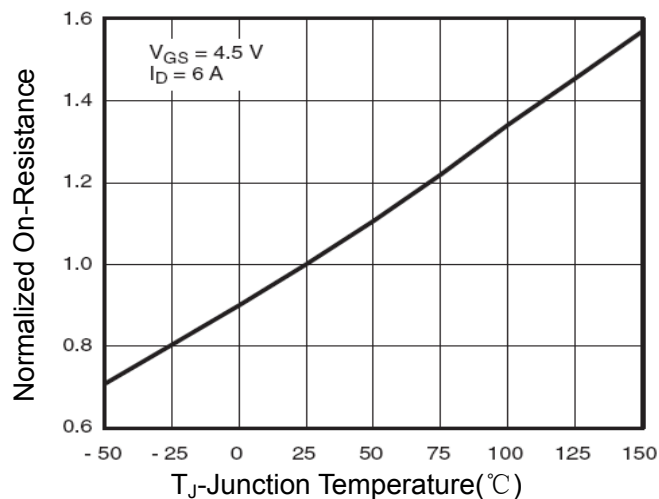
**Figure 5 Output Characteristics**



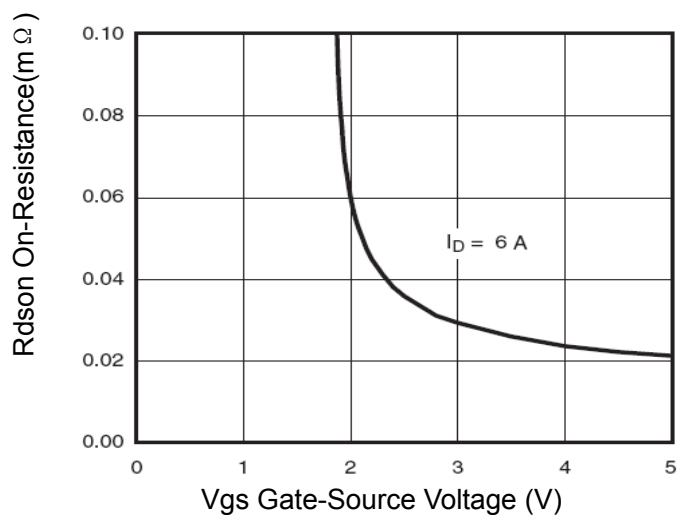
**Figure 6 Drain-Source On-Resistance**



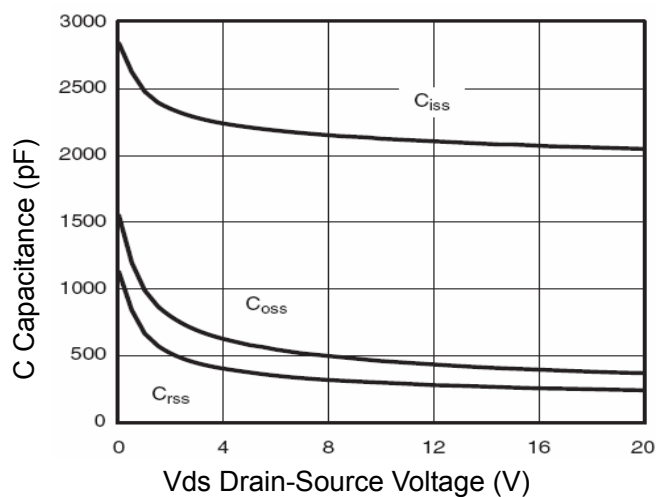
**Figure 7 Transfer Characteristics**



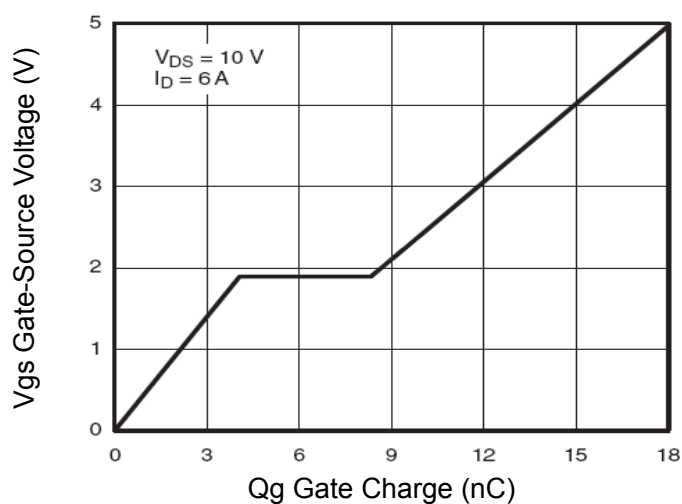
**Figure 8 Drain-Source On-Resistance**



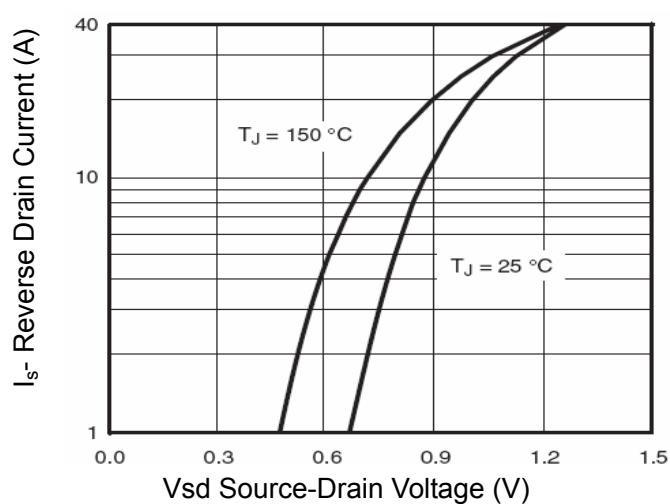
**Figure 9 Rdson vs Vgs**



**Figure 10 Capacitance vs Vds**



**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**

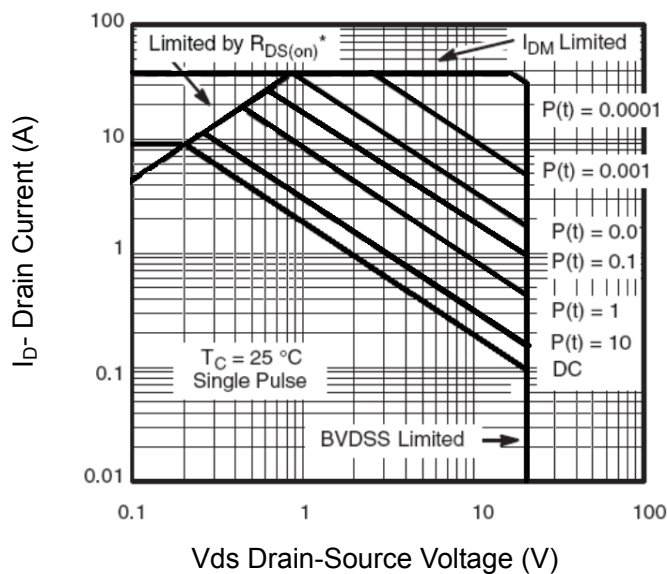


Figure 13 Safe Operation Area

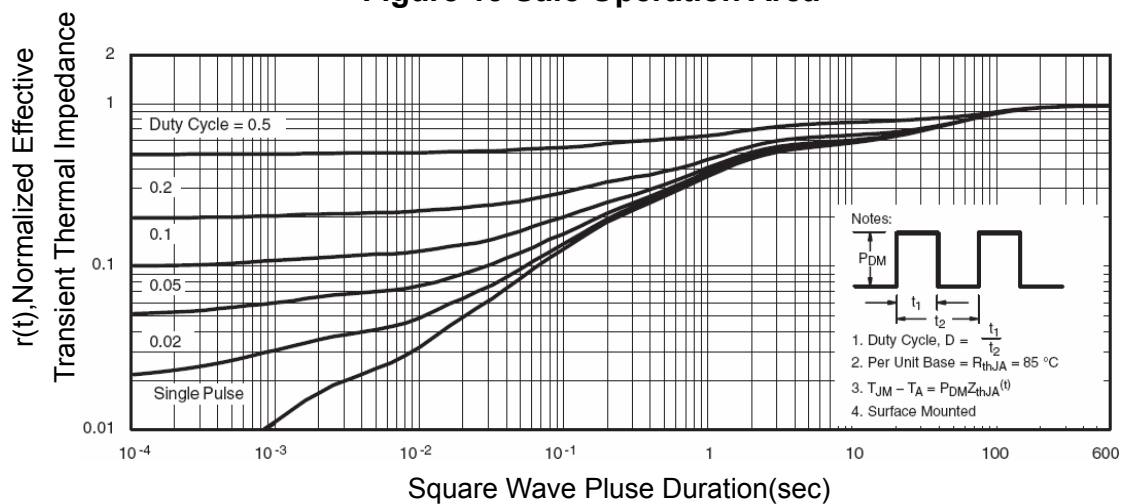
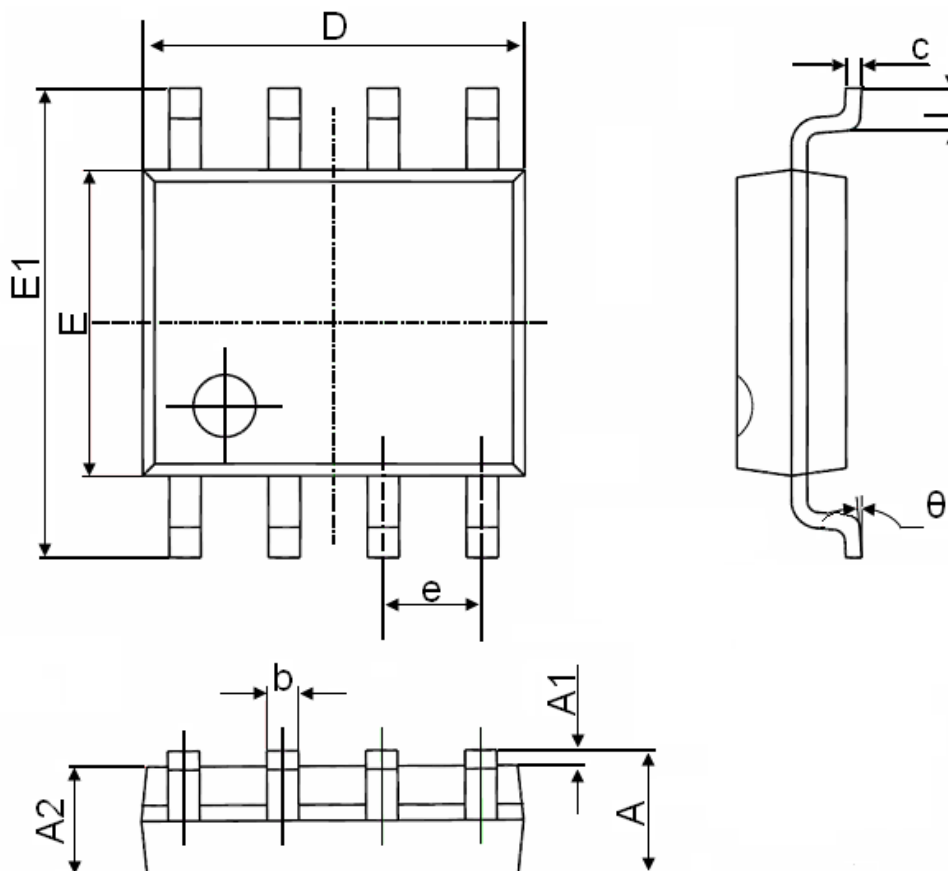


Figure 14 Normalized Maximum Transient Thermal Impedance

## 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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