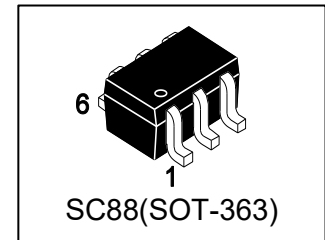


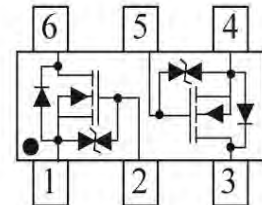
## 1. FEATURES

- We declare that the material of product complies with RoHS requirements and Halogen Free.
- S- prefix for automotive and other applications requiring unique site and control change requirements; AEC-Q101 qualified and PPAP capable.
- ESD Protected:1000V



## 2. DEVICE MARKING AND ORDERING INFORMATION

| Device   | Marking | Shipping       |
|----------|---------|----------------|
| 2N7002DW | 702     | 3000/Tape&Reel |



## 3. MAXIMUM RATINGS(Ta = 25°C)

| Parameter                         | Symbol | Limits | Unit |
|-----------------------------------|--------|--------|------|
| Drain–Source Voltage              | VDSS   | 60     | V    |
| Drain–Gate Voltage (RGS = 1.0 mΩ) | VDGR   | 60     | V    |
| Drain Current                     | ID     |        | mA   |
| – Continuous: TC = 25°C           |        | ±115   |      |
| TC = 100°C                        |        | ±75    |      |
| – Pulsed (Note 1)                 | IDM    | ±800   |      |
| Gate–Source Voltage               |        |        |      |
| – Continuous                      | VGS    | ±20    | V    |
| – Non–repetitive (tp ≤ 50μs)      | VGSM   | ±40    | V    |

## 4. THERMAL CHARACTERISTICS

| Parameter  | Symbol  | Limits   | Unit  |
|--|---------|----------|-------|
| Total Device Dissipation,<br>Per Device            | PD      | 380      | mW    |
| FR–5 Board (Note 2) @ TA = 25°C                    |         | 250      |       |
| Derate above 25°C                                  |         | 3.0      | mW/°C |
| Thermal Resistance,<br>Junction–to–Ambient(Note 2) | ROJA    | 328      | °C/W  |
| Junction and Storage temperature                   | TJ,Tstg | –55~+150 | °C    |

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
2. FR–5 = 1.0×0.75×0.062 in.

**5. ELECTRICAL CHARACTERISTICS (Ta= 25°C)**

## OFF CHARACTERISTICS

| Characteristic   | Symbol | Min.       | Typ. | Max. | Unit |
|--|--------|------------|------|------|------|
| Drain–Source Breakdown Voltage<br>(VGS = 0, ID = 10μA)   | VBRDSS | 60         | -    | -    | V    |
| Zero Gate Voltage Drain Current<br>(VGS = 0, VDS = 60 V) | IDSS   | TJ = 25°C  | -    | 1.0  | μA   |
|  |        | TJ = 125°C | -    | 500  |      |
| Gate–Body Leakage Current, Forward<br>(VGS = 20 V)       | IGSSF  | -          | -    | 1.0  | μA   |
| Gate–Body Leakage Current, Reverse<br>(VGS = - 20 V)     | IGSSR  | -          | -    | -1.0 | μA   |

## ON CHARACTERISTICS (Note 3)

|   |         |            |   |       |       |
|---|---------|------------|---|-------|-------|
| Gate Threshold Voltage<br>(VDS = VGS, ID = 250μA)   | VGS(th) | 1.0        | - | 2.0   | V     |
| On–State Drain Current<br>(VDS ≥ 2.0 VDS(on), VGS = 10 V)   | ID(on)  | 500        | - | -     | mA    |
| Static Drain–Source On–State Voltage<br>(VGS = 10 V, ID = 500 mA)<br>(VGS = 5.0 V, ID = 50 mA)    | VDS(on) | -          | - | 3.75  | V     |
|   |         | -          | - | 0.375 |       |
| Static Drain–Source On–State Resistance<br>(VGS = 10 V, ID = 500 mA)<br>(VGS = 5.0 V, ID = 50 mA) | RDS(on) | TC = 25°C  | - | 7.5   | Ohms  |
|   |         | TC = 125°C | - | 13.5  |       |
|   |         | TC = 25°C  | - | 7.5   |       |
|   |         | TC = 125°C | - | 13.5  |       |
| Forward Transconductance<br>(VDS ≥ 2.0 VDS(on), ID = 200 mA)                                      | gfs     | 80         | - | -     | mmhos |

## DYNAMIC CHARACTERISTICS

|  |      |   |   |     |    |
|--|------|---|---|-----|----|
| Input Capacitance<br>(VDS = 25 V, VGS = 0, f = 1.0 MHz)            | Cibo | - | - | 50  | pF |
| Output Capacitance<br>(VDS = 25 V, VGS = 0, f = 1.0 MHz)           | Cobo | - | - | 25  | pF |
| Reverse Transfer Capacitance<br>(VDS = 25 V, VGS = 0, f = 1.0 MHz) | Cibo | - | - | 5.0 | pF |

## SWITCHING CHARACTERISTICS

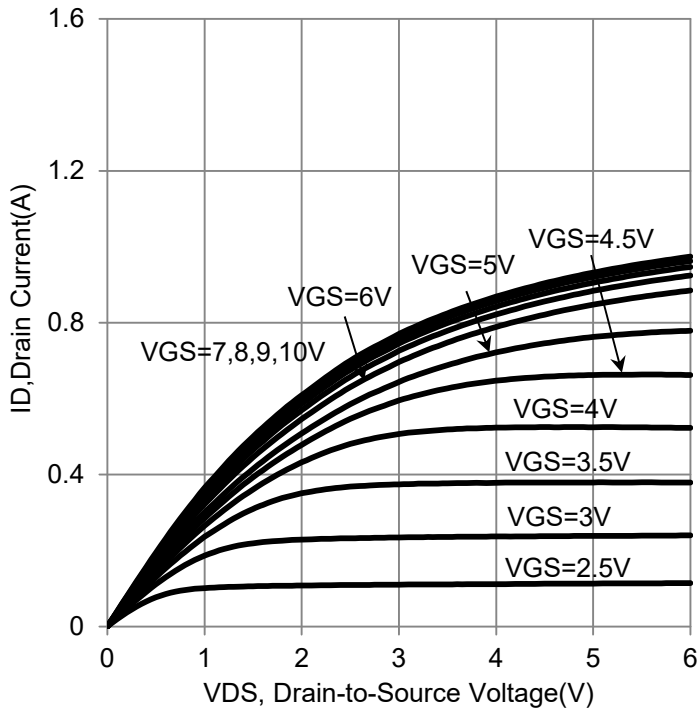
|                     |   |         |   |   |    |    |
|---------------------|---|---------|---|---|----|----|
| Turn-On Delay Time  | (VDD = 25 V, ID = 500 mA, RG = 25Ω, RL = 50 Ω, Vgen = 10 V) | td(on)  | - | - | 20 | ns |
| Turn-Off Delay Time |   | td(off) | - | - | 40 |    |

## BODY–DRAIN DIODE RATINGS

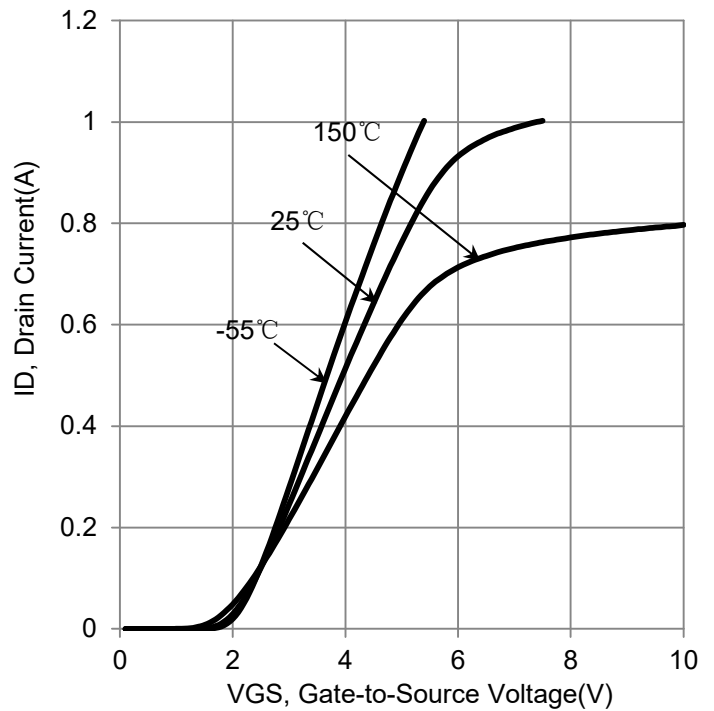
|  |     |   |   |      |    |
|--|-----|---|---|------|----|
| Diode Forward On–Voltage<br>(IS = 115 mA, VGS = 0 V) | VSD | - | - | -1.5 | V  |
| Source Current Continuous (Body Diode)               | IS  | - | - | -115 | mA |
| Source Current Pulsed                                | ISM | - | - | -800 | mA |

3.Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

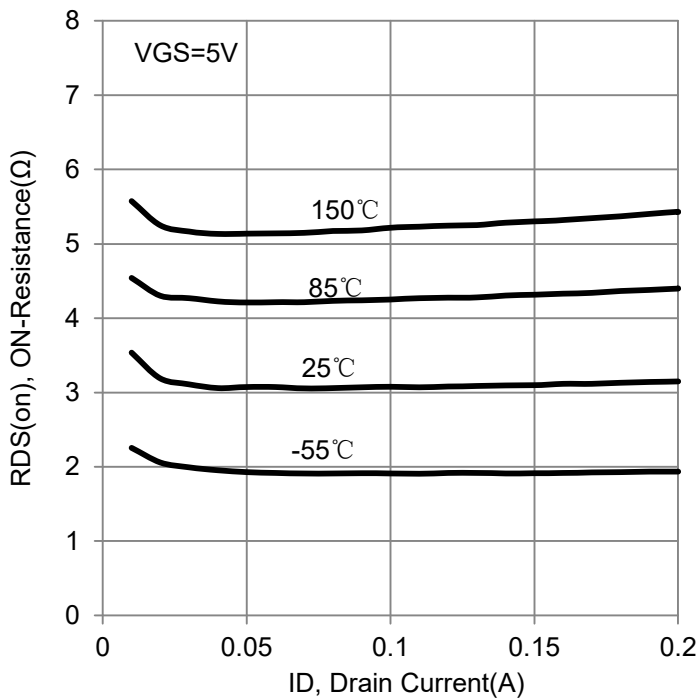
## 6. ELECTRICAL CHARACTERISTICS CURVES



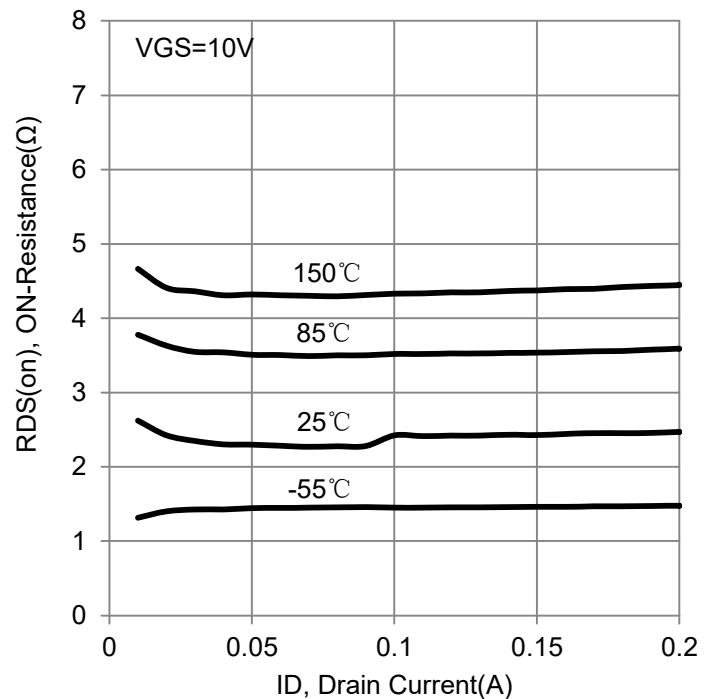
ON-Region Characteristics



Transfer Characteristics

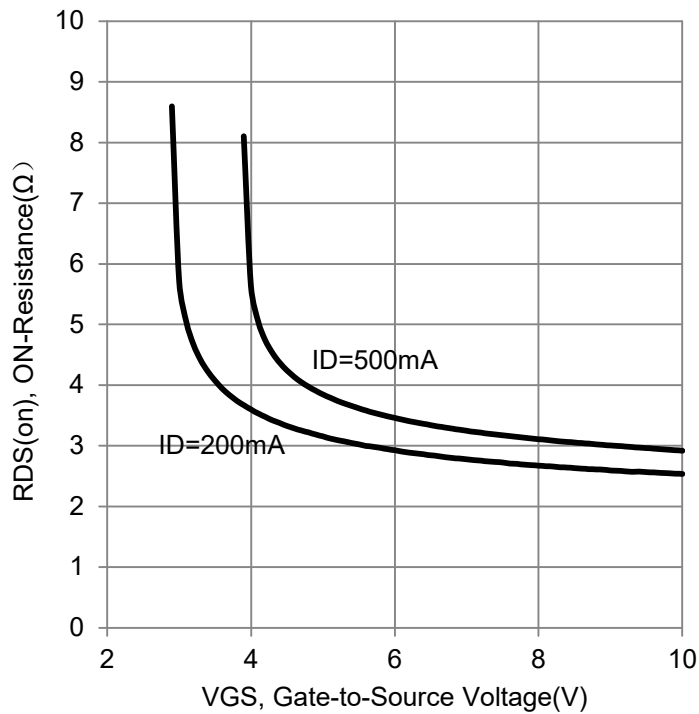


$R_{DS(on)}$  vs.  $I_D$

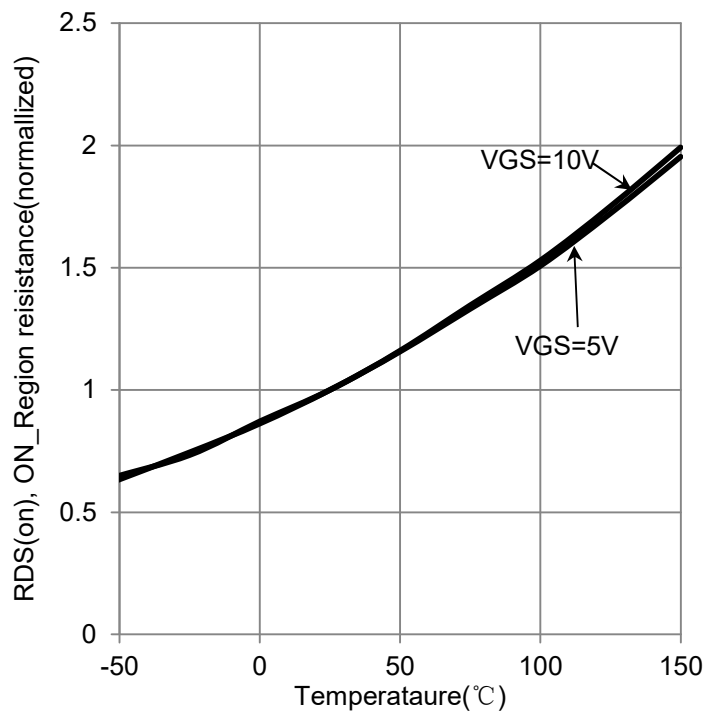


$R_{DS(on)}$  vs.  $I_D$

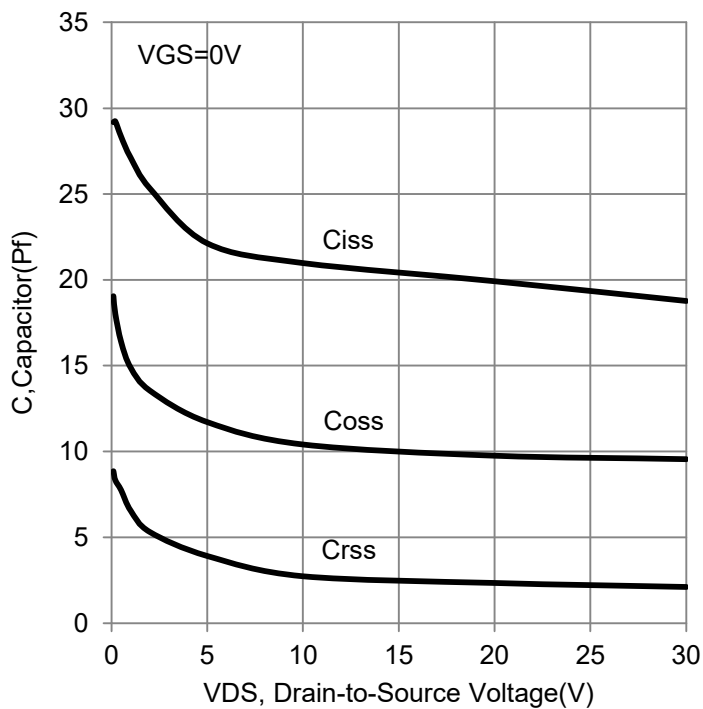
## 6. ELECTRICAL CHARACTERISTICS CURVES (Con.)



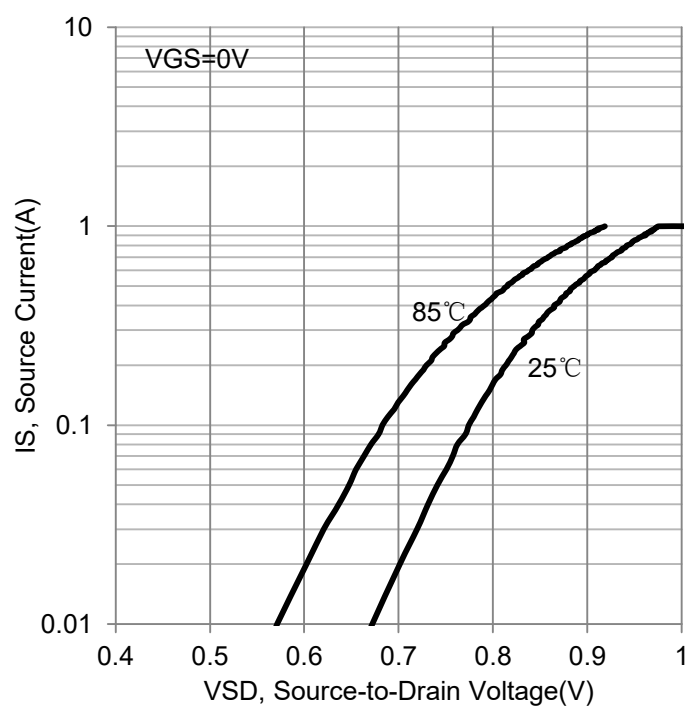
RDS(on) vs. VGS



RDS(on) vs. Temperature

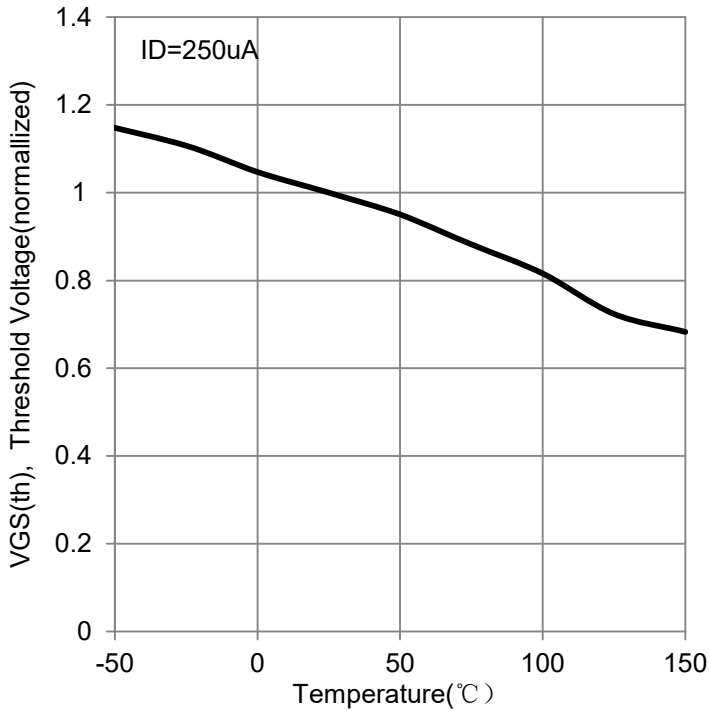


Capacitor vs.VDS

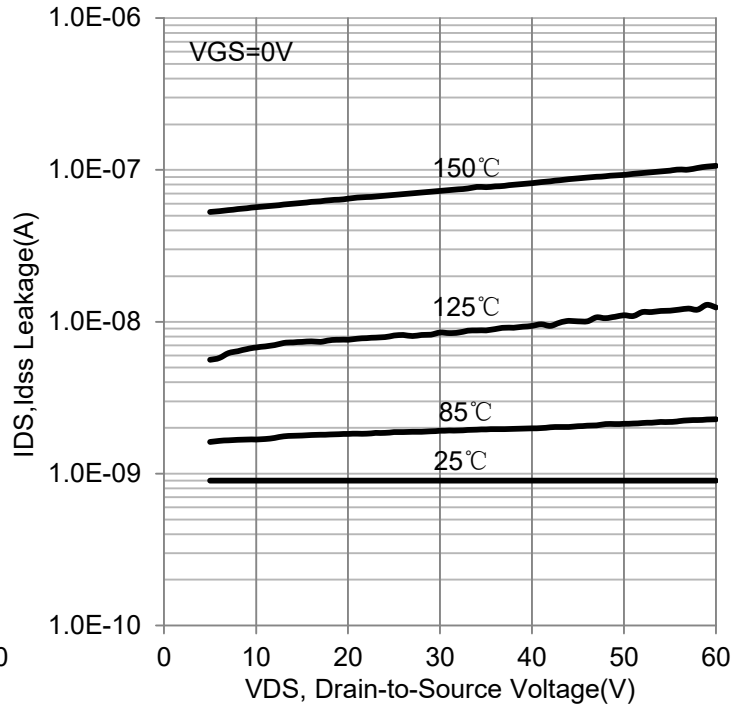


IS vs.VSD

6. ELECTRICAL CHARACTERISTICS CURVES (Con.)



VGS(th) vs. Temperature

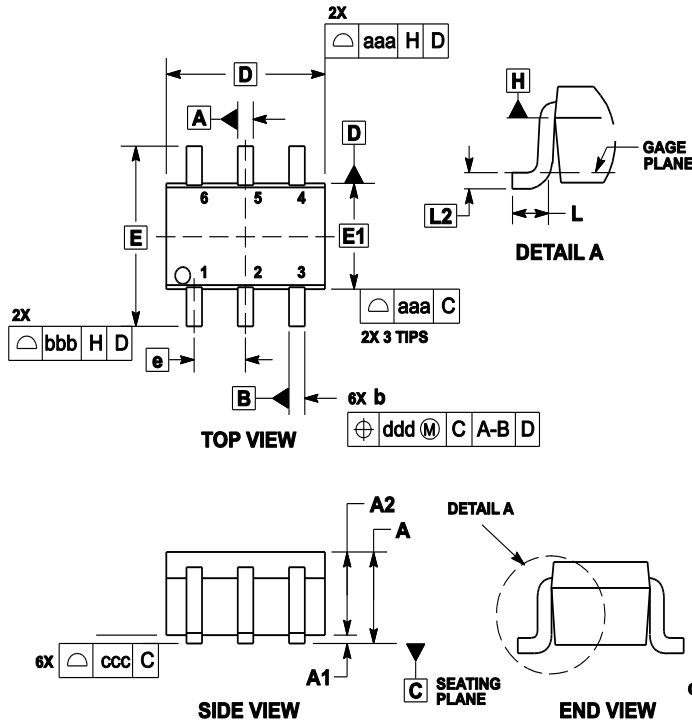


IDS vs. VDS

## 7.OUTLINE AND DIMENSIONS

Notes:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.



| DIM | MILLIMETERS |      |      | INCHES    |       |       |
|-----|-------------|------|------|-----------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN       | NOM   | MAX   |
| A   | ---         | ---  | 1.10 | ---       | ---   | 0.043 |
| A1  | 0.00        | ---  | 0.10 | 0         | ---   | 0.004 |
| A2  | 0.70        | 0.90 | 1.00 | 0.027     | 0.035 | 0.039 |
| b   | 0.15        | 0.20 | 0.25 | 0.006     | 0.008 | 0.01  |
| C   | 0.08        | 0.15 | 0.22 | 0.003     | 0.006 | 0.009 |
| D   | 1.80        | 2.00 | 2.20 | 0.07      | 0.078 | 0.086 |
| E   | 2.00        | 2.10 | 2.20 | 0.078     | 0.082 | 0.086 |
| E1  | 1.15        | 1.25 | 1.35 | 0.045     | 0.049 | 0.053 |
| e   | 0.65 BSC    |      |      | 0.026 BSC |       |       |
| L   | 0.26        | 0.36 | 0.46 | 0.010     | 0.014 | 0.018 |
| L2  | 0.15 BSC    |      |      | 0.006 BSC |       |       |
| aaa | 0.15        |      |      | 0.01      |       |       |
| bbb | 0.30        |      |      | 0.01      |       |       |
| ccc | 0.10        |      |      | 0.00      |       |       |
| ddd | 0.10        |      |      | 0.00      |       |       |

## 8.SOLDERING FOOTPRINT

