

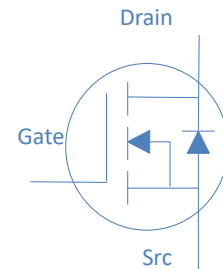
**100V N-Ch Power MOSFET**
**Feature**

- ◇ High Speed Power Switching, Logic Level
- ◇ Enhanced Body diode dv/dt capability
- ◇ Enhanced Avalanche Ruggedness
- ◇ 100% UIS Tested, 100% Rg Tested
- ◇ Lead Free, Halogen Free

|                         |               |      |            |
|-------------------------|---------------|------|------------|
| $V_{DS}$                |               | 100  | V          |
| $R_{DS(on),typ}$        | $V_{GS}=10V$  | 8.4  | m $\Omega$ |
| $R_{DS(on),typ}$        | $V_{GS}=4.5V$ | 11.3 | m $\Omega$ |
| $I_D$ (Silicon Limited) |               | 37   | A          |

**Application**

- ◇ Synchronous Rectification in SMPS
- ◇ Hard Switching and High Speed Circuit
- ◇ DC/DC in Telecoms and Industrial

**TO-220F**


| Part Number | Package | Marking    |
|-------------|---------|------------|
| HGA098N10AL | TO-220F | GA098N10AL |

**Absolute Maximum Ratings at  $T_J=25^\circ\text{C}$  (unless otherwise specified)**

| Parameter                                  | Symbol         | Conditions                             | Value      | Unit             |
|--|----------------|--|------------|------------------|
| Continuous Drain Current (Silicon Limited) | $I_D$          | $T_C=25^\circ\text{C}$                 | 37         | A                |
|  |                | $T_C=100^\circ\text{C}$                | 26         |                  |
| Drain to Source Voltage                    | $V_{DS}$       | -                                      | 100        | V                |
| Gate to Source Voltage                     | $V_{GS}$       | -                                      | $\pm 20$   | V                |
| Pulsed Drain Current                       | $I_{DM}$       | -                                      | 140        | A                |
| Avalanche Energy, Single Pulse             | $E_{AS}$       | $L=0.1\text{mH}, T_C=25^\circ\text{C}$ | 31         | mJ               |
| Power Dissipation                          | $P_D$          | $T_C=25^\circ\text{C}$                 | 30         | W                |
| Operating and Storage Temperature          | $T_J, T_{stg}$ | -                                      | -55 to 175 | $^\circ\text{C}$ |

**Absolute Maximum Ratings**

| Parameter                           | Symbol          | Max | Unit               |
|-------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance Junction-Ambient | $R_{\theta JA}$ | 60  | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-Case    | $R_{\theta JC}$ | 5   | $^\circ\text{C/W}$ |

**Electrical Characteristics at  $T_J=25^\circ\text{C}$  (unless otherwise specified)**
**Static Characteristics**

| Parameter                         | Symbol        | Conditions                                      | Value |      |           | Unit       |
|-----------------------------------|---------------|---|-------|------|-----------|------------|
|                                   |               |   | min   | typ  | max       |            |
| Drain to Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=250\mu A$                       | 100   | -    | -         | V          |
| Gate Threshold Voltage            | $V_{GS(th)}$  | $V_{GS}=V_{DS}, I_D=250\mu A$                   | 1.4   | 1.8  | 2.4       |            |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{GS}=0V, V_{DS}=100V, T_J=25^\circ\text{C}$  | -     | -    | 1         | $\mu A$    |
|                                   |               | $V_{GS}=0V, V_{DS}=100V, T_J=100^\circ\text{C}$ | -     | -    | 100       |            |
| Gate to Source Leakage Current    | $I_{GSS}$     | $V_{GS}=\pm 20V, V_{DS}=0V$                     | -     | -    | $\pm 100$ | nA         |
| Drain to Source on Resistance     | $R_{DS(on)}$  | $V_{GS}=10V, I_D=20A$                           | -     | 8.4  | 9.8       | m $\Omega$ |
|                                   |               | $V_{GS}=4.5V, I_D=20A$                          | -     | 11.3 | 13        |            |
| Transconductance                  | $g_{fs}$      | $V_{DS}=5V, I_D=10A$                            | -     | 80   | -         | S          |
| Gate Resistance                   | $R_G$         | $V_{GS}=0V, V_{DS}$ Open, $f=1\text{MHz}$       | -     | 1.4  | -         | $\Omega$   |

**Dynamic Characteristics**

|                               |              |  |   |      |   |    |
|-------------------------------|--------------|--|---|------|---|----|
| Input Capacitance             | $C_{iss}$    | $V_{GS}=0V, V_{DS}=50V, f=1\text{MHz}$           | - | 1450 | - | pF |
| Output Capacitance            | $C_{oss}$    |  | - | 273  | - |    |
| Reverse Transfer Capacitance  | $C_{rss}$    |  | - | 5.0  | - |    |
| Total Gate Charge             | $Q_g(10V)$   | $V_{DD}=50V, I_D=20A, V_{GS}=10V$                | - | 24   | - | nC |
| Total Gate Charge             | $Q_g(4.5V)$  |  | - | 12   | - |    |
| Gate to Source Charge         | $Q_{gs}$     |  | - | 4    | - |    |
| Gate to Drain (Miller) Charge | $Q_{gd}$     |  | - | 6    | - |    |
| Turn on Delay Time            | $t_{d(on)}$  | $V_{DD}=50V, I_D=20A, V_{GS}=10V, R_G=10\Omega,$ | - | 6    | - | ns |
| Rise time                     | $t_r$        |  | - | 4    | - |    |
| Turn off Delay Time           | $t_{d(off)}$ |  | - | 18   | - |    |
| Fall Time                     | $t_f$        |  | - | 3    | - |    |

**Reverse Diode Characteristics**

|                         |          |  |   |     |     |    |
|-------------------------|----------|--|---|-----|-----|----|
| Diode Forward Voltage   | $V_{SD}$ | $V_{GS}=0V, I_F=20A$                   | - | 0.9 | 1.2 | V  |
| Reverse Recovery Time   | $t_{rr}$ | $V_R=50V, I_F=20A, di_F/dt=500A/\mu s$ | - | 40  | -   | ns |
| Reverse Recovery Charge | $Q_{rr}$ |  | - | 152 | -   | nC |

Fig 1. Typical Output Characteristics

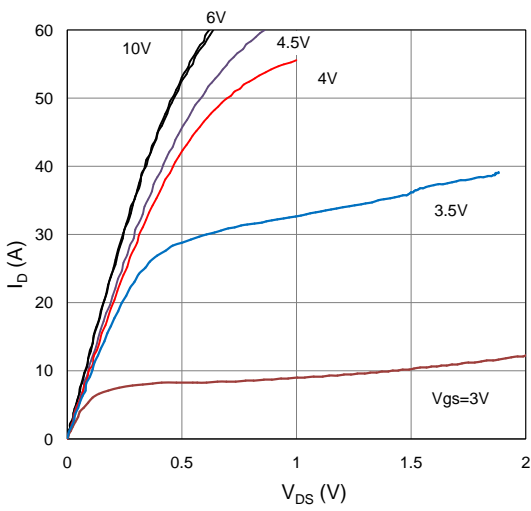


Figure 2. On-Resistance vs. Gate-Source Voltage

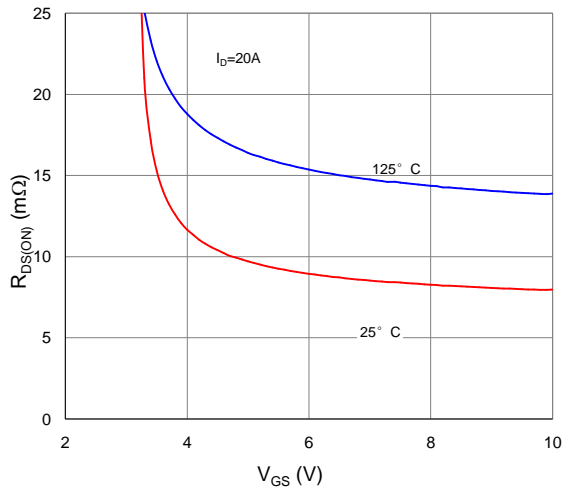


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

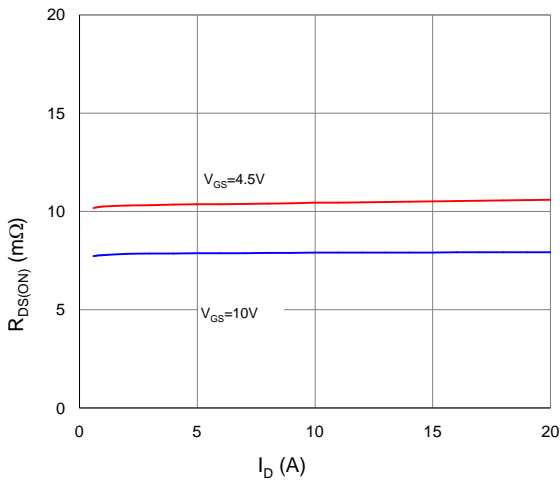


Figure 4. Normalized On-Resistance vs. Junction Temperature

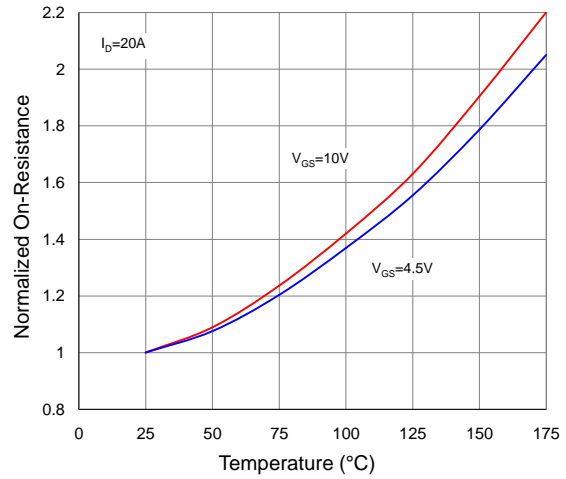


Figure 5. Typical Transfer Characteristics

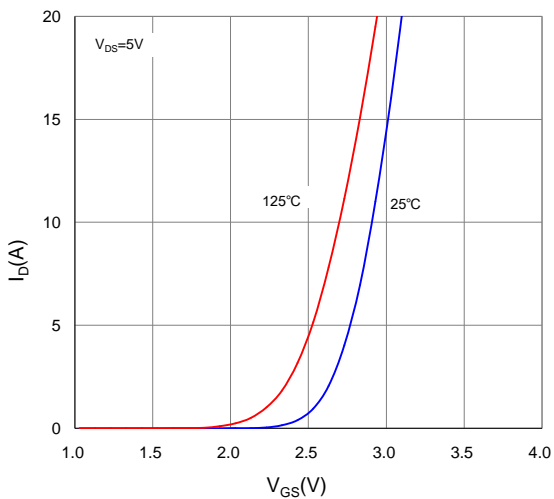


Figure 6. Typical Source-Drain Diode Forward Voltage

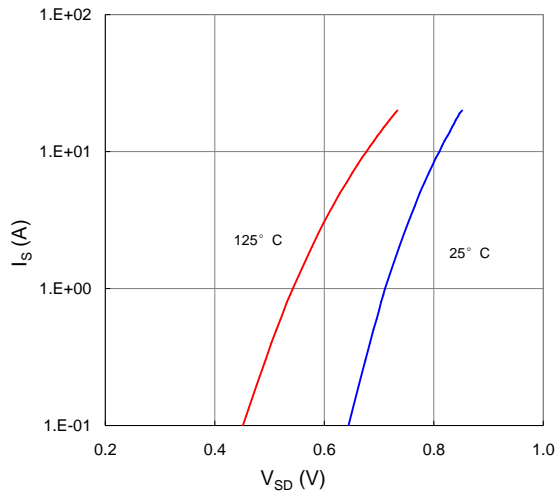


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

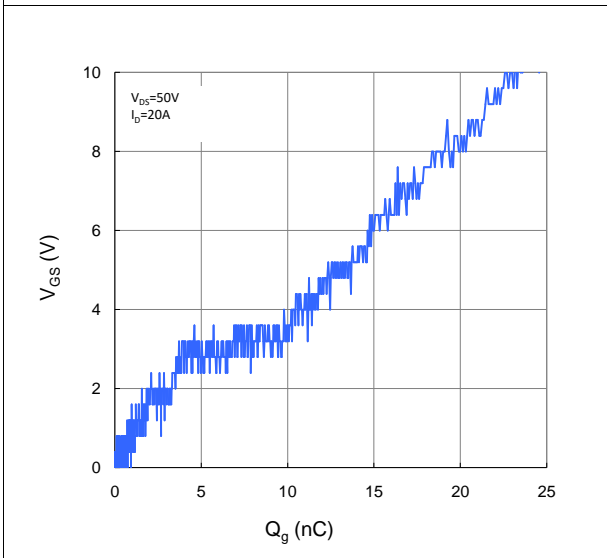


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

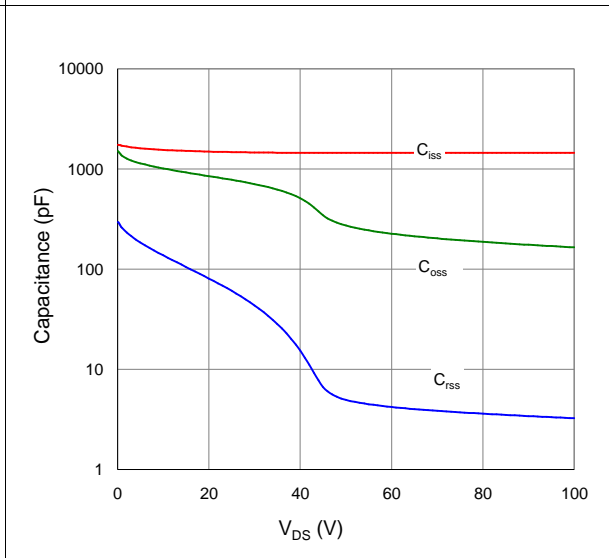


Figure 9. Maximum Safe Operating Area

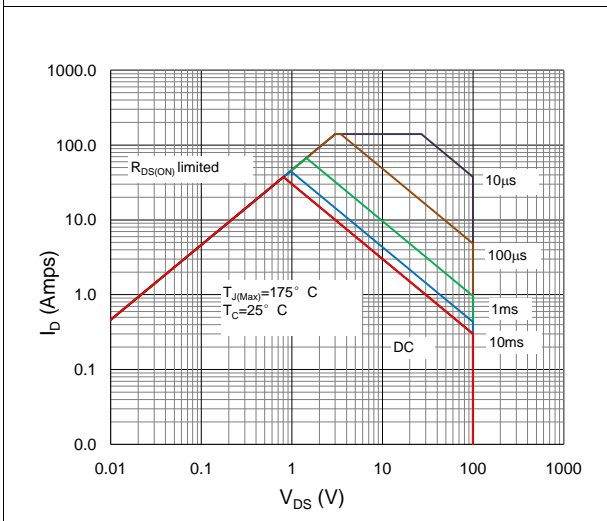


Figure 10. Maximum Drain Current vs. Case Temperature

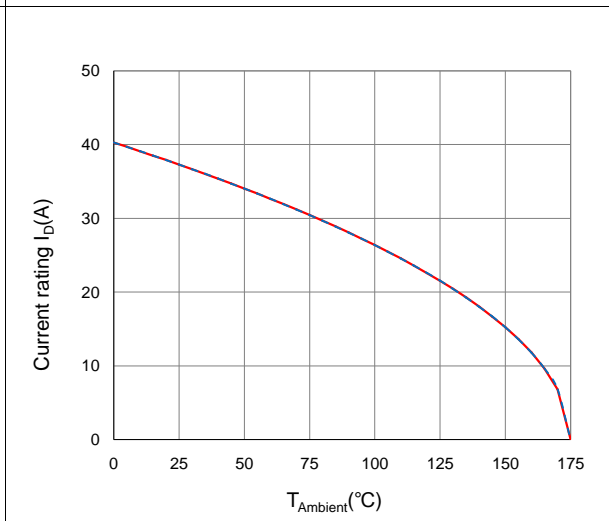
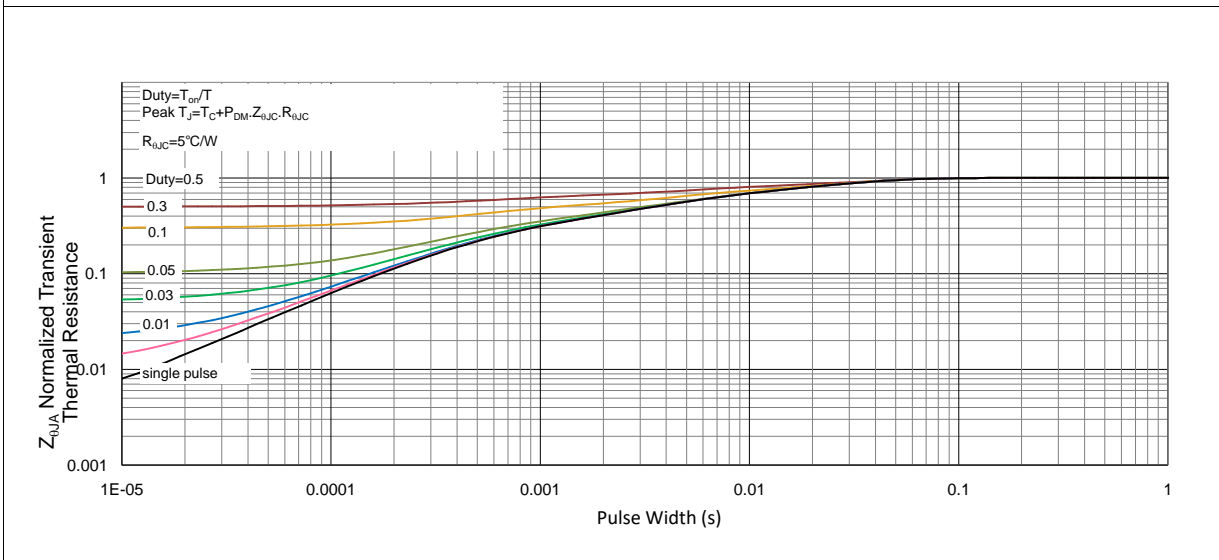
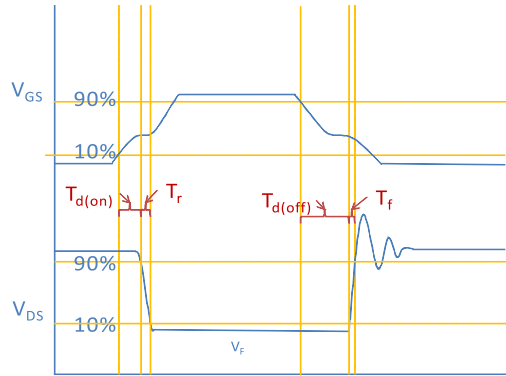
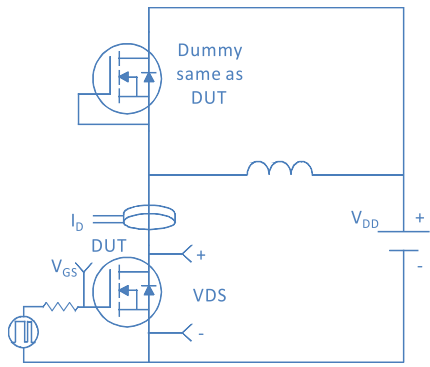


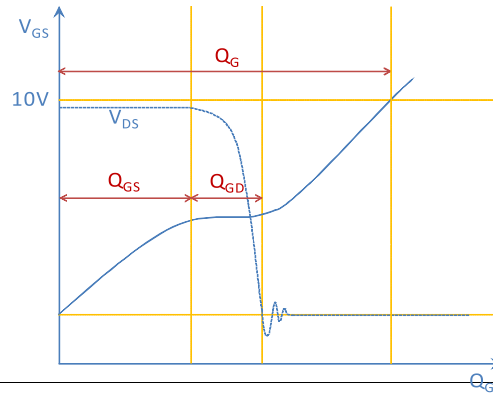
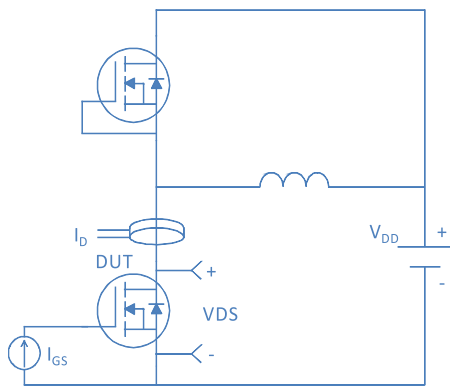
Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Ambient



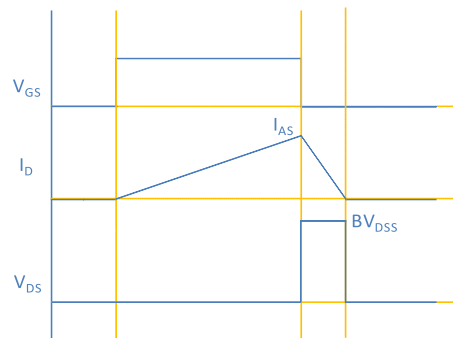
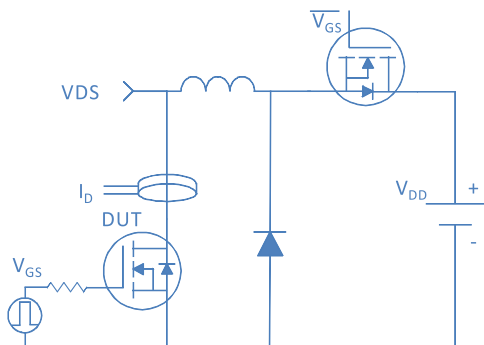
Inductive switching Test



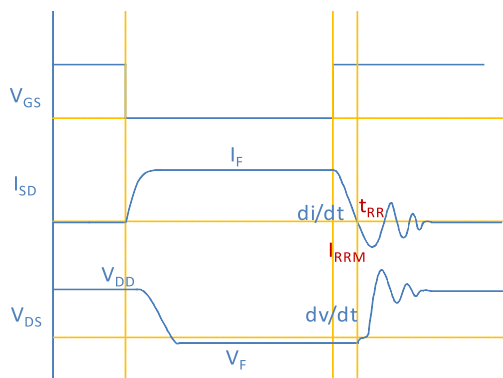
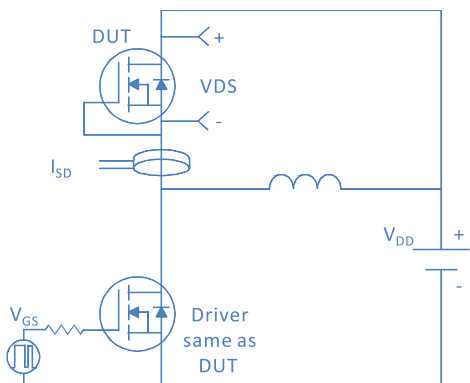
Gate Charge Test



Uclamped Inductive Switching (UIS) Test

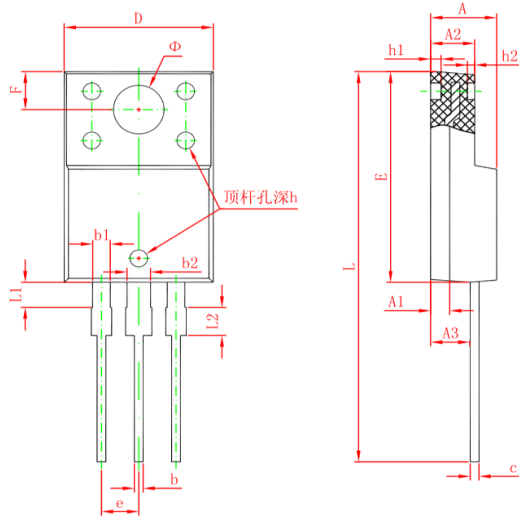


Diode Recovery Test



Package Outline

TO-220F, 3 leads



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 4.300                     | 4.700  | 0.169                | 0.185 |
| A1     | 1.300 REF.                |        | 0.051 REF.           |       |
| A2     | 2.800                     | 3.200  | 0.110                | 0.126 |
| A3     | 2.500                     | 2.900  | 0.098                | 0.114 |
| b      | 0.500                     | 0.750  | 0.020                | 0.030 |
| b1     | 1.100                     | 1.350  | 0.043                | 0.053 |
| b2     | 1.500                     | 1.750  | 0.059                | 0.069 |
| c      | 0.500                     | 0.750  | 0.020                | 0.030 |
| D      | 9.960                     | 10.360 | 0.392                | 0.408 |
| E      | 14.800                    | 15.200 | 0.583                | 0.598 |
| e      | 2.540 TYP.                |        | 0.100 TYP.           |       |
| F      | 2.700 REF.                |        | 0.106 REF.           |       |
| Φ      | 3.500 REF.                |        | 0.138 REF.           |       |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| h1     | 0.800 REF.                |        | 0.031 REF.           |       |
| h2     | 0.500 REF.                |        | 0.020 REF.           |       |
| L      | 28.000                    | 28.400 | 1.102                | 1.118 |
| L1     | 1.700                     | 1.900  | 0.067                | 0.075 |
| L2     | 1.900                     | 2.100  | 0.075                | 0.083 |