

NCE N-Channel Enhancement Mode Power MOSFET

Description

The NCE01H10 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

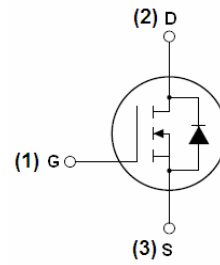
- $V_{DS} = 100V, I_D = 100A$
 $R_{DS(ON)} < 13m\Omega @ V_{GS}=10V$ (Typ:9.9m Ω)
- Special process technology for high ESD capability
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

100% UIS TESTED!

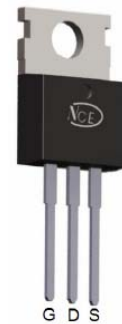
100% ΔV_d s TESTED!



Schematic diagram



Marking and pin assignment



TO-220-3L top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|----------|
| NCE01H10 | NCE01H10 | TO-220-3L | - | - | - |

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

| Symbol | Parameter | Limit | Unit |
|--------------------|---|------------|---------------|
| V_{DS} | Drain-Source Voltage | 100 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| I_D | Drain Current-Continuous | 100 | A |
| $I_D(100^\circ C)$ | Drain Current-Continuous($T_C=100^\circ C$) | 80 | A |
| I_{DM} | Pulsed Drain Current | 380 | A |
| P_D | Maximum Power Dissipation | 200 | W |
| | Derating factor | 1.33 | W/ $^\circ C$ |
| E_{AS} | Single pulse avalanche energy ^(Note 5) | 800 | mJ |
| T_J, T_{STG} | Operating Junction and Storage Temperature Range | -55 To 175 | $^\circ C$ |

Thermal Characteristic

| | | | |
|-----------------|--|------|----------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case ^(Note 2) | 0.75 | $^{\circ}\text{C/W}$ |
|-----------------|--|------|----------------------|

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

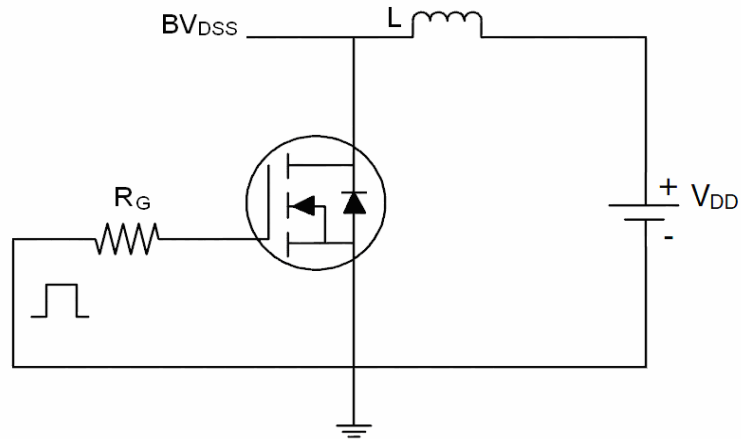
| Symbol | Parameter | Condition | Min | Typ | Max | Unit |
|--|---|--|-----|------|-----------|------------|
| Off Characteristics | | | | | | |
| V_{DS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$ | 100 | 110 | - | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=100V, V_{GS}=0V$ | - | - | 1 | μA |
| I_{GSS} | Gate-Body Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics ^(Note 3) | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_D=250\mu A$ | 2 | 3 | 4 | V |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance | $V_{GS}=10V, I_D=40A$ | - | 9.9 | 13 | m Ω |
| g_{FS} | Forward Transconductance | $V_{DS}=50V, I_D=40A$ | 100 | - | - | S |
| Dynamic Characteristics ^(Note 4) | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS}=50V, V_{GS}=0V,$ $F=1.0\text{MHz}$ | - | 4800 | - | PF |
| C_{oss} | Output Capacitance | | - | 340 | - | PF |
| C_{rss} | Reverse Transfer Capacitance | | - | 150 | - | PF |
| Switching Characteristics ^(Note 4) | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}=50V, I_D=40A$ $V_{GS}=10V, R_{GEN}=2.5\Omega$ | - | 15 | - | nS |
| t_r | Turn-on Rise Time | | - | 50 | - | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 40 | - | nS |
| t_f | Turn-Off Fall Time | | - | 55 | - | nS |
| Q_g | Total Gate Charge | $V_{DS}=80V, I_D=40A,$ $V_{GS}=10V$ | - | 85 | - | nC |
| Q_{gs} | Gate-Source Charge | | - | 18 | - | nC |
| Q_{gd} | Gate-Drain Charge | | - | 28 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| V_{SD} | Diode Forward Voltage ^(Note 3) | $V_{GS}=0V, I_S=40A$ | - | - | 1.2 | V |
| I_S | Diode Forward Current ^(Note 2) | - | - | - | 57 | A |
| t_{rr} | Reverse Recovery Time | $T_J = 25^{\circ}\text{C}, I_F = 40A$ | - | 38 | 80 | nS |
| Q_{rr} | Reverse Recovery Charge | $di/dt = 100A/\mu s$ (Note 3) | - | 53 | 100 | nC |
| t_{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

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
5. EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

Test Circuit

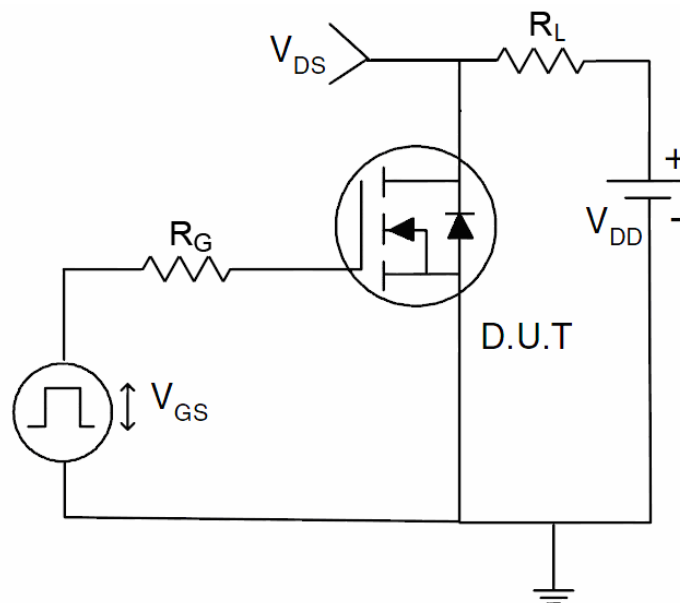
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

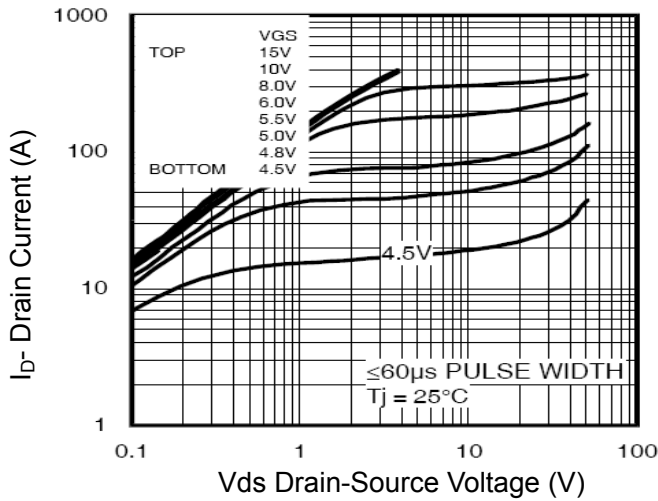


Figure 1 Output Characteristics

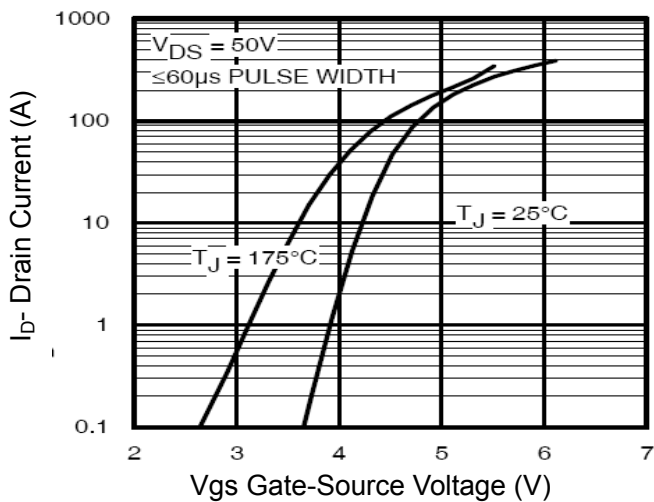


Figure 2 Transfer Characteristics

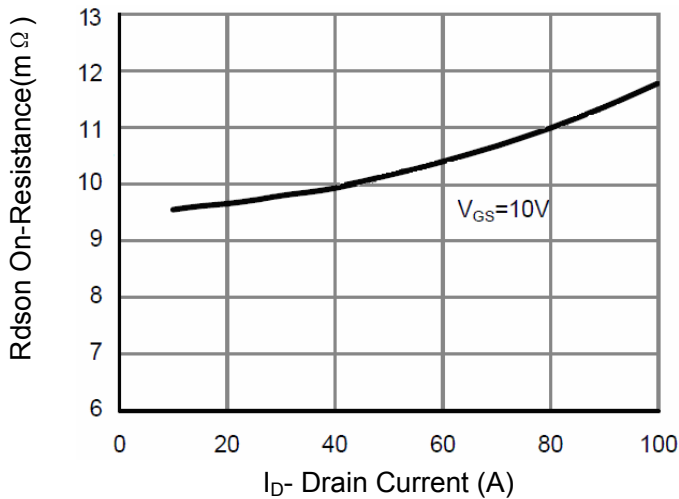


Figure 3 Rdson- Drain Current

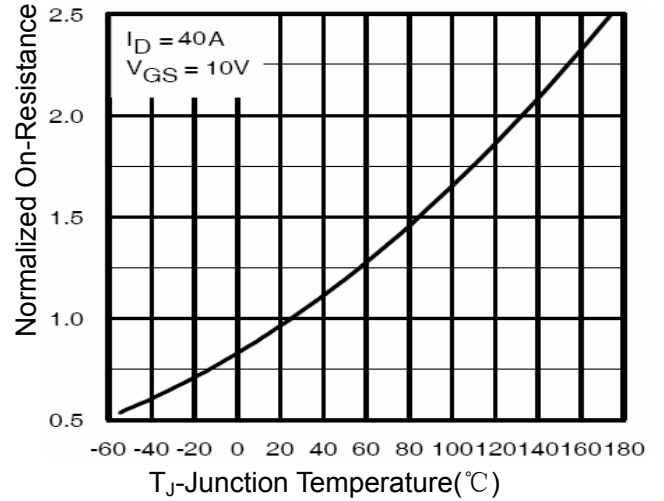


Figure 4 Rdson-Junction Temperature

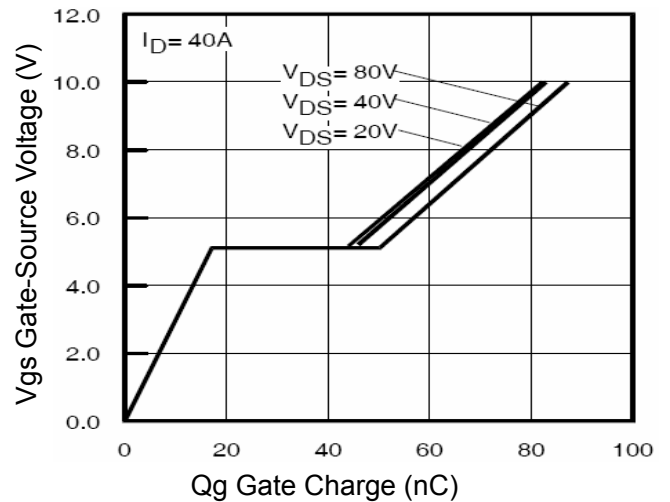


Figure 5 Gate Charge

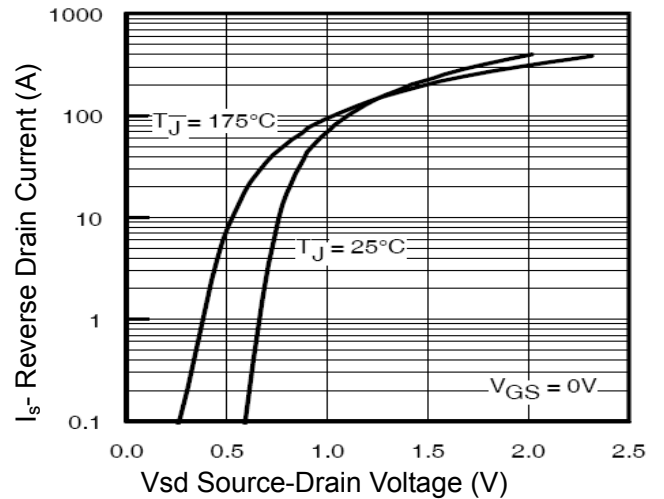


Figure 6 Source- Drain Diode Forward

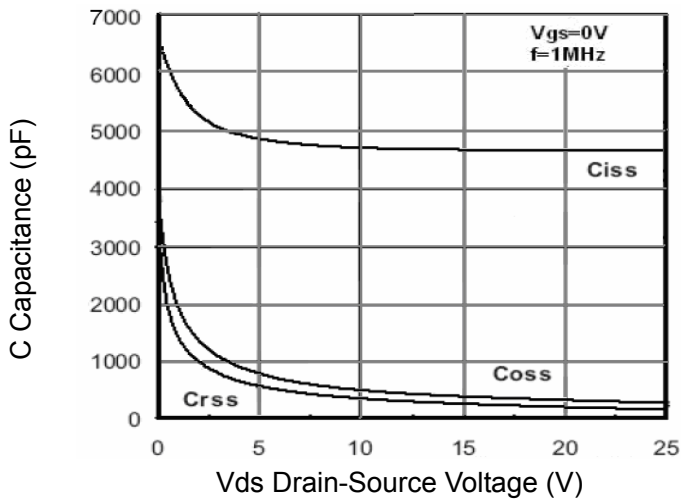


Figure 7 Capacitance vs Vds

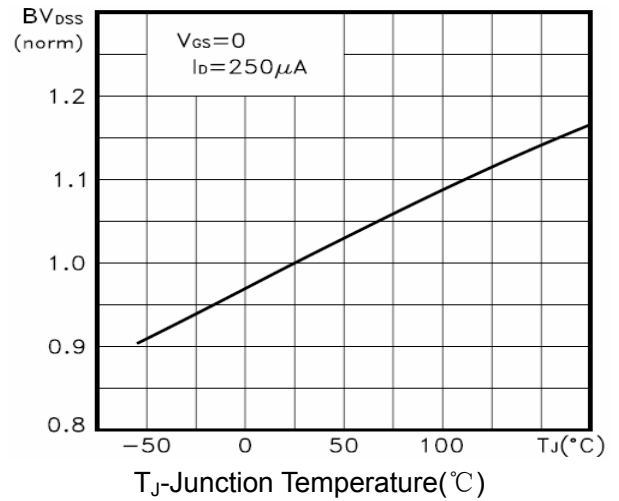


Figure 9 BV_{DSS} vs Junction Temperature

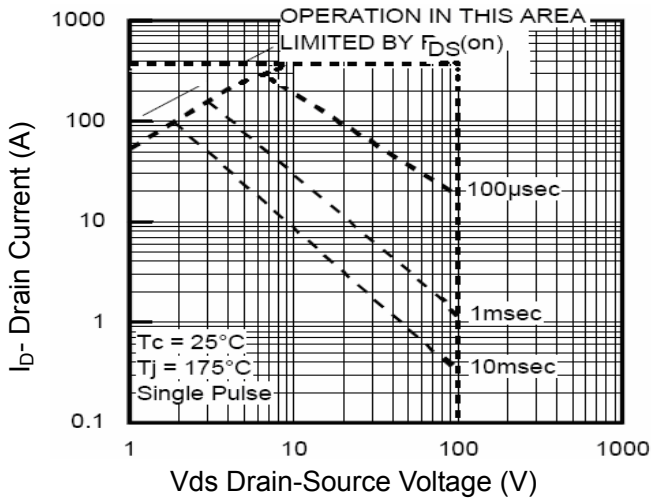


Figure 8 Safe Operation Area

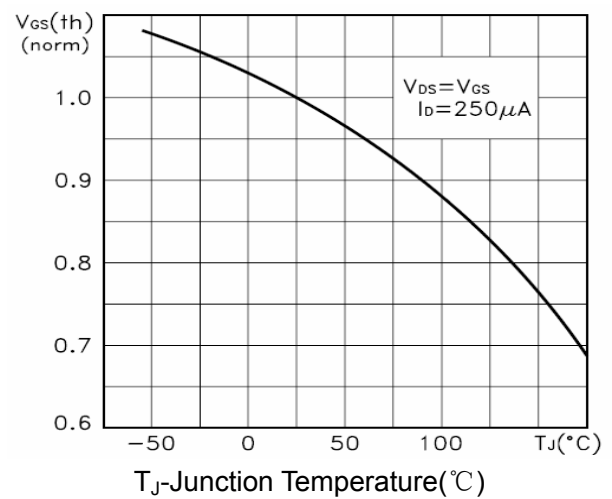


Figure 10 $V_{GS(th)}$ vs Junction Temperature

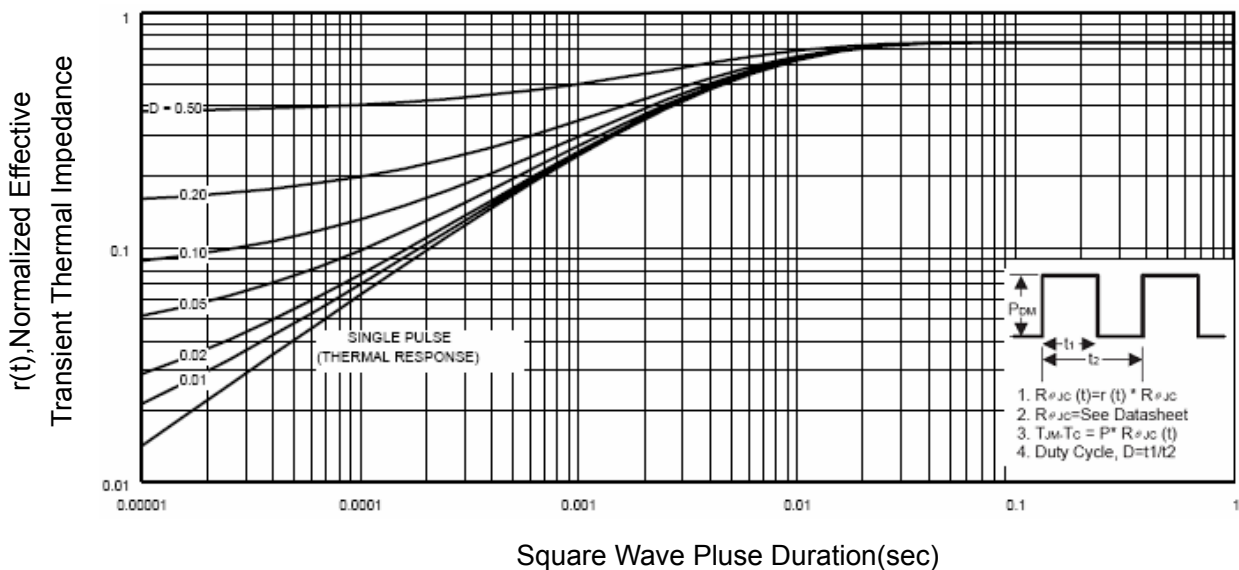
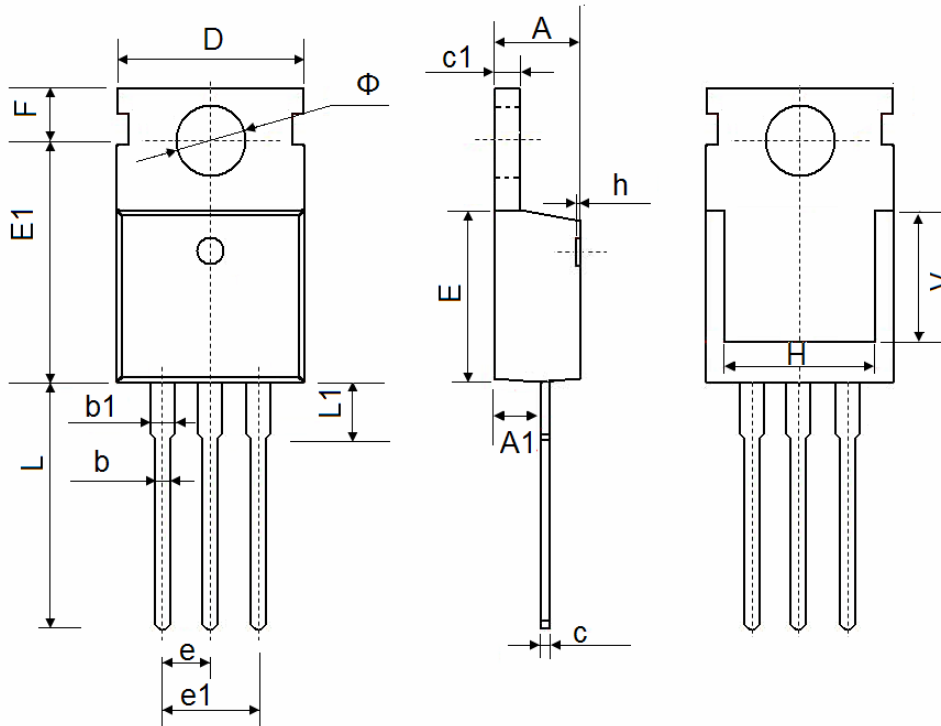


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.400 | 4.600 | 0.173 | 0.181 |
| A1 | 2.250 | 2.550 | 0.089 | 0.100 |
| b | 0.710 | 0.910 | 0.028 | 0.036 |
| b1 | 1.170 | 1.370 | 0.046 | 0.054 |
| c | 0.330 | 0.650 | 0.013 | 0.026 |
| c1 | 1.200 | 1.400 | 0.047 | 0.055 |
| D | 9.910 | 10.250 | 0.390 | 0.404 |
| E | 8.9500 | 9.750 | 0.352 | 0.384 |
| E1 | 12.650 | 12.950 | 0.498 | 0.510 |
| e | 2.540 TYP. | | 0.100 TYP. | |
| e1 | 4.980 | 5.180 | 0.196 | 0.204 |
| F | 2.650 | 2.950 | 0.104 | 0.116 |
| H | 7.900 | 8.100 | 0.311 | 0.319 |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| L | 12.900 | 13.400 | 0.508 | 0.528 |
| L1 | 2.850 | 3.250 | 0.112 | 0.128 |
| V | 7.500 REF. | | 0.295 REF. | |
| Φ | 3.400 | 3.800 | 0.134 | 0.150 |

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