

NCE N-Channel Enhancement Mode Power MOSFET

Description

The NCE85H21TC uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in automotive applications and a wide variety of other applications.

General Features

- $V_{DSS} = 85V, I_D = 210A$
 $R_{DS(ON)} < 3.9m\Omega @ V_{GS} = 10V$
- Good stability and uniformity with high E_{AS}
- Special process technology for high ESD capability
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

- Automotive applications
- Hard switched and high frequency circuits
- Uninterruptible power supply

100% UIS TESTED!

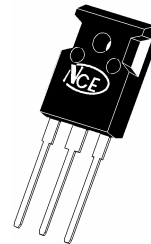
100% ΔV_{ds} TESTED!



Schematic diagram



Marking and pin assignment



TO-247 top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|------------|----------------|-----------|------------|----------|
| NCE85H21TC | NCE85H21TC | TO-247 | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|---------------------------------------------------|--------------------|------------|---------------|
| Drain-Source Voltage | V_{DSS} | 85 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 210 | A |
| Drain Current-Continuous($T_C = 100^\circ C$) | $I_D(100^\circ C)$ | 150 | A |
| Pulsed Drain Current | I_{DM} | 850 | A |
| Maximum Power Dissipation | P_D | 330 | W |
| Derating factor | | 2.2 | W/ $^\circ C$ |
| Single pulse avalanche energy ^(Note 3) | E_{AS} | 2200 | mJ |
| Peak Diode Recovery dv/dt ^(Note 4) | dv/dt | 5 | V/ns |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | $^\circ C$ |

Thermal Characteristic

| | | | |
|----------------------------------------------------------|-----------------|------|---------------|
| Thermal Resistance, Junction-to-Case ^(Note 1) | $R_{\theta JC}$ | 0.45 | $^{\circ}C/W$ |
|----------------------------------------------------------|-----------------|------|---------------|

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|-------------------------------------------|--------------|----------------------------------------------------------------------|-----|------|-----------|------------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 85 | - | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=85V, V_{GS}=0V$ | - | - | 1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 200 | nA |
| On Characteristics | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 2 | 3.2 | 4 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=40A$ | - | 3.4 | 3.9 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=25V, I_D=40A$ | 100 | 165 | - | S |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$ | - | 7200 | - | PF |
| Output Capacitance | C_{oss} | | - | 640 | - | PF |
| Reverse Transfer Capacitance | C_{riss} | | - | 487 | - | PF |
| Switching Characteristics | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=30V, I_D=2A, R_L=15\Omega$ $V_{GS}=10V, R_G=2.5\Omega$ | - | 15 | - | nS |
| Turn-on Rise Time | t_r | | - | 124 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 84 | - | nS |
| Turn-Off Fall Time | t_f | | - | 78 | - | nS |
| Total Gate Charge | Q_g | $I_D=30A, V_{DD}=30V, V_{GS}=10V$ | - | 180 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 34.5 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 70 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage | V_{SD} | $V_{GS}=0V, I_S=40A$ | - | - | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $T_J=25^{\circ}C, I_F=40A$ $di/dt=100A/\mu s$ ^(Note2) | - | 58 | - | nS |
| Reverse Recovery Charge | Q_{rr} | | - | 87 | - | nC |
| Forward Turn-On Time | t_{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

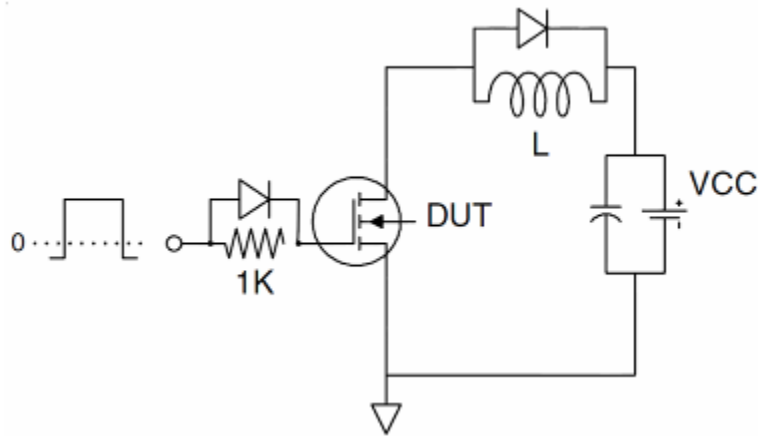
1. Surface Mounted on FR4 Board, $t \leq 10$ sec.
2. Pulse Test: Pulse Width $\leq 400\mu s$, Duty Cycle $\leq 2\%$.
3. EAS condition: $T_J=25^{\circ}C, V_{DD}=42.5V, V_G=10V, L=2mH, R_G=25\Omega, I_{AS}=37A$
4. $I_{SD} \leq 125A, di/dt \leq 260A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^{\circ}C$

Test Circuit

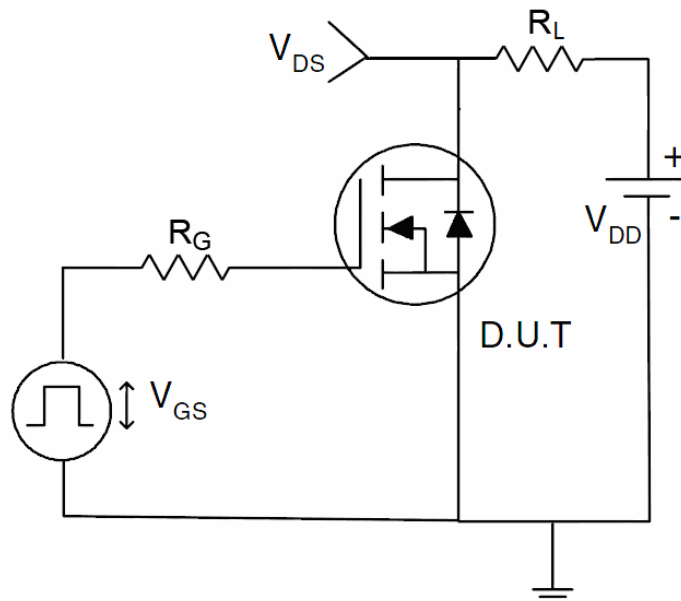
1) E_{AS} test Circuit



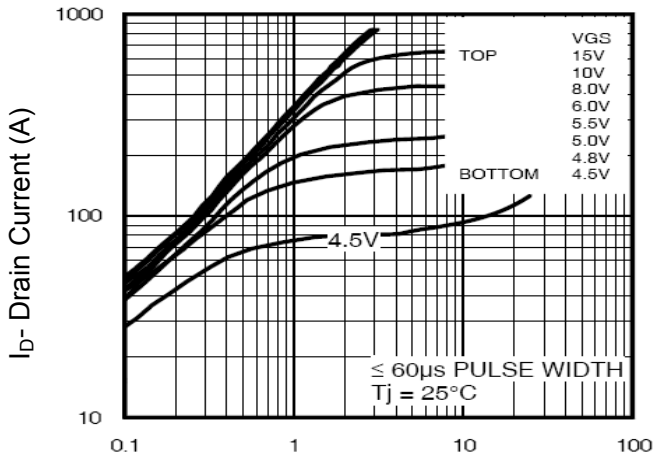
2) Gate charge test Circuit



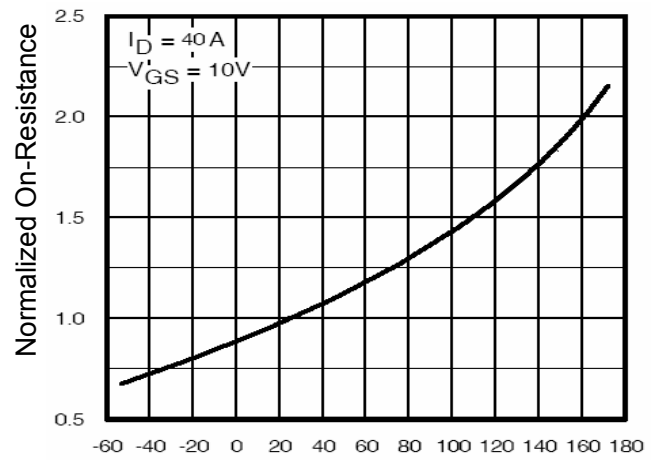
3) Switch Time Test Circuit



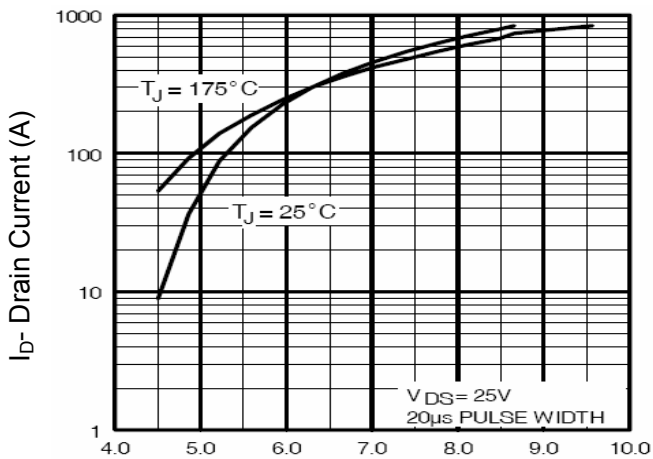
Typical Electrical and Thermal Characteristics



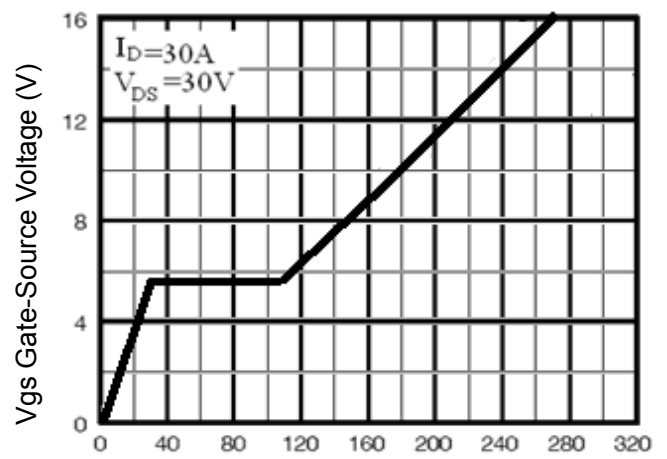
Vds Drain-Source Voltage (V)
Figure 1 Output Characteristics



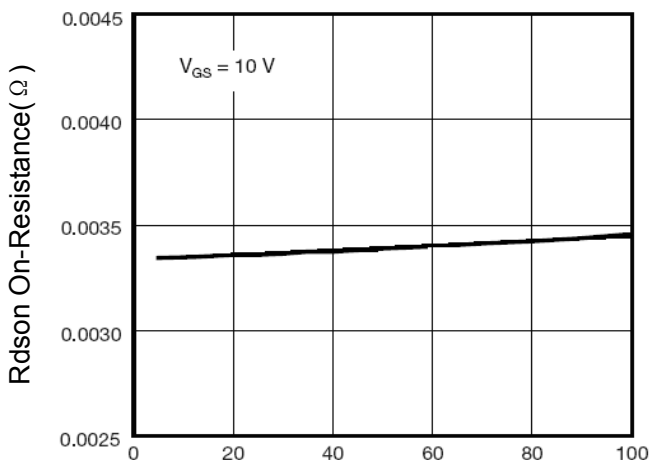
T_J-Junction Temperature(°C)
Figure 4 Rdson-Junction Temperature



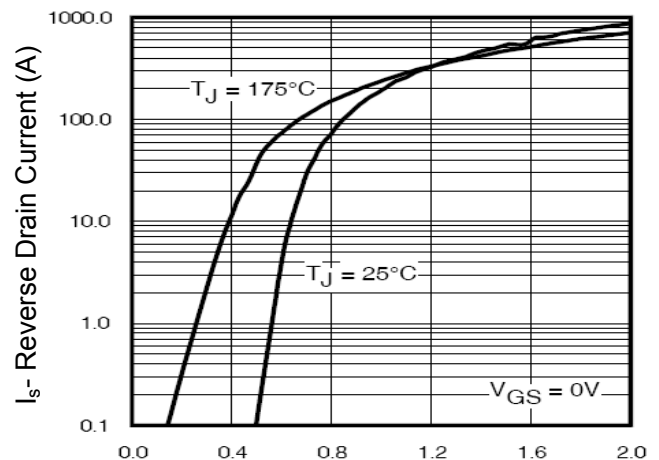
Vgs Gate-Source Voltage (V)
Figure 2 Transfer Characteristics



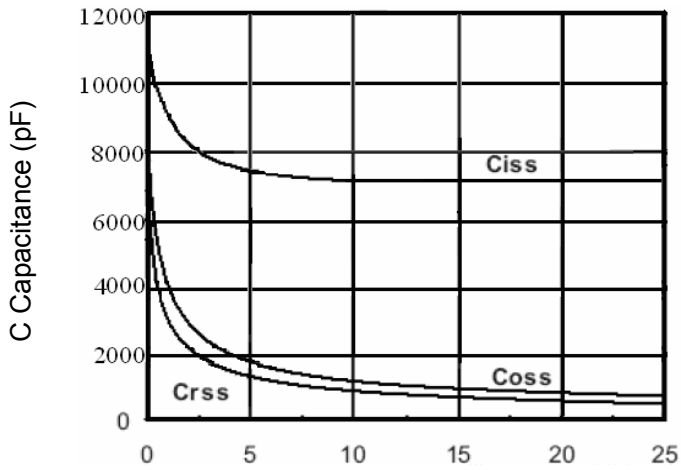
Qg Gate Charge (nC)
Figure 5 Gate Charge



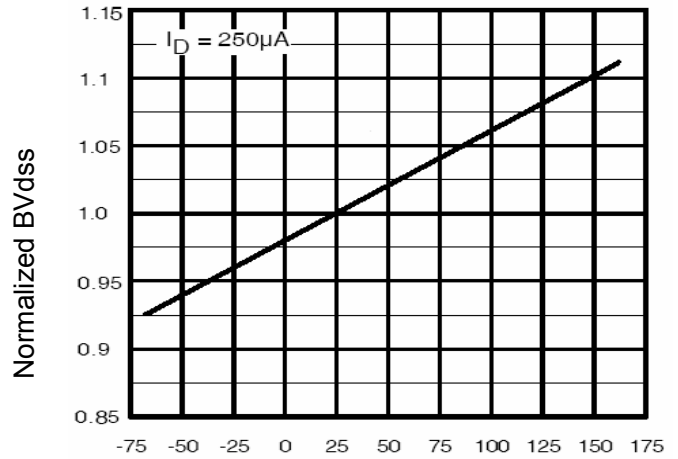
Id Drain Current (A)
Figure 3 Rdson- Drain Current



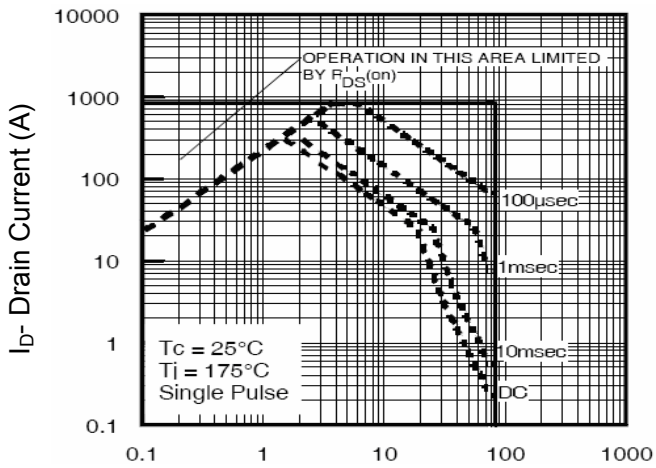
Vsd Source-Drain Voltage (V)
Figure 6 Source- Drain Diode Forward



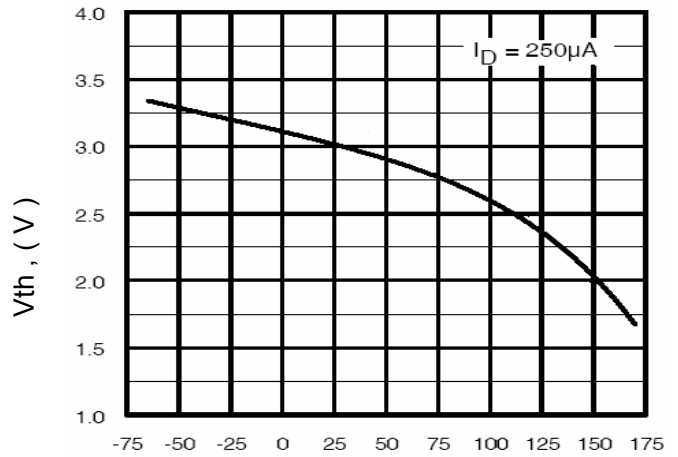
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



T_J-Junction Temperature(°C)
Figure 9 BV_{DSS} vs Junction Temperature



Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area



T_J-Junction Temperature(°C)
Figure 10 V_{GS(th)} vs Junction Temperature

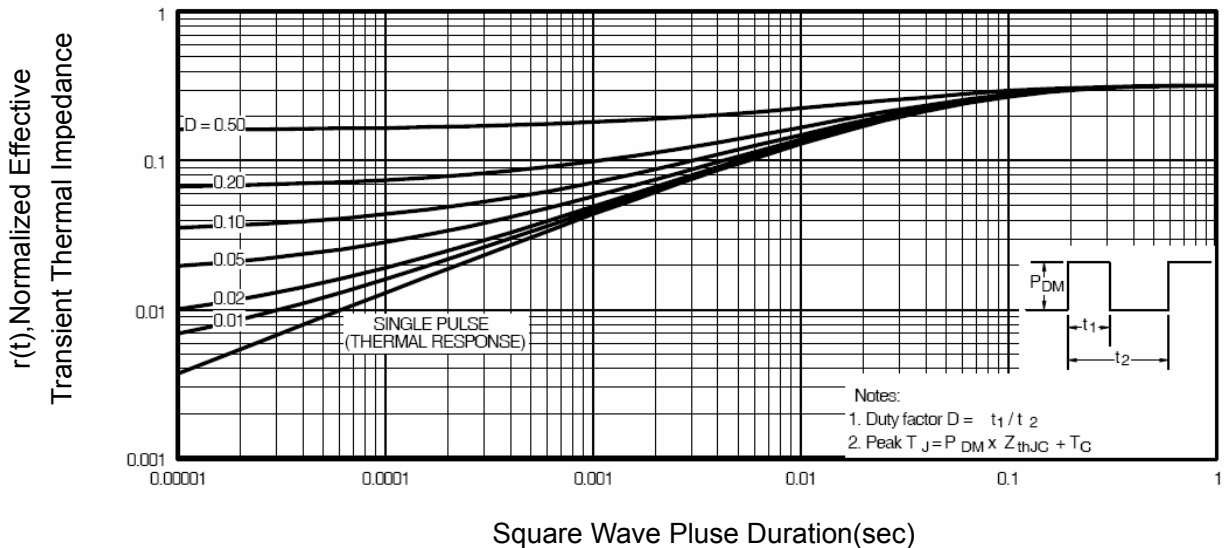
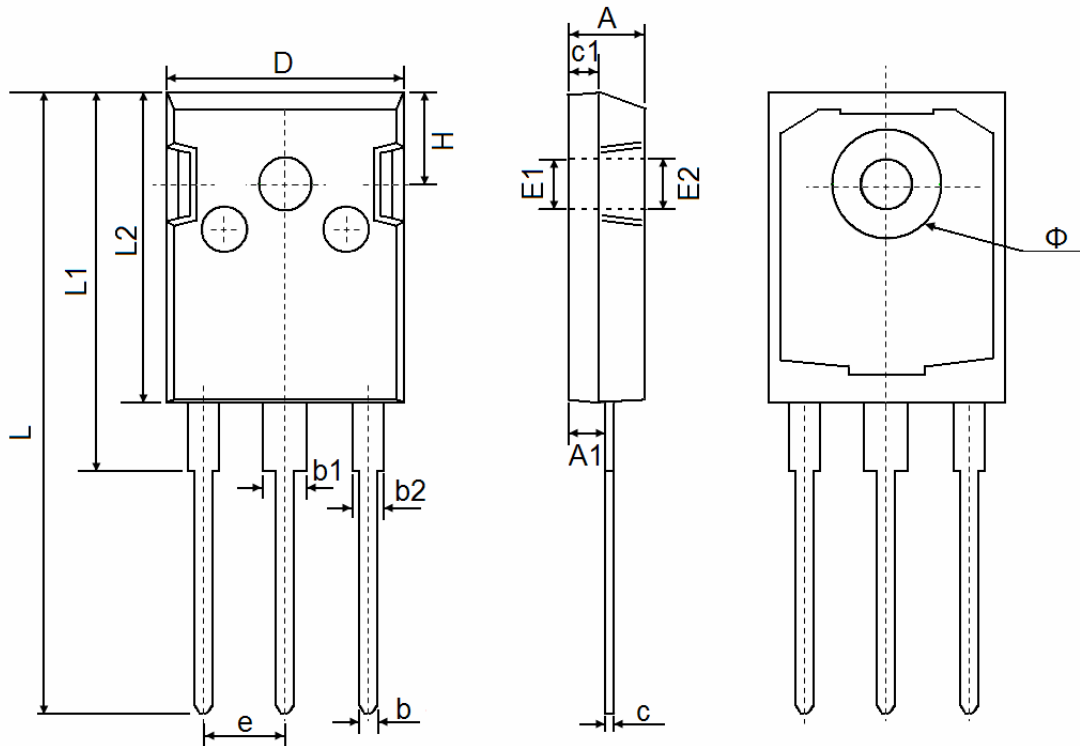


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-247 Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.850 | 5.150 | 0.191 | 0.200 |
| A1 | 2.200 | 2.600 | 0.087 | 0.102 |
| b | 1.000 | 1.400 | 0.039 | 0.055 |
| b1 | 2.800 | 3.200 | 0.110 | 0.126 |
| b2 | 1.800 | 2.200 | 0.071 | 0.087 |
| c | 0.500 | 0.700 | 0.020 | 0.028 |
| c1 | 1.900 | 2.100 | 0.075 | 0.083 |
| D | 15.450 | 15.750 | 0.608 | 0.620 |
| E1 | 3.500 REF | | 0.138 REF | |
| E2 | 3.600 REF | | 0.142 REF | |
| L | 40.900 | 41.300 | 1.610 | 1.626 |
| L1 | 24.800 | 25.100 | 0.976 | 0.988 |
| L2 | 20.300 | 20.600 | 0.799 | 0.811 |
| Φ | 7.100 | 7.300 | 0.280 | 0.287 |
| e | 5.450 TYP | | 0.215 TYP | |
| H | 5.980 REF | | 0.235 REF | |

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