

N-Channel Super Trench II Power MOSFET

Description

The series of devices uses **Super Trench II** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(on)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

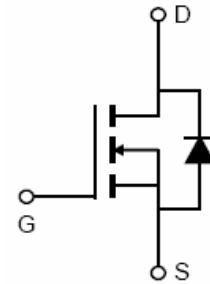
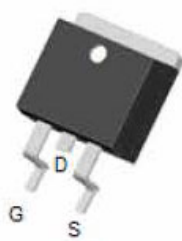
- $V_{DS} = 85V, I_D = 80A$
 $R_{DS(on)} = 6.9m\Omega$, typical (TO-220)@ $V_{GS} = 10V$
 $R_{DS(on)} = 6.9m\Omega$, typical (TO-263)@ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating

100% UIS TESTED!
100% ΔV_{ds} TESTED!

TO-220



TO-263



Schematic Diagram

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| HMS80N85 | HMS80N85 | TO-220 | - | - | - |
| HMS80N85D | HMS80N85D | TO-263 | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|---|--------------------------|------------|---------------------|
| Drain-Source Voltage | V_{DS} | 85 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 80 | A |
| Drain Current-Continuous($T_C = 100^\circ\text{C}$) | $I_D(100^\circ\text{C})$ | 56 | A |
| Pulsed Drain Current | I_{DM} | 240 | A |
| Maximum Power Dissipation | P_D | 200 | W |
| Derating factor | | 1.33 | W/ $^\circ\text{C}$ |
| Single pulse avalanche energy ^(Note 5) | E_{AS} | 1050 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | $^\circ\text{C}$ |

Thermal Characteristic

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

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit | |
|---|---------------------|---|--------|------|------|------|----|
| Off Characteristics | | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V I _D =250μA | 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} =±20V, V _{DS} =0V | - | - | ±100 | nA | |
| On Characteristics ^(Note 3) | | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 2.5 | - | 3.5 | V | |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =70A | TO-220 | - | 6.9 | 8.5 | mΩ |
| | | | TO-263 | | 6.9 | 8.5 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =5V, I _D =70A | | 90 | - | S | |
| Dynamic Characteristics ^(Note4) | | | | | | | |
| Input Capacitance | C _{ISS} | V _{DS} =40V, V _{GS} =0V, F=1.0MHz | - | 4950 | - | PF | |
| Output Capacitance | C _{OSS} | | - | 850 | - | PF | |
| Reverse Transfer Capacitance | C _{rss} | | - | 40 | - | PF | |
| Switching Characteristics ^(Note 4) | | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =40V, I _D =70A V _{GS} =10V, R _G =1.6Ω | - | 18 | - | nS | |
| Turn-on Rise Time | t _r | | - | 11 | - | nS | |
| Turn-Off Delay Time | t _{d(off)} | | - | 38 | - | nS | |
| Turn-Off Fall Time | t _f | | - | 9 | - | nS | |
| Total Gate Charge | Q _g | V _{DS} =40V, I _D =70A, V _{GS} =10V | - | 88 | - | nC | |
| Gate-Source Charge | Q _{gs} | | - | 22 | | nC | |
| Gate-Drain Charge | Q _{gd} | | - | 25 | | nC | |
| Drain-Source Diode Characteristics | | | | | | | |
| Diode Forward Voltage ^(Note 3) | V _{SD} | V _{GS} =0V, I _S =70A | - | | 1.2 | V | |
| Diode Forward Current ^(Note 2) | I _S | | - | - | 80 | A | |
| Reverse Recovery Time | t _{rr} | T _J = 25°C, I _F = 70A di/dt = 100A/μs ^(Note3) | - | 72 | - | nS | |
| Reverse Recovery Charge | Q _{rr} | | - | 102 | - | nC | |

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 : $T_J=25^{\circ}\text{C}, V_{DD}=40V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

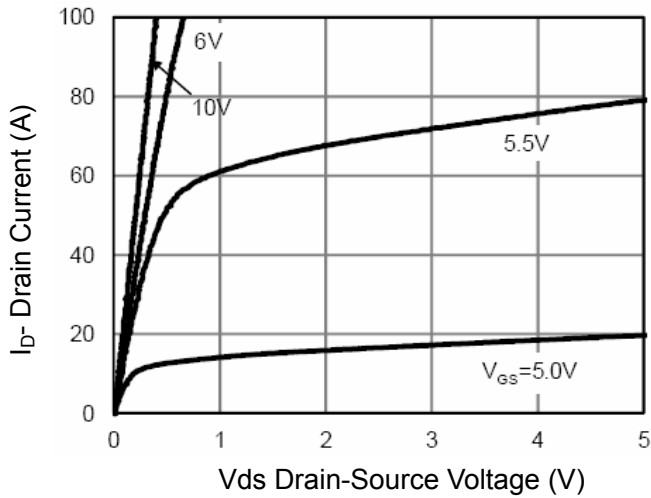


Figure 1 Output Characteristics

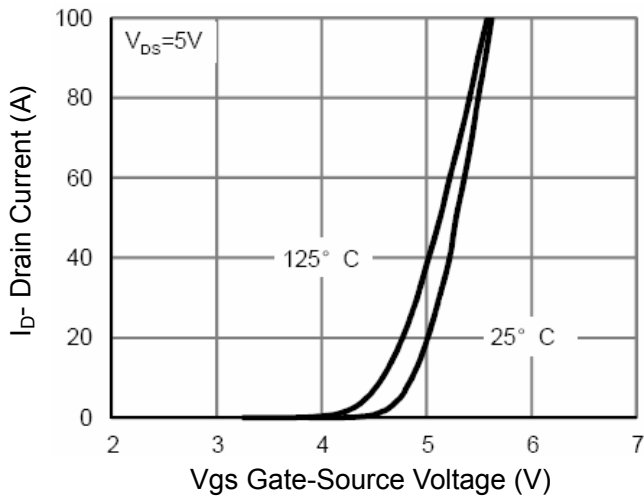


Figure 2 Transfer Characteristics

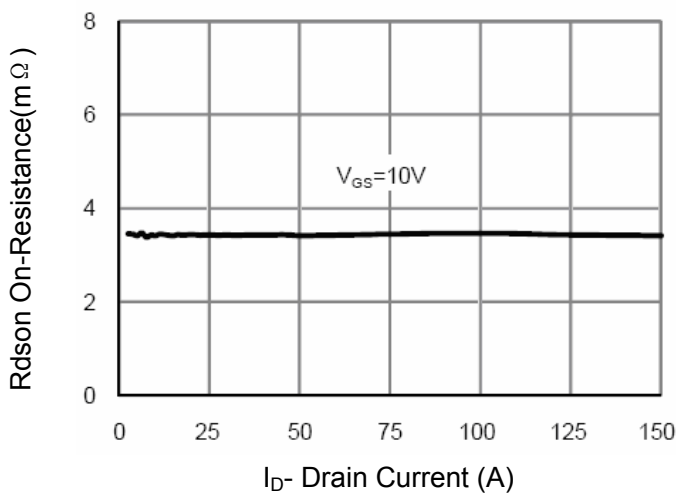


Figure 3 Rdson- Drain Current

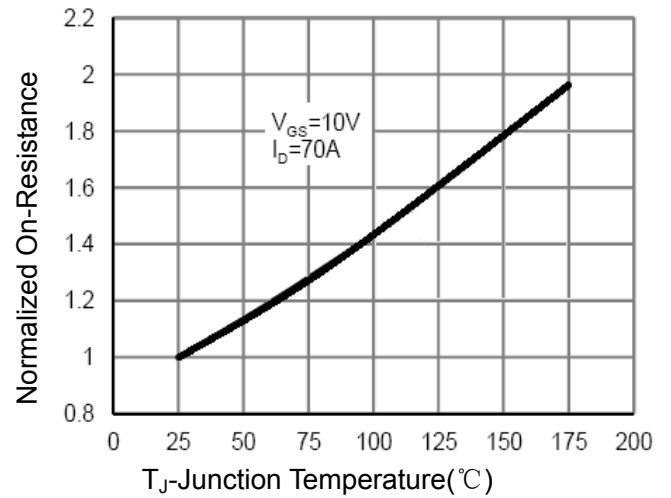


Figure 4 Rdson-Junction Temperature

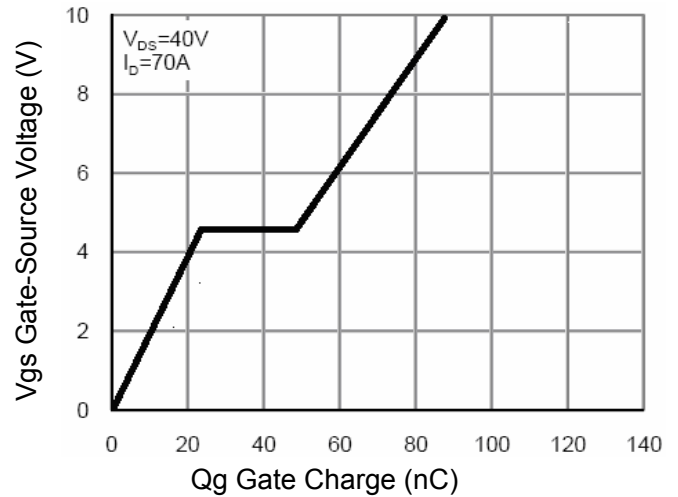


Figure 5 Gate Charge

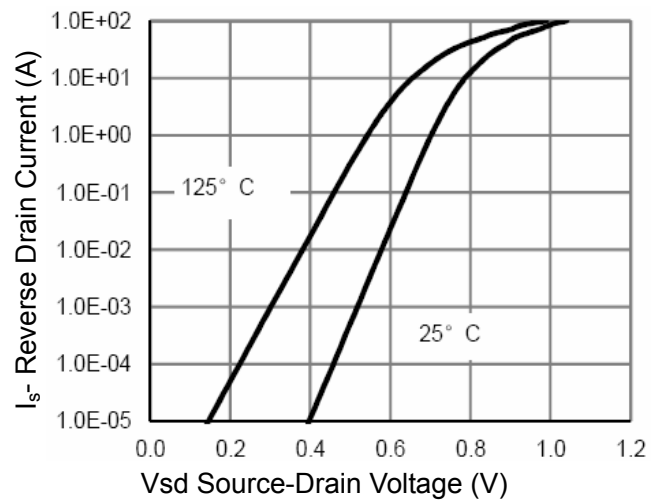


Figure 6 Source- Drain Diode Forward

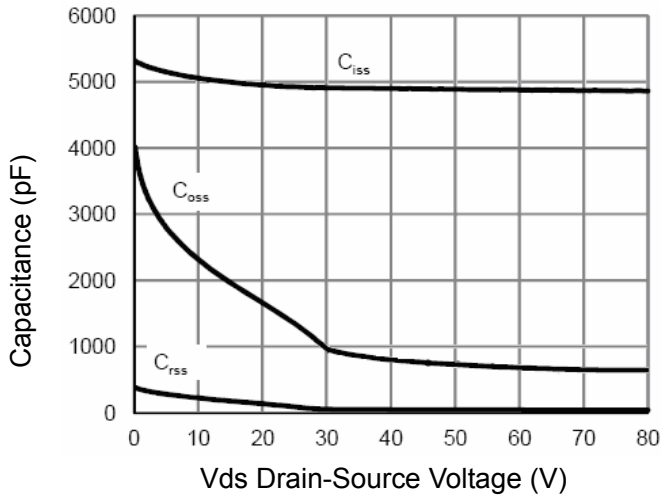


Figure 7 Capacitance vs Vds

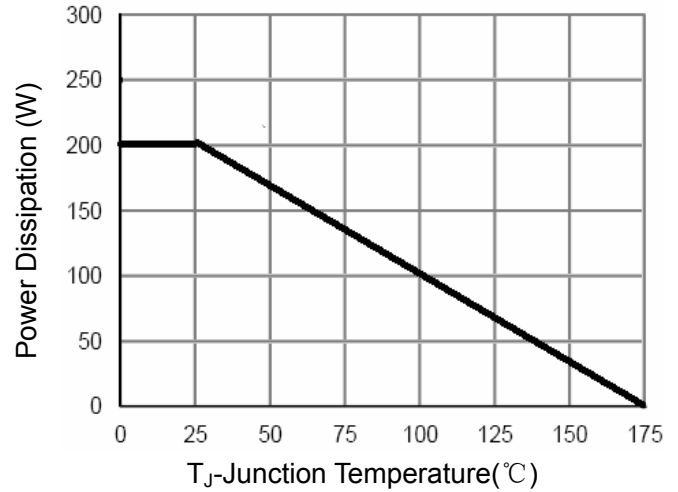


Figure 9 Power De-rating

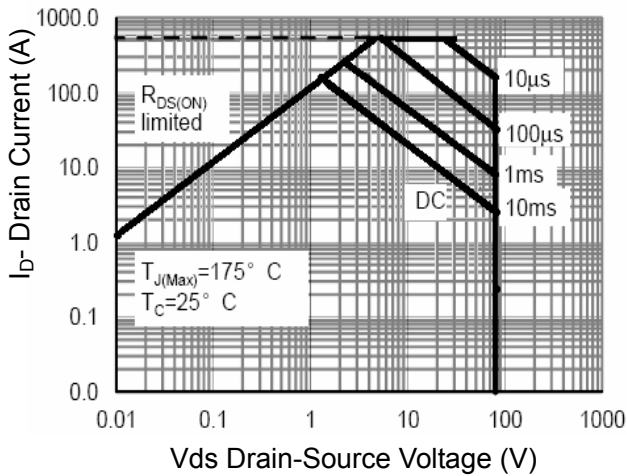


Figure 8 Safe Operation Area

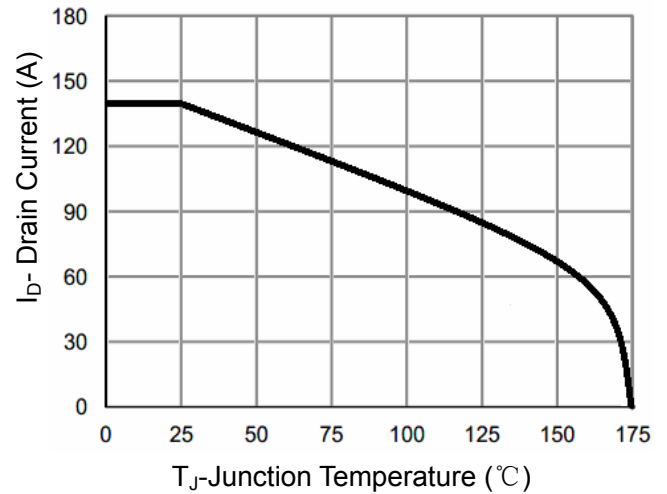


Figure 10 Current De-rating

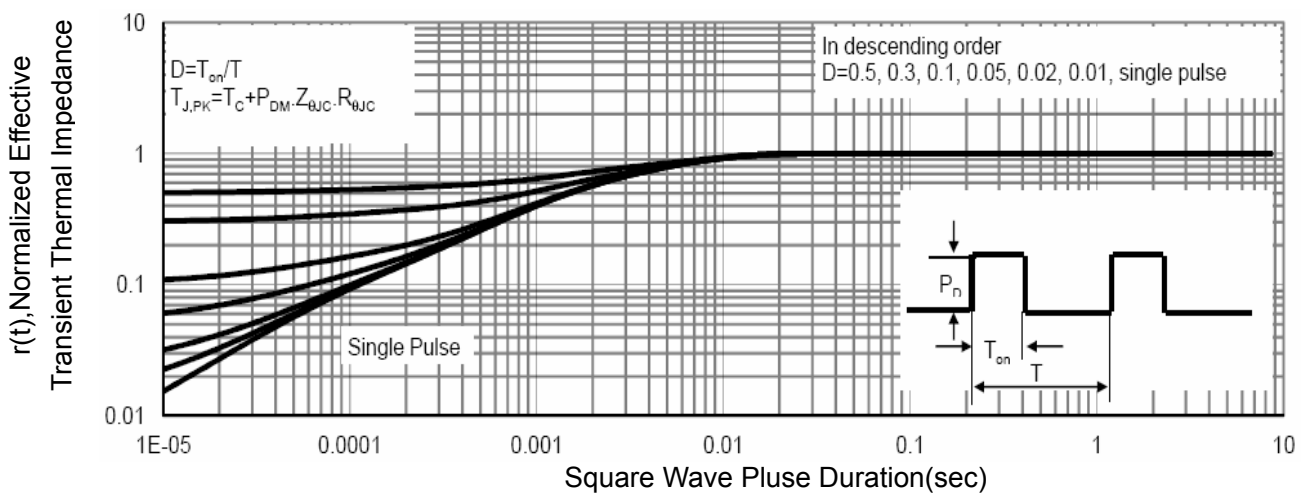
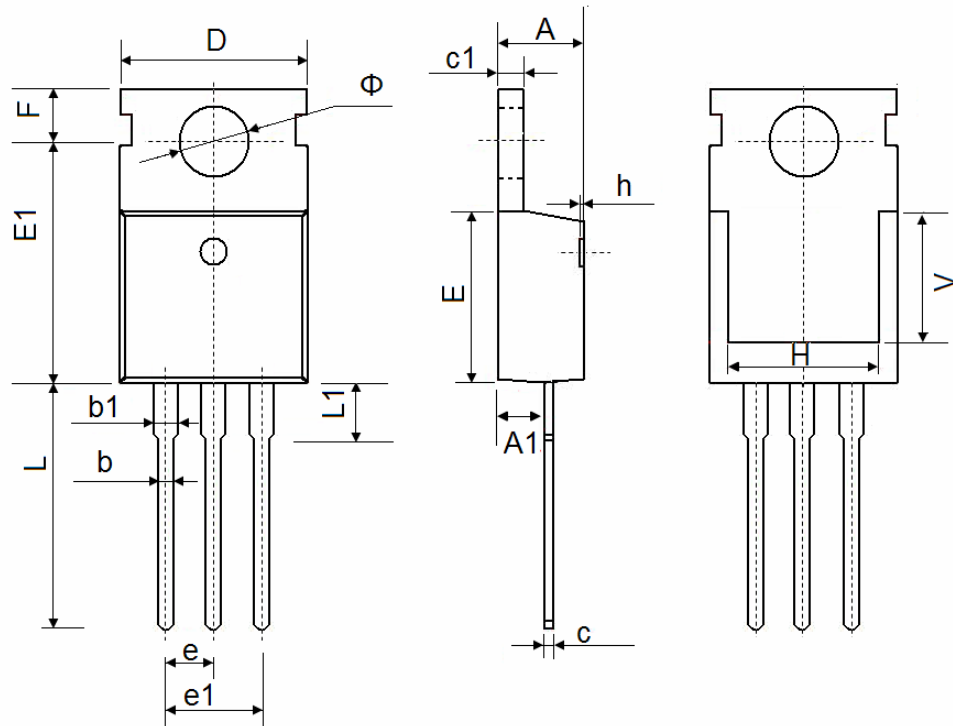


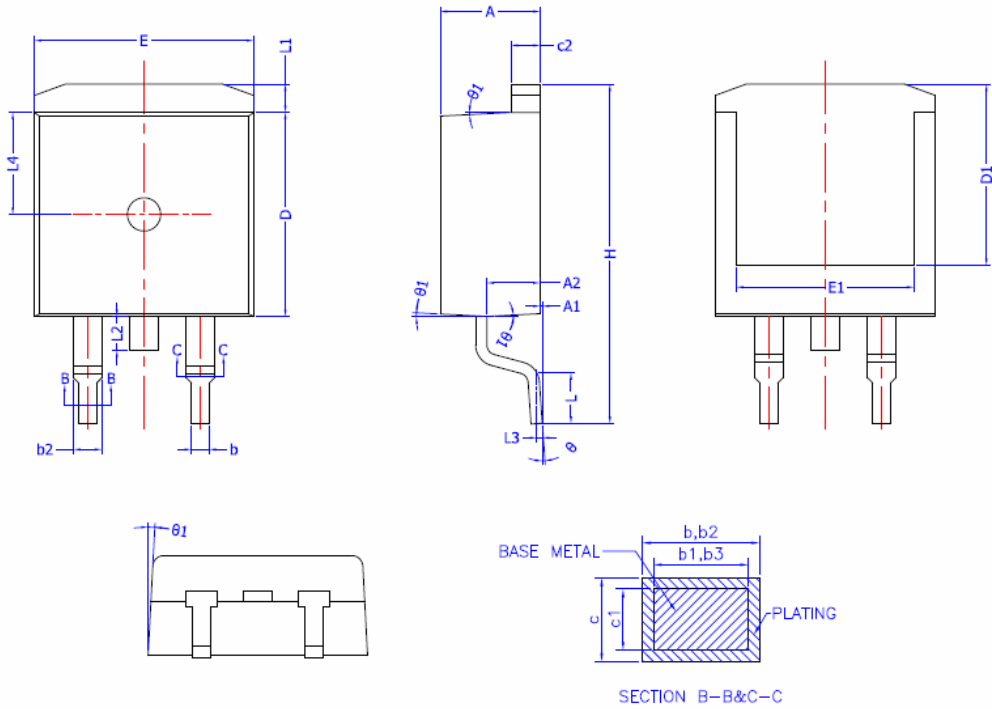
Figure 11 Normalized Maximum Transient Thermal Impedance

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 | 6.900 REF. | | 0.276 REF. | |
| Φ | 3.400 | 3.800 | 0.134 | 0.150 |

TO-263-2L Package Information



COMMON DIMENSIONS
 (UNITS OF MEASURE =MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|------------|----------|-------|-------|
| A | 4.40 | 4.50 | 4.60 |
| A1 | 0 | 0.10 | 0.25 |
| A2 | 2.20 | 2.40 | 2.60 |
| b | 0.76 | — | 0.89 |
| b1 | 0.75 | 0.80 | 0.85 |
| b2 | 1.23 | — | 1.37 |
| b3 | 1.22 | 1.27 | 1.32 |
| c | 0.47 | — | 0.60 |
| c1 | 0.46 | 0.51 | 0.56 |
| c2 | 1.25 | 1.30 | 1.35 |
| D | 9.10 | 9.20 | 9.30 |
| D1 | 8.00 | — | — |
| E | 9.80 | 9.90 | 10.00 |
| E1 | 7.80 | — | — |
| e | 2.54 BSC | | |
| H | 14.90 | 15.30 | 15.70 |
| L | 2.00 | 2.30 | 2.60 |
| L1 | 1.17 | 1.27 | 1.40 |
| L2 | — | — | 1.75 |
| L3 | 0.25BSC | | |
| L4 | 4.60 REF | | |
| θ | 0° | — | 8° |
| θ_1 | 1° | 3° | 5° |