Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!


## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

6 Lake Street, Lawrence, MA 01841
1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803
Website: http: //www.microsemi.com

Gort Road Business Park, Ennis, Co. Clare, Ireland
Tel: +353 (0) 65 6840044 Fax: +353 (0) 65 6822298

# TECHNICAL DATA SHEET

## NPN POWER SILICON TRANSISTOR

*Qualified per MIL-PRF-19500/454*

**DEVICES**

**2N5660 2N5661 2N5662**
**2N5660U3 2N5661U3 2N5663**

**LEVELS**

**JAN**
**JANTX**
**JANTXV**

### ABSOLUTE MAXIMUM RATINGS *($T_C$ = +25°C unless otherwise noted)*

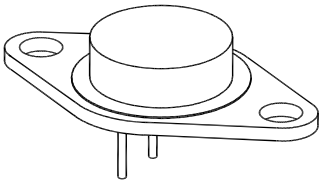
| Parameters / Test Conditions | Symbol | 2N5660 2N5662 | 2N5661 2N5663 | Unit |
|---|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEO}$ | 200 | 300 | Vdc |
| Collector-Base Voltage | $V_{CBO}$ | 250 | 400 | Vdc |
| Collector-Emitter Voltage | $V_{CER}$ | 250 | 400 | Vdc |
| Emitter-Base Voltage | $V_{EBO}$ | 6 | | Vdc |
| Base Current | $I_B$ | 0.5 | | Adc |
| Collector Current | $I_C$ | 2.0 | | Adc |
| Operating & Storage Junction Temperature Range | $T_j$, $T_{stg}$ | -65 to +200 | | °C |
| | | **2N5660 2N5661** | **2N5662 2N5663** | |
| Total Power Dissipation @ $T_A$ = +25°C (1)<br>@ $T_C$ = +100°C | $P_T$ | 2.0 (1)<br>20 (3) | 1.0 (2)<br>15 (4) | W |
| Thermal Resistance, Junction-to-Case<br>Junction-to-Ambient | $R_{\theta JC}$<br>$R_{\theta JA}$ | 5.0<br>87.5 | 6.7<br>175 | °C/W |
| Thermal Resistance, Junction-to-Case<br>**2N5660U3**<br>**2N5661U3** | $R_{\theta JC}$ | 4.5<br>4.0 | | °C/W |

**Note:**

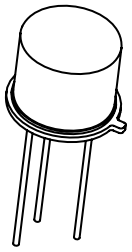
1. Derate linearly 11.4mW/°C for $T_A$ > +25°C
2. Derate linearly 5.7mW/°C for $T_A$ > +25°C
3. Derate linearly 200mW/°C for $T_C$ > +100°C
4. Derate linearly 150mW/°C for $T_C$ > +100°C

### ELECTRICAL CHARACTERISTICS *($T_A$ = +25°C, unless otherwise noted)*

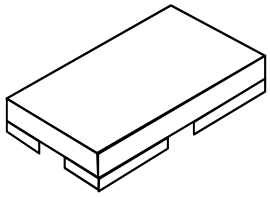
| Parameters / Test Conditions | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERTICS** | | | | | |
| Collector-Emitter Breakdown Voltage<br>$I_C$ = 10mAdc | 2N5660, U3, 2N5662<br>2N5661, U3, 2N5663 | $V_{(BR)CEO}$ | 200<br>300 | | Vdc |
| Collector-Base Breakdown Voltage<br>$I_C$ = 10mAdc, $R_{BE}$ = 100Ω | 2N5660, U3, 2N5662<br>2N5661, U3, 2N5663 | $V_{(BR)CER}$ | 250<br>400 | | Vdc |



**TO-66**
**2N5660, 2N5661**



**TO-5**
**2N5662, 2N5663**



**U3**
**2N5660U3, 2N5661U3**

*6 Lake Street, Lawrence, MA 01841*
*1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803*
**Website: http: //www.microsemi.com**

**ELECTRICAL CHARACTERISTICS** ***($T_A$ = +25°C, unless otherwise noted)***

| Parameters / Test Conditions | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERTICS** | | | | | |
| Emitter-Base Breakdown Voltage<br>$I_E$ = 10µAdc | | $V_{(BR)EBO}$ | 6.0 | | Vdc |
| Collector-Emitter Cutoff Current<br>$V_{CE}$ = 200Vdc<br>$V_{CE}$ = 300Vdc | <br>2N5660, U3, 2N5662<br>2N5661, U3, 2N5663 | $I_{CES}$ | | <br>0.2<br>0.2 | <br>µAdc |
| Collector-Base Cutoff Current<br>$V_{CB}$ = 200Vdc<br>$V_{CB}$ = 250Vdc<br>$V_{CB}$ = 300Vdc<br>$V_{CB}$ = 400Vdc | <br>2N5660, U3, 2N5662<br>2N5660, U3, 2N5662<br>2N5661, U3, 2N5663<br>2N5661, U3, 2N5663 | $I_{CBO}$ | | <br>0.1<br>1.0<br>0.1<br>1.0 | <br>µAdc<br>mAdc<br>µAdc<br>mAdc |
| **ON CHARACTERISTICS** (5) | | | | | |
| Forward-Current Transfer Ratio<br>$I_C$ = 50mAdc, $V_{CE}$ = 2.0Vdc<br>$I_C$ =0.5Adc, $V_{CE}$ = 5.0Vdc<br>$I_C$ = 1.0Adc, $V_{CE}$ = 5.0Vdc<br>$I_C$ = 2.0Adc, $V_{CE}$ = 5.0Vdc | <br>2N5660, U3, 2N5662<br>2N5661, U3, 2N5663<br>2N5660, U3, 2N5662<br>2N5661, U3, 2N5663<br>All types<br>All types | $h_{FE}$ | <br>40<br>25<br>40<br>25<br>15<br>5.0 | <br><br><br>120<br>75<br><br> | |
| Collector-Emitter Saturation Voltage<br>$I_C$ = 1.0Adc, $I_B$ = 0.1Adc<br>$I_C$ = 2.0Adc, $I_B$ = 0.4Adc | | $V_{CE(sat)}$ | | <br>0.4<br>0.8 | Vdc |
| Base-Emitter Saturation Voltage<br>$I_C$ = 1.0Adc, $I_B$ = 0.1Adc<br>$I_C$ = 2.0Adc, $I_B$ = 0.4Adc | | $V_{BE(sat)}$ | | <br>1.2<br>1.5 | Vdc |

**DYNAMIC CHARACTERISTICS**

| Parameters / Test Conditions | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| Magnitude of Common Emitter Small–Signal Short-Circuit Forward Current Transfer Ratio<br>$I_C$ = 0.1Adc, $V_{CE}$ = 5.0Vdc, f = 10MHz | $\|h_{fe}\|$ | 2.0 | 7.0 | |
| Output Capacitance<br>$V_{CB}$ = 10Vdc, $I_E$ = 0, 100kHz ≤ f ≤ 1.0MHz | $C_{obo}$ | | 45 | pF |

**SWITCHING CHARACTERISTICS**

| Parameters / Test Conditions | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Turn-On Time<br>$V_{CC}$ = 100Vdc; $I_C$ = 0.5Adc; $I_{B1}$ = 15mAdc<br>$V_{CC}$ = 100Vdc; $I_C$ = 0.5Adc; $I_{B1}$ = 25mAdc | <br>2N5660, U3, 2N5662<br>2N5661, U3, 2N5663 | $t_{on}$ | | <br>0.25<br>0.25 | µs |
| Turn-Off Time<br>$V_{CC}$ = 100Vdc; $I_C$ = 0.5Adc; $I_{B1}$ = -$I_{B2}$ = 15mAdc<br>$V_{CC}$ = 100Vdc; $I_C$ = 0.5Adc; $I_{B1}$ = -$I_{B2}$ = 25mAdc | <br>2N5660, U3, 2N5662<br>2N5661, U3, 2N5663 | $t_{off}$ | | <br>0.85<br>1.2 | µs |

*6 Lake Street, Lawrence, MA 01841*
*1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803*
**Website: http: //www.microsemi.com**

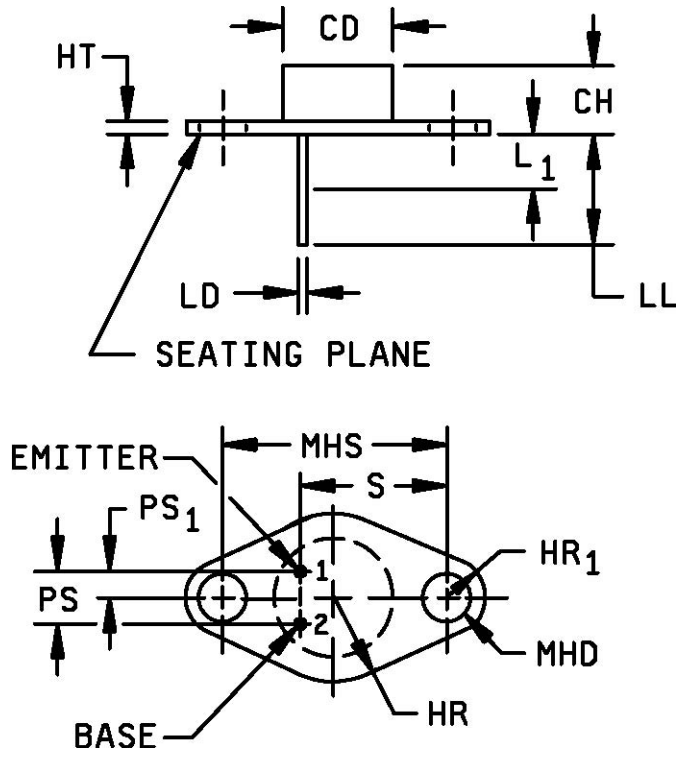
**SAFE OPERATING AREA**

| | |
|---|---|
| **DC Test** | |
| $T_C$ = +100°C, 1 cycle, t ≥ 1.0s | |
| **Test 1** | |
| $V_{CE}$ = 10Vdc, $I_C$ = 2.0Adc | 2N5660, U3, 2N5661, U3 |
| $V_{CE}$ = 7.5Vdc, $I_C$ = 2.0Adc | 2N5662, 2N5663 |
| **Test 2** | |
| $V_{CE}$ = 40Vdc, $I_C$ = 500mAdc | 2N5660, U3, 2N5661, U3 |
| $V_{CE}$ = 25Vdc, $I_C$ = 600mAdc | 2N5662, 2N5663 |
| **Test 3** | |
| $V_{CE}$ = 200Vdc, $I_C$ = 36mAdc | 2N5660, U3 |
| $V_{CE}$ = 200Vdc, $I_C$ = 27mAdc | 2N5662 |
| **Test 4** | |
| $V_{CE}$ = 300Vdc, $I_C$ = 19mAdc | 2N5661, U3 |
| $V_{CE}$ = 300Vdc, $I_C$ = 14mAdc | 2N5663 |

(5) Pulse Test: Pulse Width = 300μs, Duty Cycle ≤ 2.0%.

*6 Lake Street, Lawrence, MA 01841*
*1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803*
**Website: http: //www.microsemi.com**

## PACKAGE DIMENSIONS

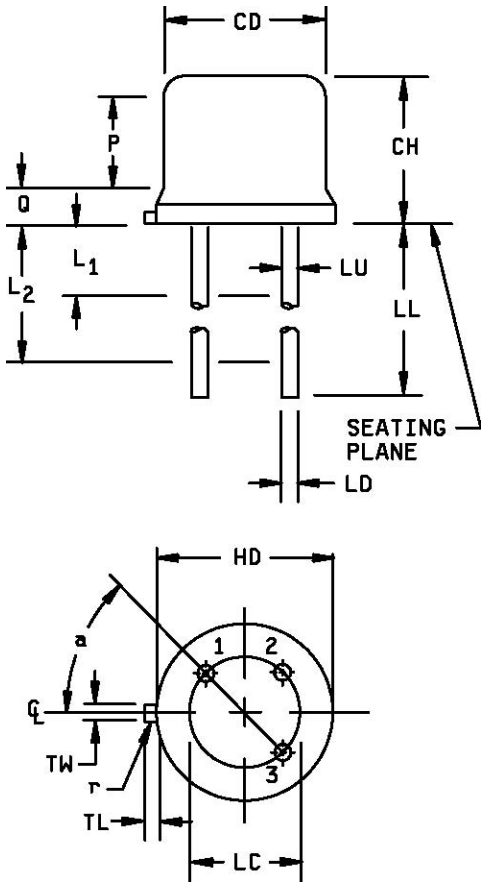



| Ltr | Dimensions | | | | Notes |
|---|---|---|---|---|---|
| | Inches | | Millimeters | | |
| | Min | Max | Min | Max | |
| CD | .470 | .500 | 11.94 | 12.70 | 7 |
| CH | .250 | .340 | 6.35 | 8.64 | |
| HR | | .350 | | 8.89 | |
| $HR_1$ | .115 | .145 | 2.92 | 3.68 | 4 |
| HT | .050 | .075 | 1.27 | 1.91 | |
| LD | .028 | .034 | 0.71 | 0.86 | 4, 6 |
| LL | .360 | .500 | 9.14 | 12.70 | 4 |
| $L_1$ | | .050 | | 1.27 | 4, 6 |
| MHD | .142 | .152 | 3.61 | 3.86 | 4 |
| MHS | .958 | .962 | 24.33 | 24.43 | |
| PS | .190 | .210 | 4.83 | 5.33 | 3 |
| $PS_1$ | .093 | .107 | 2.36 | 2.72 | 3 |
| S | .570 | .590 | 14.48 | 14.99 | 3 |

**NOTES:**
1 Dimensions are in inches.
2 Millimeters are given for general information only.
3 These dimensions should be measured at points .050 inch (1.27 mm) +.005 inch (0.13 mm) -.000 inch (0.00 mm) below seating plane. When gauge is not used, measurement will be made at the seating plane.
4 Two places.
5 The seating plane of the header shall be flat within .001 inch (0.03 mm) concave to .004 inch (0.10 mm) convex inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat within .001 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
6 Lead diameter shall not exceed twice LD within $L_1$.
7 Body contour is optional within zone defined by CD.
8 In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.
9 Lead 1 is emitter, lead 2 is base, and case is collector.

**FIGURE 1.** Physical dimensions, 2N5660 and 2N5661, (similar to TO-66).

*6 Lake Street, Lawrence, MA 01841*
*1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803*
**Website: http: //www.microsemi.com**



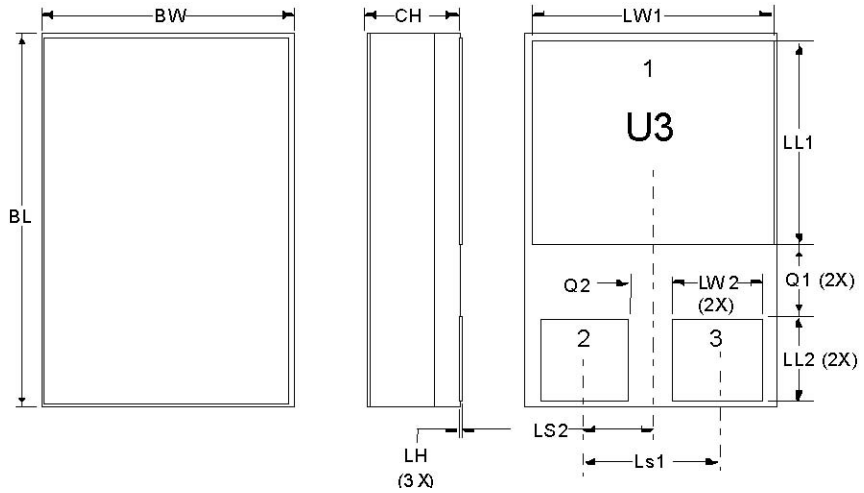

| Ltr | Dimensions | | | | Notes |
|---|---|---|---|---|---|
| | Inches | | Millimeters | | |
| | Min | Max | Min | Max | |
| CD | .305 | .355 | 7.75 | 9.02 | |
| CH | .240 | .260 | 6.10 | 6.60 | |
| HD | .335 | .370 | 8.51 | 9.40 | |
| LC | .200 TP | | 5.08 TP | | 6 |
| LD | .016 | .021 | 0.41 | 0.53 | 7 |
| LL | 1.500 | 1.750 | 38.10 | 44.45 | 7 |
| LU | .016 | .019 | 0.407 | 0.482 | 7 |
| $L_1$ | | .050 | | 1.27 | 7 |
| $L_2$ | .250 | | 6.35 | | 7 |
| TL | .029 | .045 | 0.74 | 1.14 | 3 |
| TW | .028 | .034 | 0.712 | 0.863 | 9 |
| P | .100 | | 2.54 | | |
| Q | | .050 | | 1.27 | 4 |
| r | | .010 | | 0.25 | 10 |
| α | 45° TP | | 45° TP | | 6 |

**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Symbol TL is measured from HD maximum.
4. Details of outline in this zone are optional.
5. Symbol CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane .054 inch (1.37 mm) +.001 inch (0.03 mm) - .000 inch (0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of TP relative to tab. Device may be measured by direct methods or by gauge.
7. Symbol LU applies between L1 and L2. Dimension LD applies between L2 and LL minimum.
8. Lead number three is electrically connected to case.
9. Beyond r maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
10. Symbol r applied to both inside corners of tab.
11. In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.
12. Lead 1 is emitter, lead 2 is base, and lead 3 is collector.

**FIGURE 2.** Physical dimensions, 2N5662 and 2N5663, (similar to TO-5)

*6 Lake Street, Lawrence, MA 01841*
*1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803*
**Website: http: //www.microsemi.com**




| Symbol | Dimensions | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| BL | .395 | .405 | 10.04 | 10.28 |
| BW | .291 | .301 | 7.40 | 7.64 |
| CH | .1085 | .1205 | 2.76 | 3.06 |
| LH | .010 | .020 | 0.25 | 0.51 |
| $LW_1$ | .281 | .291 | 7.14 | 7.39 |
| $LW_2$ | .090 | .100 | 2.29 | 2.54 |
| $LL_1$ | .220 | .230 | 5.59 | 5.84 |
| $LL_2$ | .115 | .125 | 2.93 | 3.17 |
| $LS_1$ | .150 BSC | | 3.81 BSC | |
| $LS_2$ | .075 BSC | | 1.91 BSC | |
| $Q_1$ | .030 | | 0.762 | |
| $Q_2$ | .030 | | 0.762 | |
| Term 1 | Collector | | | |
| Term 2 | Base | | | |
| Term 3 | Emitter | | | |

**FIGURE 3.** Physical dimensions, 2N5660U3 and 2N5661U3(U3).