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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)*

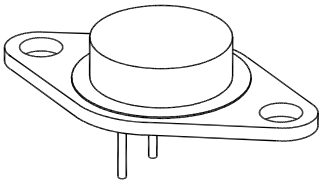
Parameters / Test Conditions	Symbol	2N5660 2N5662	2N5661 2N5663	Unit
Collector-Emitter Voltage	V_{CEO}	200	300	Vdc
Collector-Base Voltage	V_{CBO}	250	400	Vdc
Collector-Emitter Voltage	V_{CER}	250	400	Vdc
Emitter-Base Voltage	V_{EBO}	6		Vdc
Base Current	I_B	0.5		Adc
Collector Current	I_C	2.0		Adc
Operating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

Note:

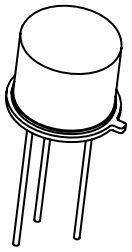
1. Derate linearly 11.4mW/°C for T_A > +25°C
2. Derate linearly 5.7mW/°C for T_A > +25°C
3. Derate linearly 200mW/°C for T_C > +100°C
4. Derate linearly 150mW/°C for T_C > +100°C

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

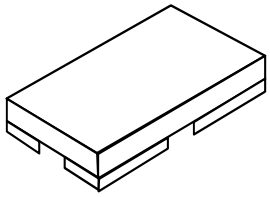
Parameters / Test Conditions		Symbol	Min.	Max.	Unit
OFF CHARACTERTICS					
Collector-Emitter Breakdown Voltage I_C = 10mAdc	2N5660, U3, 2N5662 2N5661, U3, 2N5663	$V_{(BR)CEO}$	200 300		Vdc
Collector-Base Breakdown Voltage I_C = 10mAdc, R_{BE} = 100Ω	2N5660, U3, 2N5662 2N5661, U3, 2N5663	$V_{(BR)CER}$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



TO-66
2N5660, 2N5661



TO-5
2N5662, 2N5663



U3
2N5660U3, 2N5661U3

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

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

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small–Signal Short-Circuit Forward Current Transfer Ratio I_C = 0.1Adc, V_{CE} = 5.0Vdc, f = 10MHz	$\|h_{fe}\|$	2.0	7.0	
Output Capacitance 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 V_{CC} = 100Vdc; I_C = 0.5Adc; I_{B1} = 15mAdc V_{CC} = 100Vdc; I_C = 0.5Adc; I_{B1} = 25mAdc	 2N5660, U3, 2N5662 2N5661, U3, 2N5663	t_{on}		 0.25 0.25	µs
Turn-Off Time V_{CC} = 100Vdc; I_C = 0.5Adc; I_{B1} = -I_{B2} = 15mAdc V_{CC} = 100Vdc; I_C = 0.5Adc; I_{B1} = -I_{B2} = 25mAdc	 2N5660, U3, 2N5662 2N5661, U3, 2N5663	t_{off}		 0.85 1.2	µs

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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%.

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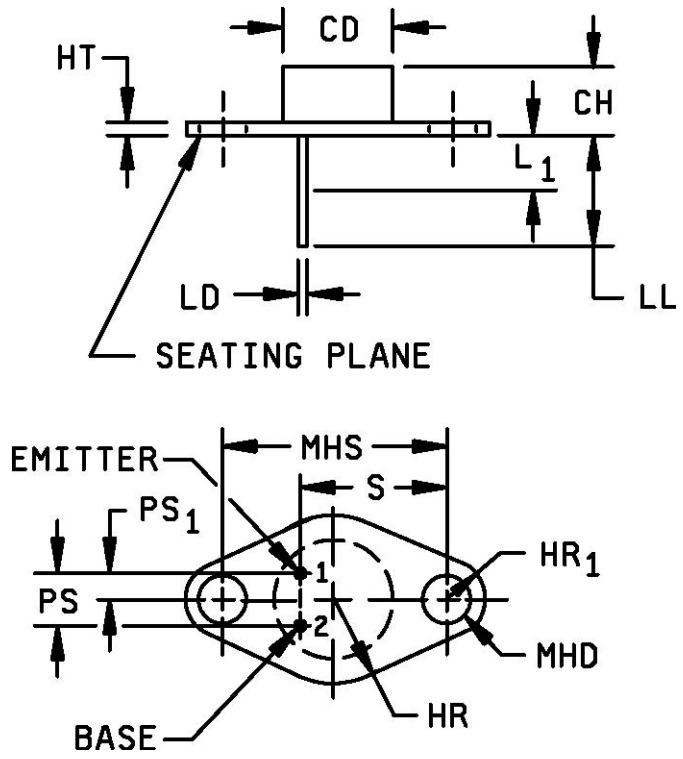
PACKAGE DIMENSIONS



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).

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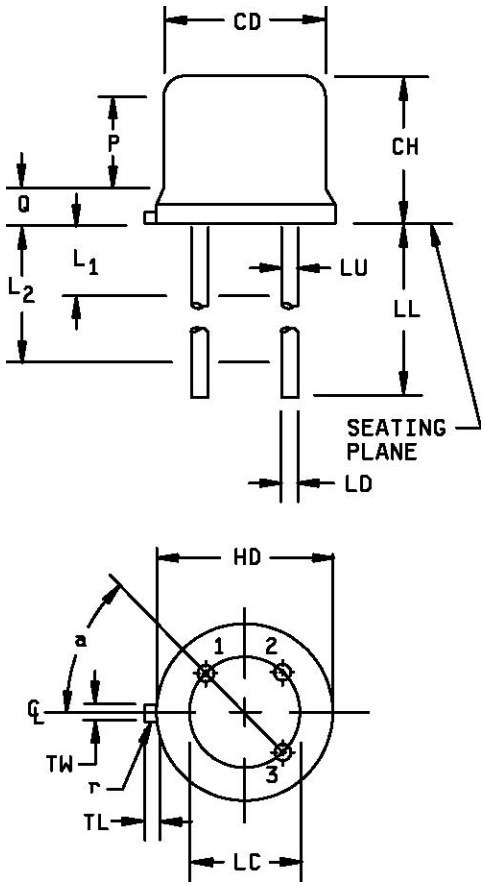

Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.355	7.75	9.02	
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	
LC	.200 TP		5.08 TP		6
LD	.016	.021	0.41	0.53	7
LL	1.500	1.750	38.10	44.45	7
LU	.016	.019	0.407	0.482	7
L_1		.050		1.27	7
L_2	.250		6.35		7
TL	.029	.045	0.74	1.14	3
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)

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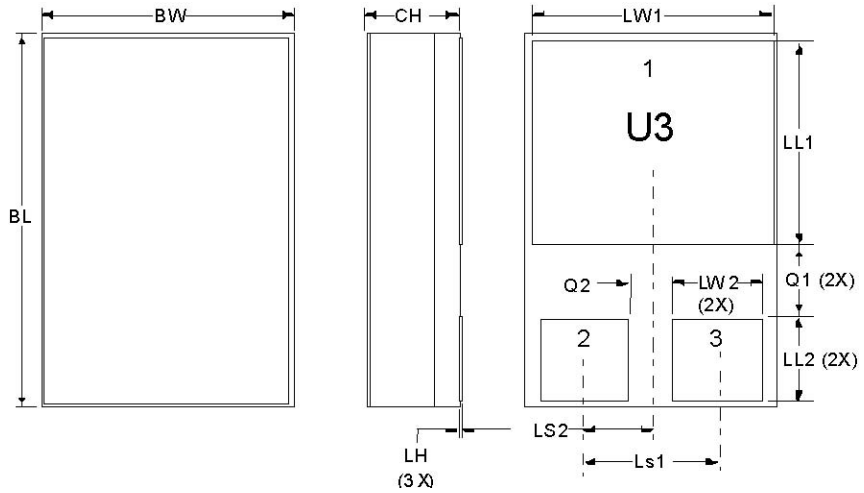

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.395	.405	10.04	10.28
BW	.291	.301	7.40	7.64
CH	.1085	.1205	2.76	3.06
LH	.010	.020	0.25	0.51
LW_1	.281	.291	7.14	7.39
LW_2	.090	.100	2.29	2.54
LL_1	.220	.230	5.59	5.84
LL_2	.115	.125	2.93	3.17
LS_1	.150 BSC		3.81 BSC	
LS_2	.075 BSC		1.91 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).