

## NPN POWER SILICON SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500/560

### DEVICES

**2N5339      2N5339U3**

**LEVELS**  
**JAN**  
**JANTX**  
**JANTXV**  
**JANS**

### ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$ unless otherwise noted)

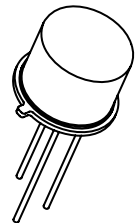
Parameters / Test Conditions	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	100	Vdc
Collector-Base Voltage	$V_{CBO}$	100	Vdc
Emitter-Base Voltage	$V_{EBO}$	6.0	Vdc
Base Current	$I_B$	1.0	Adc
Collector Current	$I_C$	5.0	Adc
Total Power Dissipation	$P_T$	@ $T_A = +25^\circ\text{C}$ <sup>(1)</sup>	1.0
		@ $T_C = +25^\circ\text{C}$ <sup>(2)</sup>	17.5
		@ $T_C = +25^\circ\text{C}$ <sup>(3)</sup> – U3	75
Operating & Storage Junction Temperature Range	$T_{op}, T_{stg}$	-65 to +200	$^\circ\text{C}$
Thermal Resistance, Junction-to Air	$R_{\theta JA}$	175	$^\circ\text{C}/\text{W}$

### NOTES:

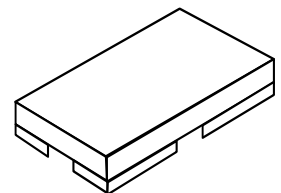
- 1) Derate linearly 5.71mW/ $^\circ\text{C}$  for  $T_A > 25^\circ\text{C}$
- 2) Derate linearly 100mW/ $^\circ\text{C}$  for  $T_C > 25^\circ\text{C}$
- 3) Derate linearly 434mW/ $^\circ\text{C}$  for  $T_C > 25^\circ\text{C} - \text{U3}$

### ELECTRICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage $I_C = 50\text{mA}$	$V_{(BR)CEO}$	100		Vdc
Collector-Emitter Cutoff Current $V_{CE} = 100\text{Vdc}$	$I_{CEO}$		100	$\mu\text{Adc}$
Collector-Emitter Cutoff Current $V_{CE} = 90\text{Vdc}, V_{BE} = 1.5\text{Vdc}$	$I_{CEX}$		1.0	$\mu\text{Adc}$
Collector-Base Cutoff Current $V_{CB} = 100\text{Vdc}$	$I_{CBO}$		1.0	$\mu\text{Adc}$
Emitter-Base Cutoff Current $V_{EB} = 6.0\text{Vdc}$	$I_{EBO}$		100	$\mu\text{Adc}$



**TO-39**  
**(TO-205AD)**



**U-3**  
**(TO-276AA)**

## ELECTRICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise noted) (CONT.)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS <sup>(3)</sup></b>				
Forward-Current Transfer Ratio $I_C = 0.5\text{A}_{dc}$ , $V_{CE} = 2.0\text{V}_{dc}$ $I_C = 2.0\text{A}_{dc}$ , $V_{CE} = 2.0\text{V}_{dc}$ $I_C = 5.0\text{A}_{dc}$ , $V_{CE} = 2.0\text{V}_{dc}$	$h_{FE}$	60 60 40	240	
Collector-Emitter Saturation Voltage $I_C = 2.0\text{A}_{dc}$ , $I_B = 0.2\text{A}_{dc}$ $I_C = 5.0\text{A}_{dc}$ , $I_B = 0.5\text{A}_{dc}$	$V_{CE(sat)}$		0.7 1.2	Vdc
Base-Emitter Saturation Voltage $I_C = 2.0\text{A}_{dc}$ , $I_B = 0.2\text{A}_{dc}$ $I_C = 5.0\text{A}_{dc}$ , $I_B = 0.5\text{A}_{dc}$	$V_{BE(sat)}$		1.2 1.8	Vdc

## DYNAMIC CHARACTERISTICS

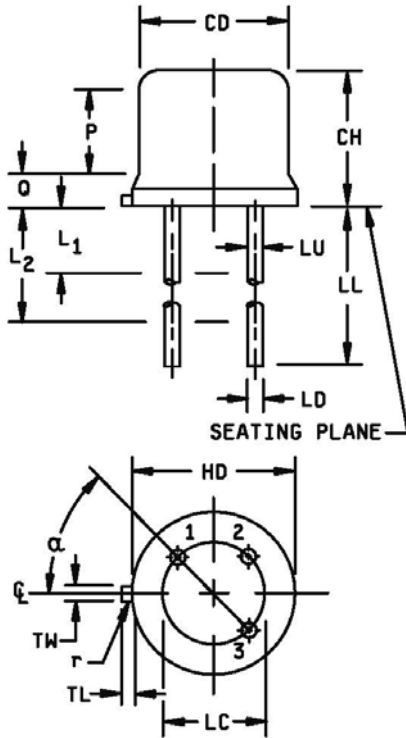
Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 0.5\text{A}_{dc}$ , $V_{CE} = 10\text{V}_{dc}$ , $f = 10\text{MHz}$	$ h_{fe} $	3.0	15	
Output Capacitance $V_{CB} = 10\text{V}_{dc}$ , $I_E = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$	$C_{obo}$		250	pF
Input Capacitance $V_{BE} = 2.0\text{V}_{dc}$ , $I_C = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$	$C_{ibo}$		1,000	pF

## SAFE OPERATING AREA

<b>DC Tests</b> $T_C = +25^\circ\text{C}$ , 1 Cycle, $t \geq 0.5\text{s}$ <b>Test 1</b> $V_{CE} = 2.0\text{V}_{dc}$ , $I_C = 5.0\text{A}_{dc}$ <b>Test 2</b> $V_{CE} = 5.0\text{V}_{dc}$ , $I_C = 2.0\text{A}_{dc}$ <b>Test 3</b> $V_{CE} = 90\text{V}_{dc}$ , $I_C = 55\text{mA}_{dc}$
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(3) Pulse Test: Pulse Width = 300 $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

## PACKAGE DIMENSIONS



Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.355	7.75	9.02	5
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	3
LC	.200 TP		5.08 TP		6
LD	.016	.021	0.41	0.53	7
LL	.500	.750	12.70	19.05	7
LU	.016	.019	0.41	0.48	7
L <sub>1</sub>		.050		1.27	7
L <sub>2</sub>	.250		6.35		7
TL	.029	.045	0.74	1.14	3
TW	.028	.034	0.71	0.86	10
P	.100		2.54		5
Q		.050		1.27	4
r		.010		0.25	10, 11
α	45° TP		45° TP		6
Notes	1, 2, 8, 9		1, 2, 8, 9		

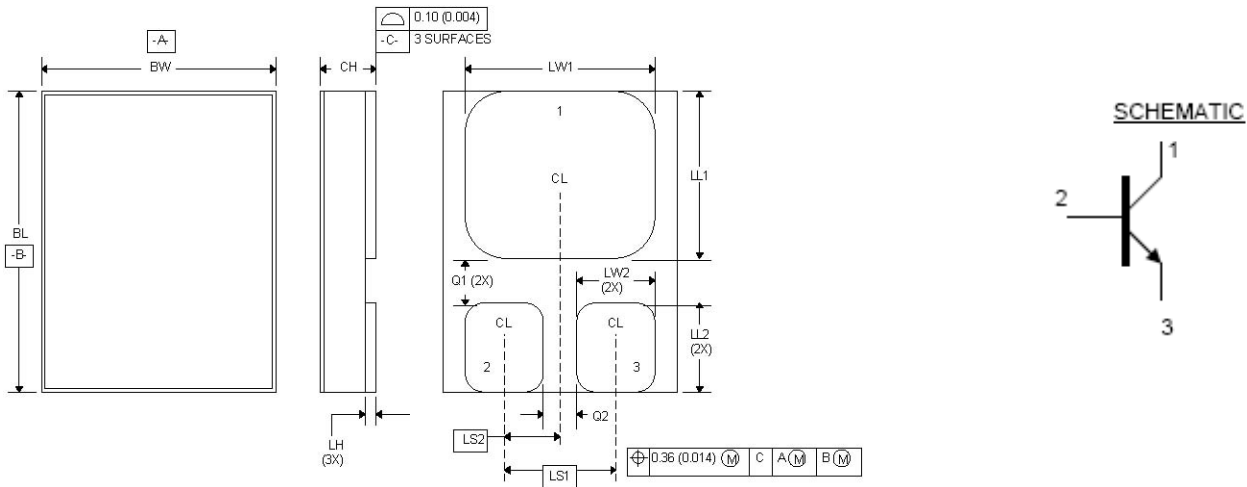
### NOTES:

- Dimensions are in inches.
- Millimeters are given for general information only.
- Symbol TL is measured from HD maximum.
- Details of outline in this zone are optional.
- Symbol CD shall not vary more than .010 (0.25 mm) in zone P. This zone is controlled for automatic handling.
- 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 true position (TP) relative to tab. Device may be measured by direct methods or by gauge.
- Symbol LD applies between L<sub>1</sub> and L<sub>2</sub>. Dimension LD applies between L<sub>2</sub> and LL minimum.
- Lead designation, depending on device type, shall be as follows:

Lead number	TO-39
1	Emitter
2	Base
3	Collector

- Lead number three is electrically connected to case.
- Beyond r maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
- Symbol r applied to both inside corners of tab.
- In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.

FIGURE 1. Physical dimensions (TO-39)



### NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.
4. Terminal 1 - collector, terminal 2 - base, terminal 3 - emitter.

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.395	.405	10.03	10.29
BW	.291	.301	7.40	7.65
CH	.1085	.1205	2.76	3.06
LH	.010	.020	0.25	0.51
LW <sub>1</sub>	.281	.291	7.14	7.39
LW <sub>2</sub>	.090	.100	2.29	2.54
LL <sub>1</sub>	.220	.230	5.59	5.84
LL <sub>2</sub>	.115	.125	2.92	3.18
LS <sub>1</sub>	.150 BSC		3.81 BSC	
LS <sub>2</sub>	.075 BSC		1.91 BSC	
Q <sub>1</sub>	.030		0.762	
Q <sub>2</sub>	.030		0.762	

**FIGURE 2.** Physical dimensions and configuration (U3) (SMD 5) (TO-276AA)