

## PNP SILICON LOW POWER TRANSISTOR

Qualified per MIL-PRF-19500/350

### DEVICES

**2N3867**                      **2N3867S**  
**2N3868**                      **2N3868S**

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

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

Parameters / Test Conditions	Symbol	2N3867	2N3868	Unit
Collector-Base Voltage	$V_{CBO}$	40	60	Vdc
Collector-Emitter Voltage	$V_{CEO}$	40	60	Vdc
Emitter-Base Voltage	$V_{EBO}$	4.0		Vdc
Collector Current	$I_C$	3.0		mA
Total Power Dissipation @ $T_A = +25^\circ\text{C}$ <sup>(1)</sup>	$P_T$	1.0		W/°C
Operating & Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200		°C

### THERMAL CHARACTERISTICS

Parameters / Test Conditions	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	175	°C/mW

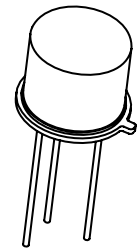
**Note:** \* Electrical characteristics for “S” suffix devices are identical to the “non S” corresponding devices.

1/ Derate linearly 5.71mW/°C for  $T_A > +25^\circ\text{C}$

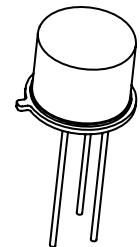
2/ Derate linearly 57.1mW/°C for  $T_C > +25^\circ\text{C}$

### 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 Current $I_C = 10\mu\text{A}$	$V_{(BR)CEO}$	40	60	Vdc
Collector-Base Cutoff Current $V_{CB} = 40\text{Vdc}$ $V_{CB} = 60\text{Vdc}$	$I_{CBO}$		100	$\mu\text{A}$
Emitter-Base Cutoff Current $V_{EB} = 4.0\text{Vdc}$	$I_{EBO}$		100	$\mu\text{A}$
Collector-Emitter Cutoff Current $V_{CE} = 40\text{Vdc}$ $V_{CE} = 60\text{Vdc}$ $V_{CE} = 40\text{Vdc}, T_A = +150^\circ\text{C}$ $V_{CE} = 60\text{Vdc}, T_A = +150^\circ\text{C}$	$I_{CEX}$		1.0 1.0 50 50	$\mu\text{A}$



**TO-5 \***  
**2N3867, 2N3868**



**TO-39 \* (TP-205AD)**  
**2N3867S, 2N3868S**

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS <sup>(2)</sup></b>				
Forward-Current Transfer Ratio $I_C = 500\text{mA}$ , $V_{CE} = 1.0\text{Vdc}$ 2N3867, S 2N3868, S	h <sub>FE</sub>	50		
$I_C = 1.5\text{A}$ , $V_{CE} = 2.0\text{Vdc}$ 2N3867, S 2N3868, S		35	200	
$I_C = 2.5\text{A}$ , $V_{CE} = 3.0\text{Vdc}$ 2N3867, S 2N3868, S		40	150	
$I_C = 3.0\text{A}$ , $V_{CE} = 5.0\text{Vdc}$ 2N3867, S 2N3868, S		25		
$I_C = 500\text{mA}$ , $V_{CE} = 1.0\text{Vdc}$ , $T_A = -55^\circ\text{C}$ 2N3867, S 2N3868, S		20		
$I_C = 500\text{mA}$ , $V_{CE} = 1.0\text{Vdc}$ , $T_A = -55^\circ\text{C}$ 2N3867, S 2N3868, S		17		
Collector-Emitter Saturation Voltage $I_C = 500\text{mA}$ , $I_B = 50\text{mA}$ $I_C = 1.5\text{A}$ , $I_B = 150\text{mA}$ $I_C = 2.5\text{A}$ , $I_B = 250\text{mA}$	V <sub>CE(sat)</sub>		0.5 0.75 1.5	Vdc
Base-Emitter Saturation Voltage $I_C = 500\text{mA}$ , $I_B = 50\text{mA}$ $I_C = 1.5\text{A}$ , $I_B = 150\text{mA}$ $I_C = 2.5\text{A}$ , $I_B = 250\text{mA}$ 2N3867, S 2N3868, S	V <sub>BE(sat)</sub>	0.9 0.85	1.0 1.4 1.4 2.0	Vdc

**DYNAMIC CHARACTERISTICS**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short Circuit Forward Current Transfer Ratio $I_C = 100\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$ , $f = 20\text{MHz}$	h <sub>fc</sub>	3	12	kΩ
Output Capacitance $V_{CB} = 10\text{Vdc}$ , $I_E = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$	C <sub>obo</sub>		120	pF
Input Capacitance $V_{EB} = 3.0\text{Vdc}$ , $I_C = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$	C <sub>ibo</sub>		800	pF

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

## SWITCHING CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Delay Time $V_{CC} = -30\text{dc}, V_{EB} = 0$	$t_d$		35	nS
Rise Time $I_C = 1.5\text{Adc}, I_{B1} = 150\text{mAdc}$	$t_r$		65	
Storage Time $V_{CC} = -30\text{dc}, V_{EB} = 0$	$t_s$		500	nS
Fall Time $I_C = 1.5\text{Adc}, I_{B1} = I_{B2} = 150\text{mAdc}$	$t_f$		100	
Turn-On Time $V_{CC} = 30, I_C = 1.5\text{Adc}, I_B = 150\text{mA}$	$t_{on}$		100	nS
Turn-Off Time $V_{CC} = 30, I_C = 1.5\text{Adc}, I_B = 150\text{mA}$	$t_{off}$		600	nS

## SAFE OPERATING AREA

### DC Test

$T_C = 25^\circ\text{C}, 1 \text{ cycle}, t = 1.0\text{s}$

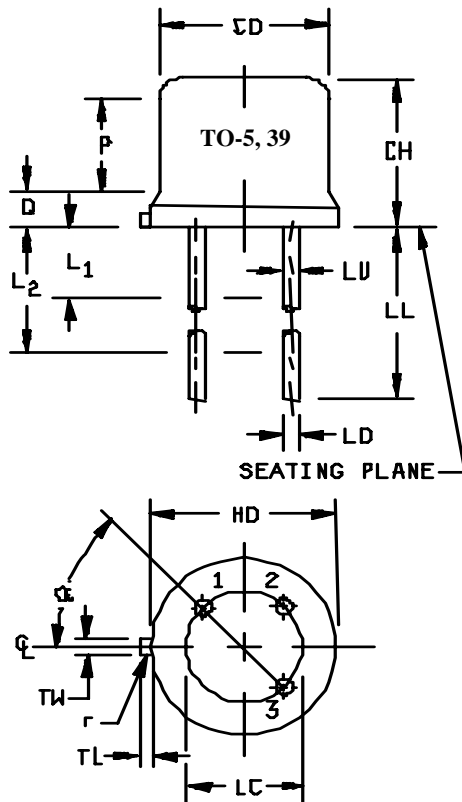
### Test 1

$V_{CE} = 3.33\text{Vdc}, I_C = 3.0\text{Adc}$

### Test 2

$V_{CE} = 40\text{Vdc}, I_C = 160\text{mAdc}$       2N3867,  
 $V_{CE} = 60\text{Vdc}, I_C = 80\text{mAdc}$       2N3868, S

## PACKAGE DIMENSIONS



Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	5, 6
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	4, 5
LC	.200 TP		5.08 TP		7
LD	.016	.019	0.41	0.48	8,9
LL	See note 8, 14				
LU	.016	.019	0.41	0.48	8,9
L <sub>1</sub>		.050		1.27	8,9
L <sub>2</sub>	.250		6.35		8,9
P	.100		2.54		7
Q		.030		0.76	5
TL	.029	.045	0.74	1.14	3,4
TW	.028	.034	0.71	0.86	3
R		.010		0.25	10
α	45° TP		45° TP		7
1, 2, 10, 12, 13, 14					

### NOTES:

- Dimensions are in inches.
- Millimeters are given for general information only.
- Beyond r (radius) maximum, TW shall be held for a minimum length of .011 (0.28 mm).
- Dimension TL measured from maximum HD.
- Body contour optional within zone defined by HD, CD, and Q.
- CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
- Leads at gauge plane  $.054 + .001 - .000$  inch ( $1.37 + 0.03 - 0.00$  mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC. The device may be measured by direct methods or by gauging procedure.
- Dimension LU applies between L<sub>1</sub> and L<sub>2</sub>. Dimension LD applies between L<sub>2</sub> and LL minimum. Diameter is uncontrolled in and beyond LL minimum.
- All three leads.
- The collector shall be internally connected to the case.
- Dimension r (radius) applies to both inside corners of tab.
- In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.
- Lead 1 = emitter, lead 2 = base, lead 3 = collector.
- For non-S-suffix devices (TO-5), dimension LL = 1.5 inches (38.10 mm) min. and 1.75 inches (44.45 mm) max. For S-suffix types (TO-39), dimension LL = .5 inch (12.70 mm) min. and .750 inch (19.05 mm) max.

**FIGURE 1.** Physical dimensions (similar to TO-5, TO-39)