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## NPN Silicon Switching Transistor

Qualified per MIL-PRF-19500/399

Qualified Levels:  
JAN, JANTX, AND  
JANTXV

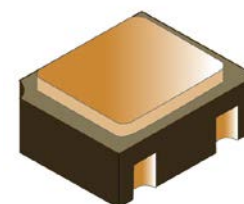
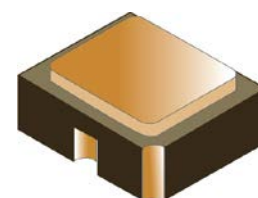
### DESCRIPTION

This 2N3960UB epitaxial planar transistor is military qualified up to the JANTXV level for high-reliability applications. It features a low profile ceramic UB package. This device is also available in a thru-hole TO-18 package.

**Important:** For the latest information, visit our website <http://www.microsemi.com>.

### FEATURES

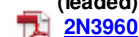
- Surface mount equivalent of JEDEC registered 2N3960 number
- JAN, JANTX, and JANTXV qualifications are available per MIL-PRF-19500/366. (See [part nomenclature](#) for all available options.)
- RoHS compliant



### UB Package

Also available in:

**TO-18 package**  
(lead)



[2N3960](#)

### APPLICATIONS / BENEFITS

- General purpose transistors for medium power applications requiring high frequency switching
- Low profile ceramic package
- Lightweight
- Military and other high-reliability applications

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

Parameters / Test Conditions	Symbol	Value	Unit
Junction & Storage Temperature Range	$T_J, T_{stg}$	-65 to +200	$^\circ\text{C}$
Collector-Emitter Voltage	$V_{CEO}$	12	V
Collector-Base Voltage	$V_{CBO}$	20	V
Emitter-Base Voltage	$V_{EBO}$	4.5	V
Total Power Dissipation @ $T_A = +25^\circ\text{C}^{(1)}$	$P_T$	400	mW

**Notes:** 1. Derate linearly 2.3 mW/ $^\circ\text{C}$  above  $T_A = +25^\circ\text{C}$

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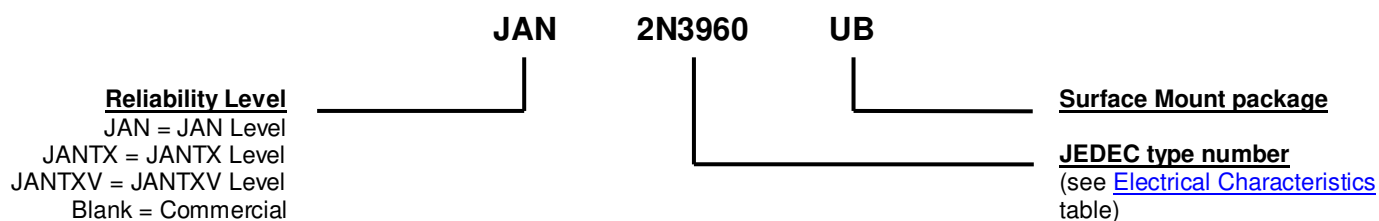
**Website:**

[www.microsemi.com](http://www.microsemi.com)

### MECHANICAL and PACKAGING

- CASE: Ceramic with kovar lid
- TERMINALS: Gold plating over nickel under plate.
- MARKING: Part number, date code, manufacturer's ID
- TAPE & REEL option: Standard per EIA-418D. Consult factory for quantities.
- WEIGHT: Less than 0.04 grams
- See [Package Dimensions](#) on last page.

### PART NOMENCLATURE



### SYMBOLS & DEFINITIONS

Symbol	Definition
$I_B$	Base current: The value of the dc current into the base terminal.
$I_C$	Collector current: The value of the dc current into the collector terminal.
$V_{CB}$	Collector-base voltage: The dc voltage between the collector and the base.
$V_{CBO}$	Collector-base voltage, base open: The voltage between the collector and base terminals when the emitter terminal is open-circuited.
$V_{CE}$	Collector-emitter voltage: The dc voltage between the collector and the emitter.
$V_{CEO}$	Collector-emitter voltage, base open: The voltage between the collector and the emitter terminals when the base terminal is open-circuited.
$V_{CC}$	Collector-supply voltage: The supply voltage applied to a circuit connected to the collector.
$V_{EB}$	Emitter-base voltage: The dc voltage between the emitter and the base
$V_{EBO}$	Emitter-base voltage, collector open: The voltage between the emitter and base terminals with the collector terminal open-circuited.



**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 $I_C = 10\ \mu\text{A}$ , pulsed	$V_{(BR)CEO}$	12		V
Collector-Base Cutoff Current $V_{CB} = 20\ \text{V}$	$I_{CBO}$		10	$\mu\text{A}$
Emitter-Base Cutoff Current $V_{EB} = 4.5\ \text{V}$	$I_{EBO}$		10	$\mu\text{A}$
Collector-Emitter Cutoff Current $V_{CE} = 10\ \text{V}$ , $V_{EB} = 0.4\ \text{V}$ $V_{CE} = 10\ \text{V}$ , $V_{EB} = 2.0\ \text{V}$	$I_{CEX1}$ $I_{CEX2}$		1 5	$\mu\text{A}$ nA

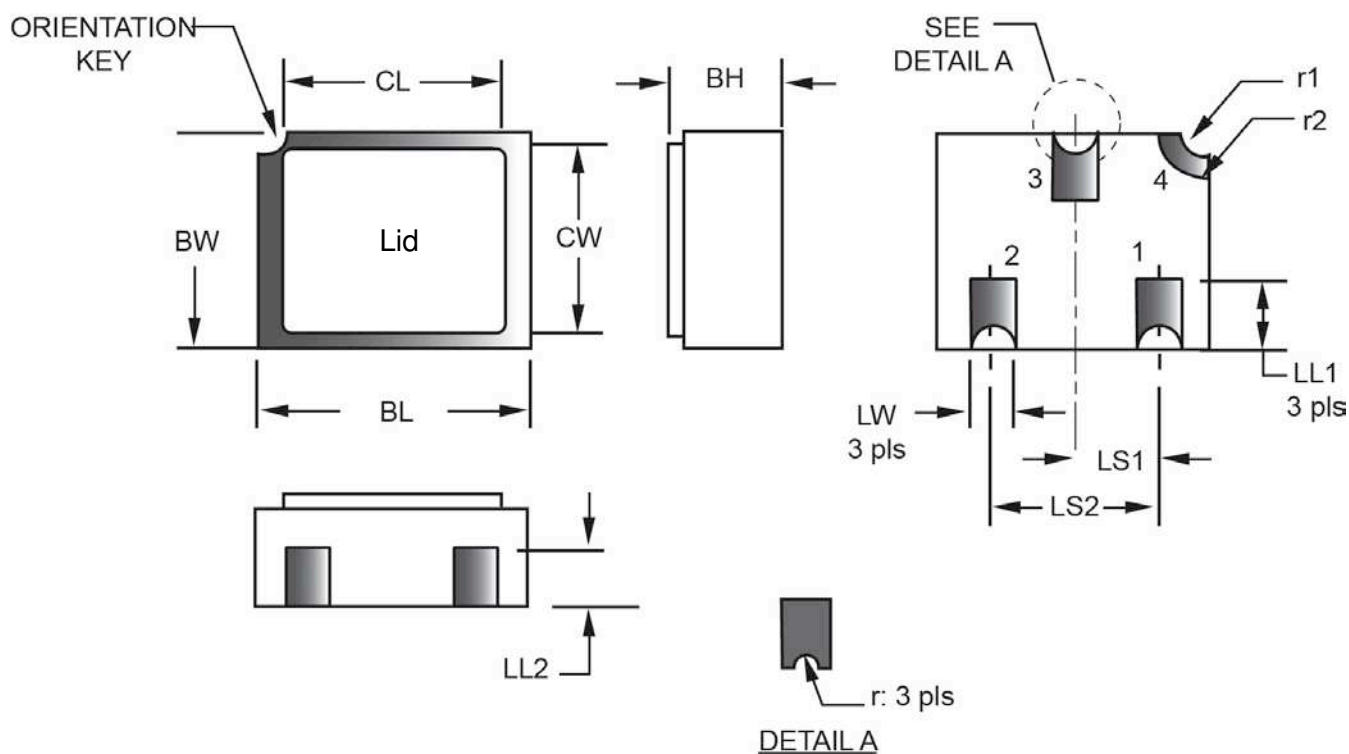
**ON CHARACTERISTICS <sup>(1)</sup>**

Forward-Current Transfer Ratio $I_C = 1.0\ \text{mA}$ , $V_{CE} = 1\ \text{V}$ $I_C = 10\ \text{mA}$ , $V_{CE} = 1\ \text{V}$ $I_C = 30\ \text{mA}$ , $V_{CE} = 1\ \text{V}$	$h_{FE}$	40 60 30	300	
Collector-Emitter Saturation Voltage $I_C = 1.0\ \text{mA}$ , $I_B = 0.1\ \text{mA}$ $I_C = 30\ \text{mA}$ , $I_B = 3.0\ \text{mA}$	$V_{CE(sat)}$		0.2 0.3	V
Base-Emitter Saturation Voltage $I_C = 1.0\ \text{mA}$ , $V_{CE} = 1.0\ \text{V}$ $I_C = 30\ \text{mA}$ , $V_{CE} = 1.0\ \text{V}$	$V_{BE}$		0.8 1.0	V

**DYNAMIC CHARACTERISTICS**

Forward Current Transfer Ratio, Magnitude $I_C = 5.0\ \text{mA}$ , $V_{CE} = 4\ \text{V}$ , $f = 100\ \text{MHz}$ $I_C = 10\ \text{mA}$ , $V_{CE} = 4\ \text{V}$ , $f = 100\ \text{MHz}$ $I_C = 30\ \text{mA}$ , $V_{CE} = 4\ \text{V}$ , $f = 100\ \text{MHz}$	$ h_{fe} $	13 14 12		
Output Capacitance $V_{CB} = 4\ \text{V}$ , $I_E = 0$ , $100\ \text{kHz} \leq f \leq 1\ \text{MHz}$	$C_{obo}$		2.5	pF
Input Capacitance $V_{EB} = 0.5\ \text{V}$ , $I_C = 0$ , $100\ \text{kHz} \leq f \leq 1.0\ \text{MHz}$	$C_{ibo}$		2.5	pF

(1) Pulse Test: pulse width = 300  $\mu\text{s}$ , duty cycle  $\leq 2.0\%$

**PACKAGE DIMENSIONS**


Symbol	Dimensions				Note	Symbol	Dimensions				Note
	Inch		Millimeters				Inch		Millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
BH	0.046	0.056	1.17	1.42		LS <sub>1</sub>	0.035	0.040	0.89	1.02	
BL	0.115	0.128	2.92	3.25		LS <sub>2</sub>	0.071	0.079	1.80	2.01	
BW	0.085	0.108	2.16	2.74		LW	0.016	0.024	0.41	0.61	
CL	-	0.128	-	3.25		r	-	0.008	-	0.203	
CW	-	0.108	-	2.74		r <sub>1</sub>	-	0.012	-	0.305	
LL <sub>1</sub>	0.022	0.038	0.56	0.97		r <sub>2</sub>	-	0.022	-	0.559	
LL <sub>2</sub>	0.017	0.035	0.43	0.89							

**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for information only.
3. Hatched areas on package denote metallized areas.
4. Lid material: Kovar
5. Pad 1 = Base, Pad 2 = Emitter, Pad 3 = Collector, Pad 4 = Shielding connected to the lid.
6. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.