



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

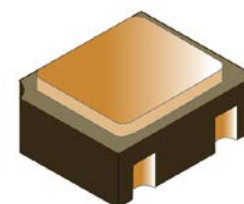
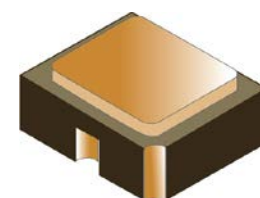
APPLICATIONS / BENEFITS

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

MAXIMUM RATINGS @ $T_C = +25\text{ }^{\circ}\text{C}$ 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 @ $T_A = +25\text{ }^{\circ}\text{C}$ ⁽¹⁾	P_T	400	mW

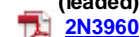
Notes: 1. Derate linearly 2.3 mW/ $^{\circ}\text{C}$ above $T_A = +25\text{ }^{\circ}\text{C}$



UB Package

Also available in:

TO-18 package
(leaded)



[2N3960](#)

MSC – Lawrence

6 Lake Street,
Lawrence, MA 01841
Tel: 1-800-446-1158 or
(978) 620-2600
Fax: (978) 689-0803

MSC – Ireland

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

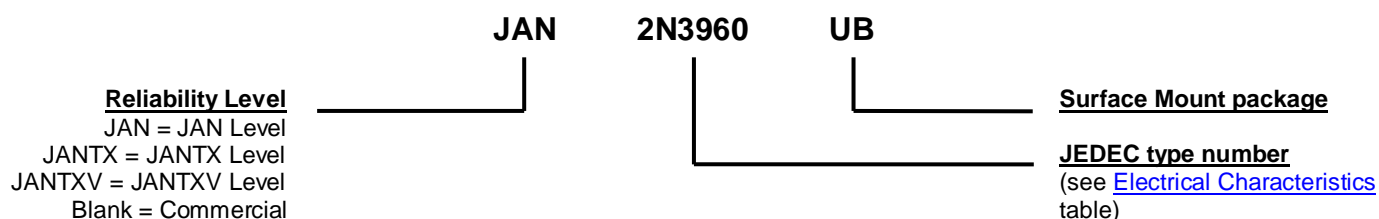
Website:

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 @ $T_A = +25\text{ }^{\circ}\text{C}$, unless otherwise noted

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
------------------------------	--------	------	------	------

OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage $I_C = 10\text{ }\mu\text{A}$, pulsed	$V_{(BR)CEO}$	12		V
Collector-Base Cutoff Current $V_{CB} = 20\text{ V}$	I_{CBO}		10	μA
Emitter-Base Cutoff Current $V_{EB} = 4.5\text{ V}$	I_{EBO}		10	μA
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	μA nA

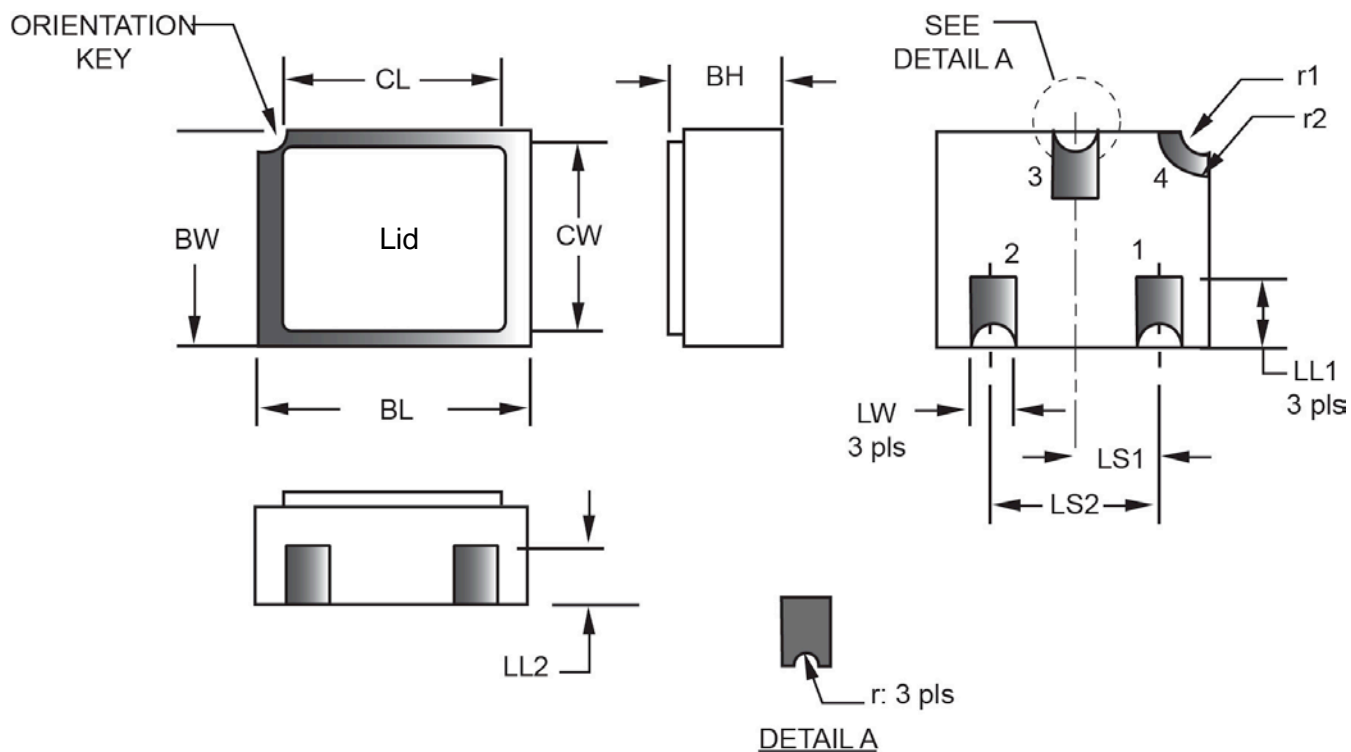
ON CHARACTERISTICS ⁽¹⁾

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 μs , 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 ₁	0.035	0.040	0.89	1.02	
BL	0.115	0.128	2.92	3.25		LS ₂	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 ₁	-	0.012	-	0.305	
LL ₁	0.022	0.038	0.56	0.97		r ₂	-	0.022	-	0.559	
LL ₂	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 Φ x symbology.