



## USS304NX

Preliminary

NPN EPITAXIAL SILICON TRANSISTOR

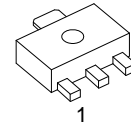
### 60V NPN LOW SATURATION MEDIUM POWER TRANSISTOR

#### DESCRIPTION

The **USS304NX** is an new low saturation 60V NPN transistor offers extremely low on state losses making it ideal for use in DC-DC circuits and various driving and power management functions.

#### FEATURES

- \* Low collector-emitter saturation voltage  $V_{CE(SAT)}$
- \* High collector current capability  $I_C$  and  $ICM$
- \* High collector current gain ( $h_{FE}$ ) at high  $I_C$
- \* High efficiency due to less heat generation
- \* Smaller required Printed-Circuit Board (PCB) area than for conventional transistors



SOT-89

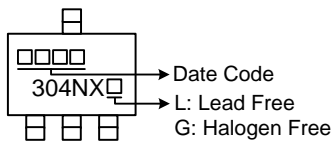
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
USS304NXL-AB3-R	USS304NXG-AB3-R	SOT-89	B	C	E	Tape Reel

Note: Pin Assignment: B: Base C: Collector E: Emitter

USS304NXG-AB3-R	(1)Packing Type	(1) R: Tape Reel
	(2)Package Type	(2) AB3: SOT-89
	(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

#### MARKING



### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>= 25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Collector to Base Voltage	V <sub>CBO</sub>	60	V
Collector to Emitter Voltage	V <sub>CEO</sub>	60	V
Emitter to Base Voltage	V <sub>EBO</sub>	5	V
Collector Current	I <sub>C</sub>	4.7	A
Peak Collector Current	I <sub>CM</sub>	9.4	A
Collector Dissipation	P <sub>C</sub>	1.65	W
Junction Temperature	T <sub>J</sub>	+150	°C
Storage Temperature	T <sub>STG</sub>	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Single pulse, P<sub>W</sub>=10ms.

3. Device mounted on FR-4 PCB with minimum recommended pad layout.

### ■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ <sub>JA</sub>	76	°C/W
Junction to Case	θ <sub>JC</sub>	20	°C/W

### ■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>= 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	I <sub>C</sub> =100μA				V
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> =1μA				V
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	I <sub>E</sub> =100μA				V
Collector Cutoff Current	I <sub>CBO</sub>	V <sub>CB</sub> =60V, I <sub>E</sub> =0A			100	nA
Collector-Emitter Cut-off Current	I <sub>CES</sub>	V <sub>CE</sub> =120V				nA
Emitter Cutoff Current	I <sub>EBO</sub>	V <sub>EB</sub> =5V, I <sub>C</sub> =0A			100	nA
Base Emitter On Voltage (Note)	V <sub>BE(ON)</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =2A			0.85	V
Base-Emitter Saturation Voltage (Note)	V <sub>BE(SAT)</sub>	I <sub>C</sub> =1A, I <sub>B</sub> =100mA			0.9	V
		I <sub>C</sub> =4A, I <sub>B</sub> =400mA			1.05	V
Collector-Emitter Saturation Voltage (Note)	V <sub>CE(SAT)</sub>	I <sub>C</sub> =0.5A, I <sub>B</sub> =50mA			35	mV
		I <sub>C</sub> =1A, I <sub>B</sub> =50mA			70	mV
		I <sub>C</sub> =1A, I <sub>B</sub> =10mA			120	mV
		I <sub>C</sub> =2A, I <sub>B</sub> =40mA			150	mV
		I <sub>C</sub> =4A, I <sub>B</sub> =200mA			210	mV
		I <sub>C</sub> =4A, I <sub>B</sub> =400mA			200	mV
		I <sub>C</sub> =4A, I <sub>B</sub> =80mA			290	mV
DC Current Transfer Ratio (Note)	h <sub>FE</sub>	I <sub>C</sub> =0.5A, V <sub>CE</sub> =2V	300			
		I <sub>C</sub> =1A, V <sub>CE</sub> =2V	300			
		I <sub>C</sub> =2A, V <sub>CE</sub> =2V	250			
		I <sub>C</sub> =4A, V <sub>CE</sub> =2V	150			
		I <sub>C</sub> =6A, V <sub>CE</sub> =2V	75			
Delay Time	t <sub>d</sub>	I <sub>C</sub> =3A, V <sub>CC</sub> =12.5V, I <sub>BON</sub> =0.15A I <sub>BOFF</sub> =-0.15A		15		ns
Rise Time	t <sub>r</sub>			95		ns
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>			110		ns
Storage Time	t <sub>s</sub>			360		ns
Fall Time	t <sub>f</sub>			195		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			555		ns
Transition Frequency	f <sub>T</sub>		I <sub>C</sub> =100mA, V <sub>CE</sub> =10V, f=1MHz		130	
Collector Capacitance	C <sub>OB</sub>	V <sub>CB</sub> =10V, I <sub>E</sub> =I <sub>B</sub> =0A, f=1MHz		48	70	pF

Note : Measured under pulsed conditions. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

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