



## NPN Darlington Power Silicon Transistor

### Qualified per MIL-PRF-19500/539

*Qualified Levels:  
JAN, JANTX, and  
JANTXV*

#### DESCRIPTION

This high speed NPN transistor is rated at 8 amps and is military qualified up to a JANTXV level. This TO-213AA isolated package features a 180 degree lead orientation.



**TO-213AA (TO-66)  
Package**

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

#### FEATURES

- JEDEC registered 2N6300 and 2N6301
- Hermetically sealed
- JAN, JANTX, and JANTXV qualifications are available per MIL-PRF-19500/539
- RoHS compliant versions available (commercial grade only)

#### APPLICATIONS / BENEFITS

- Convenient package
- Mechanically rugged
- Military, space and other high reliability applications

#### MAXIMUM RATINGS @ T<sub>C</sub> = 25 °C unless otherwise stated

Parameters/Test Conditions	Symbol	Value	Unit	
Junction and Storage Temperature	T <sub>J</sub> and T <sub>STG</sub>	-55 to +200	°C	
Thermal Resistance Junction-to-Case	R <sub>θJC</sub>	2.66	°C	
Collector-Base Voltage	V <sub>CBO</sub>	2N6300	60	V
		2N6301	80	
Collector-Emitter Voltage	V <sub>CEO</sub>	2N6300	60	V
		2N6301	80	
Emitter-Base Voltage	V <sub>EBO</sub>	5	V	
Continuous Operating Collector Current	I <sub>C</sub>	8	A	
Base Current	I <sub>B</sub>	120	mA	
Total Power Dissipation <sup>(1)</sup>	P <sub>T</sub>	@ T <sub>C</sub> = 0 °C	75	W
		@ T <sub>C</sub> = 100 °C	37	

**NOTES:** 1. Derate linearly at 0.428 W/°C above T<sub>C</sub> > 0 °C.

**MSC – Lawrence**

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

**MSC – Ireland**

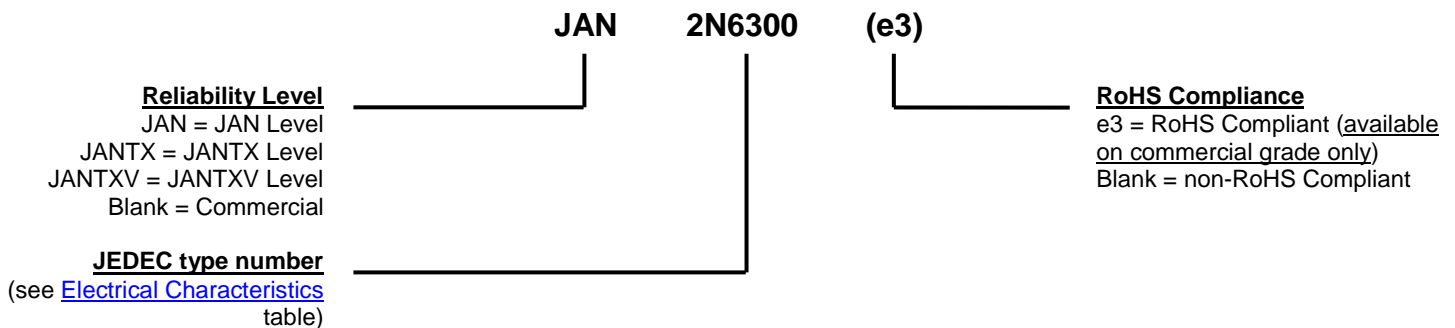
Gort Road Business Park,  
Ennis, Co. Clare, Ireland  
Tel: +353 (0) 65 6840044  
Fax: +353 (0) 65 6822298

**Website:**

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

**MECHANICAL and PACKAGING**

- CASE: Hermetic, TO-213AA package. Nickel plate with nickel cap.
- TERMINALS: Solder dipped (Sn63/Pb37) over nickel plated alloy 52. RoHS compliant matte-tin plating is also available on commercial grade only.
- MARKING: MSC, part number, date code, polarity symbol
- WEIGHT: Approximately 5.7 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.
$I_E$	Emitter current: The value of the dc current into the emitter terminal.
$T_C$	Case temperature: The temperature measured at a specified location on the case of a device.
$V_{CB}$	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.
$V_{CC}$	Collector-supply voltage: The supply voltage applied to a circuit connected to the collector.
$V_{CE}$	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.
$V_{EB}$	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 @ 25 °C unless otherwise stated**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage $I_C = 100 \text{ mA}$	2N6300 2N6301 $V_{(BR)CEO}$	60 80		V
Collector-Emitter Cutoff Current $V_{CE} = 60 \text{ V}, V_{BE} = 1.5 \text{ V}$ $V_{CE} = 80 \text{ V}, V_{BE} = 1.5 \text{ V}$	2N6300 2N6301 $I_{CEX}$		10	$\mu\text{A}$
Collector-Emitter Cutoff Current, Base Open $V_{CE} = 30 \text{ V}$ $V_{CE} = 40 \text{ V}$	2N6300 2N6301 $I_{CEO}$		0.5	mA
Emitter-Base Cutoff Current $V_{EB} = 5 \text{ V}$	$I_{EBO}$		2.0	mA
Forward Current Transfer Ratio $I_C = 1 \text{ A}, V_{CE} = 3 \text{ V}$ $I_C = 4 \text{ A}, V_{CE} = 3 \text{ V}$ $I_C = 8 \text{ A}, V_{CE} = 3 \text{ V}$	$h_{FE}$	500 750 100	18000	
Collector-Emitter Saturation Voltage $I_C = 4.0 \text{ A}, I_B = 16 \text{ mA}$ $I_C = 8.0 \text{ A}, I_B = 80 \text{ mA}$	$V_{CE(sat)}$		2.0 3.0	V
Base-Emitter Saturation Voltage $V_{CE} = 3.0 \text{ V}, I_C = 4 \text{ A}$ $I_C = 8.0 \text{ A}, I_B = 80 \text{ mA}$	$V_{BE(sat)}$		2.8 4.0	V

**DYNAMIC CHARACTERISTICS**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $V_{CE} = 3.0 \text{ V}, I_C = 3.0 \text{ A}, f = 1 \text{ MHz}$	$ h_{fe} $	25	350	
Common Emitter Small-Signal Short-Circuit Forward Current Trans-Ratio $V_{CE} = 3 \text{ V}, I_C = 3 \text{ A}, f = 1 \text{ kHz}$	$h_{fe}$	300		
Common Base Output $V_{CB} = 10 \text{ V}, I_E = 0 \text{ A}, 100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	$C_{obo}$		200	pF

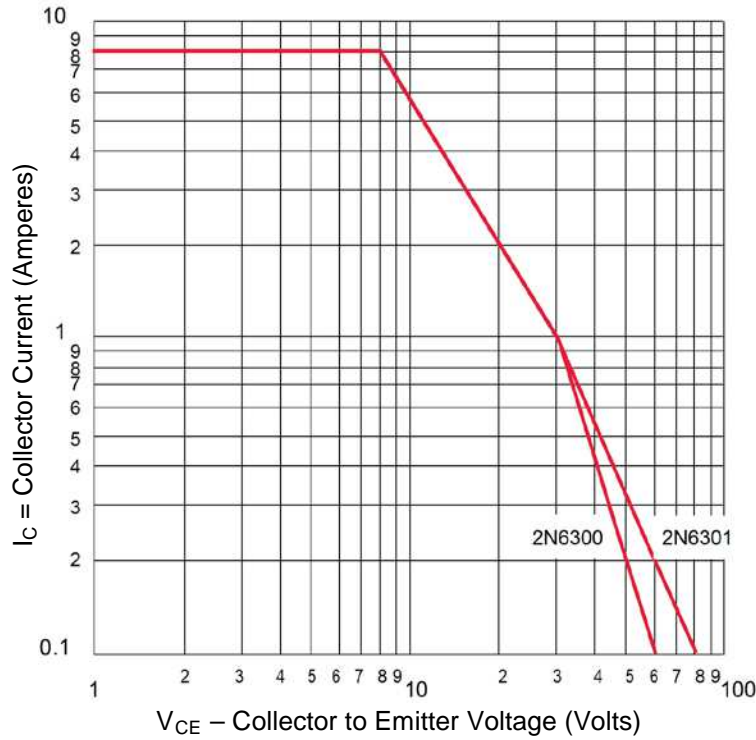
**ELECTRICAL CHARACTERISTICS @  $T_C = 25^\circ\text{C}$  unless otherwise noted. (continued)**
**SWITCHING CHARACTERISTICS**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-On time $V_{CC} = 30\text{ V}, I_C = 4\text{ A}, I_{B1} = 16\text{ mA}$	$t_{on}$		2.0	$\mu\text{s}$
Turn-Off time $V_{CC} = 30\text{ V}, I_C = 4\text{ A}, I_{B1} = -I_{B2} = 16\text{ mA}$	$t_{off}$		8.0	$\mu\text{s}$

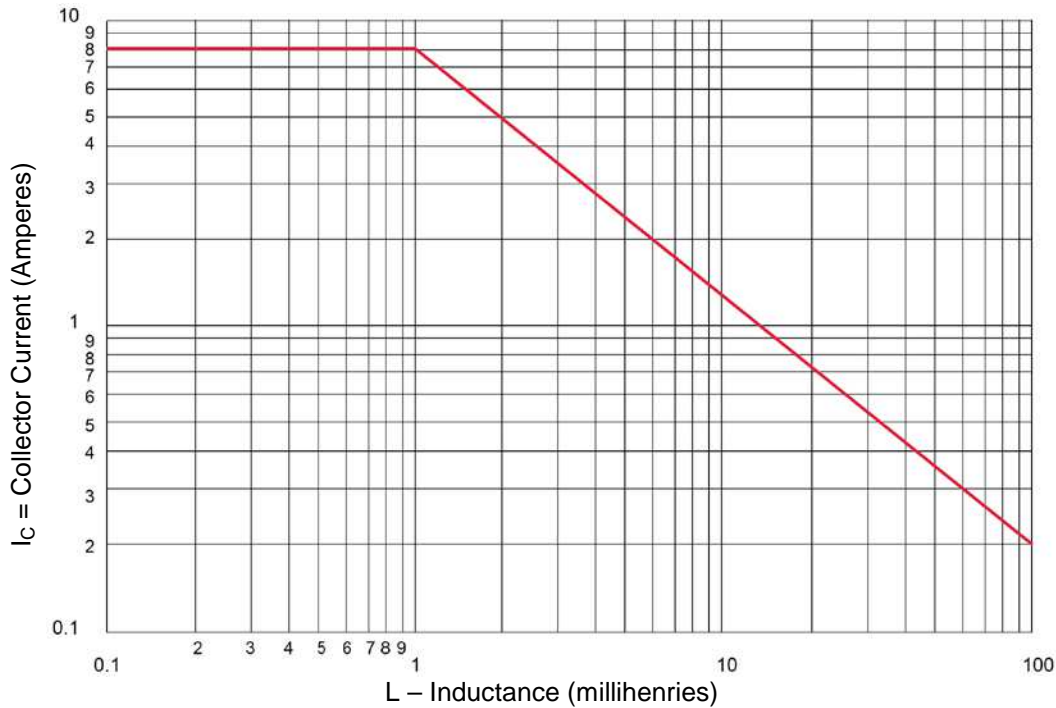
**SAFE OPERATING AREA (See [Figures 1 and 2](#) and [MIL-STD-750, Test Method 3053](#))**
**DC Tests**
 $T_C = +25^\circ\text{C}, t = 1\text{ second}, \text{duty cycle} \leq 10\%$ 
**Test 1**
 $V_{CE} = 8\text{ V}, I_C = 8\text{ A}$ 
**Test 2**
 $V_{CE} = 20\text{ V}, I_C = 2.0\text{ A}$ 
**Test 3**
 $V_{CE} = 60\text{ V}, I_C = 100\text{ mA}$  (2N6300)

 $V_{CE} = 80\text{ V}, I_C = 100\text{ mA}$  (2N6301)

**SAFE OPERATING AREA**

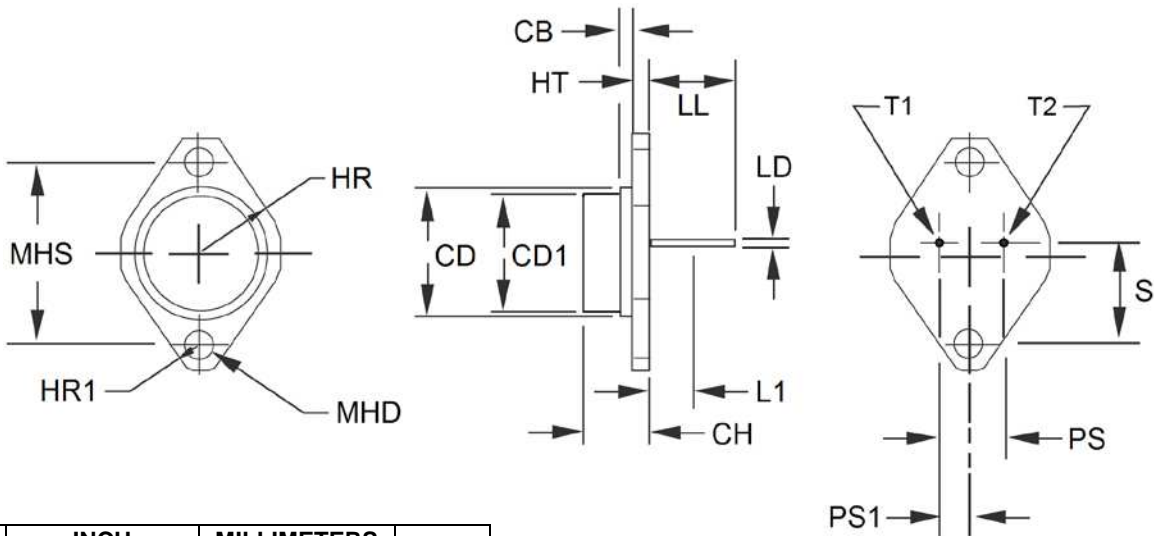


**FIGURE 1 – Maximum Safe Operating Area (dc)**



**FIGURE 2 – Safe Operating Area for switching between saturation and cutoff (unclamped inductive load)**

PACKAGE DIMENSIONS



DIM	INCH		MILLIMETERS		Notes
	MIN	MAX	MIN	MAX	
CB	0.470	0.500	11.94	12.70	
CD	-	0.620	-	15.76	
CH	0.250	0.340	6.35	8.64	
HR	-	0.350	-	8.89	
HT	0.050	0.075	1.27	1.91	
HR1	0.115	0.145	2.92	3.68	4
LD	0.028	0.034	0.71	0.86	4, 6
LL	0.360	0.500	9.14	12.70	
L1	-	0.050	-	1.27	6
MHD	0.142	0.152	3.61	3.86	4
MHS	0.958	0.962	24.33	24.43	
PS	0.190	0.210	4.83	5.33	3
PS1	0.093	0.107	2.36	2.73	3
S	0.570	0.590	14.48	14.99	
T1	Base				
T2	Emitter				
Case	Collector				

NOTES:

- Dimensions are in inches.
- Millimeters are given for information only.
- These dimensions should be measured at points 0.050 inch (1.27 mm) +0.005 inch (0.13 mm) -0.000 inch (0.00 mm) below seating plane. When gauge is not used, measurement will be made at the seating plane.
- Two places.
- The seating plane of the header shall be flat within 0.001 inch (0.03 mm) concave to 0.004 inch (0.10 mm) convex inside a 0.930 inch (23.62 mm) diameter circle on the center of the header and flat within 0.001 inch (0.03 mm) concave to 0.006 inch (0.15 mm) convex overall.
- Lead diameter shall not exceed twice LD within L1.
- Lead number 1 is the emitter, lead 2 is the base, case is the collector.
- In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi x$  symbology.

SCHEMATIC

