

## NPN POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/538

### Devices

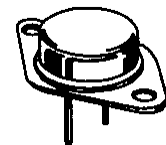
2N6676      2N6678      2N6691      2N6693

### Qualified Level

JAN  
JANTX  
JANTXV

### MAXIMUM RATINGS

Ratings	Symbol	2N6676 2N6691	2N6678 2N6693	Unit
Collector-Emitter Voltage	$V_{CEO}$	300	400	Vdc
Collector-Base Voltage	$V_{CBO}$	450	650	Vdc
Collector-Base Voltage	$V_{CEX}$	450	650	Vdc
Emitter-Base Voltage	$V_{EBO}$	8.0		Vdc
Base Current	$I_B$	5.0		Adc
Collector Current	$I_C$	15		Adc
		<b>2N6676</b> <b>2N6678</b>	<b>2N6691</b> <b>2N6693</b>	
Total Power Dissipation	@ $T_A = 25^{\circ}C$	6.0 <sup>(2)</sup>	3.0 <sup>(3)</sup>	W
	@ $T_C = 25^{\circ}C$ <sup>(1)</sup>	175	175	W
Operating & Storage Junction Temperature Range	$T_{op}, T_{stg}$	-65 to +200		$^{\circ}C$



2N6676, 2N6678  
TO-3 (TO-204AA)\*



2N6691, 2N6693  
TO-61\*

\* See Appendix A for Package Outline

### THERMAL CHARACTERISTICS

Characteristics	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.0	$^{\circ}C/W$

- 1) Derate linearly 1.0 W/ $^{\circ}C$  for  $T_C > 25^{\circ}C$
- 2) Derate linearly 34.2 mW/ $^{\circ}C$  for  $T_A > 25^{\circ}C$
- 3) Derate linearly 17.1 mW/ $^{\circ}C$  for  $T_A > 25^{\circ}C$

### ELECTRICAL CHARACTERISTICS ( $T_C = 25^{\circ}C$ unless otherwise noted)

Characteristics	Symbol	Min.	Max.	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage $I_C = 200$ mAdc	2N6676, 2N6691 2N6678, 2N6693	$V_{(BR)CEO}$	300 400	Vdc
Collector-Emitter Cutoff Current $V_{CE} = 450$ Vdc, $V_{BE} = 1.5$ Vdc $V_{CE} = 650$ Vdc, $V_{BE} = 1.5$ Vdc	2N6676, 2N6691 2N6678, 2N6693	$I_{CEX}$	0.1 0.1	mAdc

**2N6676, 2N6678, 2N6691, 2N6693 JAN SERIES**

**ELECTRICAL CHARACTERISTICS (con't)**

Characteristics	Symbol	Min.	Max.	Unit
Emitter-Base Cutoff Current $V_{EB} = 8.0 \text{ Vdc}$	$I_{EBO}$		2.0	mAdc
Collector-Base Cutoff Current $V_{CB} = 450 \text{ Vdc}$ $V_{CB} = 650 \text{ Vdc}$	$I_{CBO}$	2N6676, 2N6691 2N6678, 2N6693	1.0 1.0	mAdc

**ON CHARACTERISTICS <sup>(4)</sup>**

Forward-Current Transfer Ratio $I_C = 1.0 \text{ Adc}; V_{CE} = 3.0 \text{ Vdc}$ $I_C = 15 \text{ Adc}; V_{CE} = 3.0 \text{ Vdc}$	$h_{FE}$	15 8.0	40 20	
Collector-Emitter Saturation Voltage $I_C = 15 \text{ Adc}; I_B = 3.0 \text{ Adc}$	$V_{CE(sat)}$		1.0	Vdc
Base-Emitter Saturation Voltage $I_C = 15 \text{ Adc}; I_B = 3.0 \text{ Adc}$	$V_{BE(sat)}$		1.5	Vdc

**DYNAMIC CHARACTERISTICS**

Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 1.0 \text{ Adc}; V_{CE} = 10 \text{ Vdc}, f = 5 \text{ MHz}$	$ h_{fe} $	3.0	10	
Output Capacitance $V_{CB} = 10 \text{ Vdc}; I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{obo}$	150	500	pF

**SWITCHING CHARACTERISTICS**

Delay Time	See Figure 3 of MIL-PRF-19500/538	$t_d$		0.1	$\mu\text{s}$
Rise Time		$t_r$		0.6	$\mu\text{s}$
Storage Time		$t_s$		2.5	$\mu\text{s}$
Fall Time		$t_f$		0.5	$\mu\text{s}$
Cross-Over Time		$t_c$		0.5	$\mu\text{s}$

**SAFE OPERATING AREA**

<b>DC Tests</b>	
$T_C = +25^{\circ}\text{C}, 1 \text{ Cycle}, t = 1.0 \text{ s}$	
<b>Test 1</b>	$V_{CE} = 11.7 \text{ Vdc}, I_C = 15 \text{ Adc}$ All Types
<b>Test 2</b>	$V_{CE} = 30 \text{ Vdc}, I_C = 5.9 \text{ Adc}$ 2N6676, 2N6678
<b>Test 3</b>	$V_{CE} = 100 \text{ Vdc}, I_C = 0.25 \text{ Adc}$ All Types
<b>Test 4</b>	$V_{CE} = 25 \text{ Vdc}, I_C = 7.0 \text{ Adc}$ 2N6691, 2N6693
<b>Test 5</b>	$V_{CE} = 300 \text{ Vdc}, I_C = 20 \text{ mAdc}$ 2N6676, 2N6691
	$V_{CE} = 400 \text{ Vdc}, I_C = 10 \text{ mAdc}$ 2N6678, 2N6693
<b>Clamped Switching</b>	
$T_A = 25^{\circ}\text{C}; V_{CC} = 15 \text{ Vdc}$	
	$I_C = 15 \text{ Adc}; \text{Clamped Voltage} = 350 \text{ Vdc}$ 2N6676, 2N6691
	$I_C = 15 \text{ Adc}; \text{Clamped Voltage} = 450 \text{ Vdc}$ 2N6678, 2N6693

(4) Pulse Test: Pulse Width = 300 $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .