New Jersey Semi-Conductor Products, Inc.

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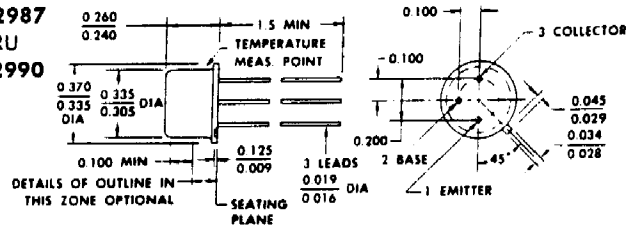
HIGH-FREQUENCY INTERMEDIATE-POWER TRANSISTORS

- **15 Watts at 100°C Case Temperature**
- **Typ $V_{CE(sat)}$ of 0.2 V at 200 mA**
- **Typ V_{BE} of 0.8 V at 200 mA**
- **Typ f_T of 50 MHz at 10 V, 100 mA**

* mechanical data

2N2987 THRU 2N2990

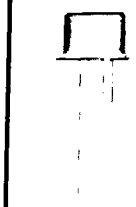


THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE CASE

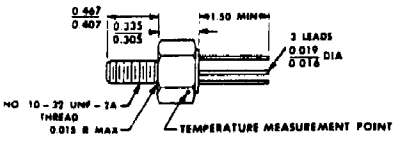
ALL JEDEC TO-5 DIMENSIONS AND NOTES ARE APPLICABLE

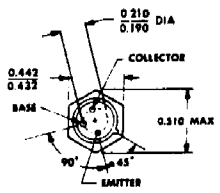
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED

CASE TEMPERATURE IS MEASURED 0.144 INCH ± 0.010 INCH DOWN FROM TOP OF CAN



2N2991 THRU 2N2994



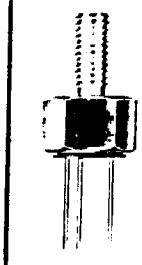


THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE CASE

POSITION OF THE LEADS IN RELATION TO THE HEX IS NOT CONTROLLED

MAXIMUM RECOMMENDED MOUNTING TORQUE: 15 IN.-LB.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED



absolute maximum ratings at 25°C case temperature (unless otherwise noted)

	2N2987 2N2989	2N2988 2N2990	2N2991 2N2993	2N2992 2N2994
* Collector-Base Voltage	95 V	155 V	95 V	155 V
* Collector-Emitter Voltage (See Note 1)	80 V	100 V	80 V	100 V
* Emitter-Base Voltage	7 V			
* Continuous Collector Current	1 A			
Peak Collector Current (See Note 2)	1.5 A			
* Continuous Base Current	0.2 A			
Safe Operating Region at (or below) 100°C Case Temperature	See Figure 10			
* Continuous Device Dissipation at (or below) 100°C Case Temperature (See Note 3)	15 W			
* Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 4)	1 W	2 W		
* Operating Case Temperature Range	−65°C to 200°C			
* Storage Temperature Range	−65°C to 200°C			
* Lead Temperature 1/16 Inch from Case for 10 Seconds	230°C			

NOTES: 1. This value applies between 1 mA and 30 mA collector current when the base-emitter diode is open-circuited.
2. This value applies for $t_p \leq 0.3$ ms, duty cycle $\leq 10\%$.
3. Derate linearly to 200°C case temperature at the rate of 150 mW/deg.
4. Derate linearly to 200°C free-air temperature at the rate of 5.7 mW/deg for the 2N2987 through 2N2990 and 11.4 mW/deg for the 2N2991 through 2N2994.

Quality Semi-Conductors

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***electrical characteristics at 25°C case temperature (unless otherwise noted)**

PARAMETER		TEST CONDITIONS	2N2987 2N2991		2N2988 2N2992		2N2989 2N2993		2N2990 2N2994		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 30$ mA, $I_B = 0$, See Note 5	80		100		80		100		V
I_{CEO}	Collector Cutoff Current	$V_{CE} = 50$ V, $I_B = 0$		0.1				0.1			μA
		$V_{CE} = 90$ V, $I_B = 0$				0.1				0.1	
I_{CEV}	Collector Cutoff Current	$V_{CE} = 90$ V, $V_{BE} = -1.5$ V		25				25			nA
		$V_{CE} = 150$ V, $V_{BE} = -1.5$ V				25				25	
		$V_{CE} = 90$ V, $V_{BE} = -1.5$ V, $T_C = 175°C$		15				15			μA
		$V_{CE} = 150$ V, $V_{BE} = -1.5$ V, $T_C = 175°C$				15				15	
I_{EBO}	Emitter Cutoff Current	$V_{EB} = 7$ V, $I_C = 0$		25		25		25		25	nA
h_{FE}	Static Forward Current Transfer Ratio	$V_{CE} = 5$ V, $I_C = 1$ mA	20		20		40		40		
		$V_{CE} = 5$ V, $I_C = 200$ mA, See Notes 5 and 6	25	75	25	75	60	120	60	120	
		$V_{CE} = 5$ V, $I_C = 500$ mA, See Notes 5 and 6	20		20		40		40		
		$V_{CE} = 10$ V, $I_C = 100$ mA, See Notes 5 and 6	25		25		50		50		
		$V_{CE} = 5$ V, $I_C = 200$ mA, $T_C = -55°C$, See Notes 5 and 6	10		10		20		20		
V_{BE}	Base-Emitter Voltage	$V_{CE} = 5$ V, $I_C = 200$ mA, See Notes 5 and 6		0.9		0.9		0.9		0.9	V
		$I_B = 20$ mA, $I_C = 200$ mA, See Notes 5 and 6		1		1		1		1	
		$I_B = 50$ mA, $I_C = 500$ mA, See Notes 5 and 6		1.4		1.4		1.4		1.4	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_B = 20$ mA, $I_C = 200$ mA, See Notes 5 and 6		0.8		0.8		0.8		0.8	V
		$I_B = 50$ mA, $I_C = 500$ mA, See Notes 5 and 6		3		3		3		3	
h_{fe}	Small-Signal Common-Emitter Forward Current Transfer Ratio	$V_{CE} = 10$ V, $I_C = 100$ mA, $f = 1$ kHz	25	85	25	85	50	170	50	170	
$\|h_{fe}\|$	Small-Signal Common-Emitter Forward Current Transfer Ratio	$V_{CE} = 10$ V, $I_C = 100$ mA, $f = 30$ MHz	1		1		1		1		
C_{obo}	Common-Base Open-Circuit Output Capacitance	$V_{CB} = 10$ V, $I_E = 0$, $f = 1$ MHz		50		50		50		50	pF

NOTES: 5. These parameters must be measured using pulse techniques. $t_p = 300$ μs, duty cycle $\leq 2\%$.

6. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

*Indicates JEDEC registered data

thermal characteristics

PARAMETER		2N2987 THRU 2N2990	2N2991 THRU 2N2994	UNIT
		MAX	MAX	
θ_{J-C}	Junction-to-Case Thermal Resistance	6.67	6.67	deg/W
θ_{J-A}	Junction-to-Free-Air Thermal Resistance	175	87.5	

switching characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS†	TYP	UNIT
t_{on}	Turn-On Time	$I_C = 200$ mA, $I_{B(1)} = 20$ mA, $I_{B(2)} = -20$ mA,	0.14	μs
t_{off}	Turn-Off Time	$V_{BE(off)} = -3.4$ V, $R_L = 150\ \Omega$, See Figure 1	2.6	

†Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.