

NJL4281D (NPN) NJL4302D (PNP)

Complementary ThermalTrak™ Transistors

The ThermalTrak family of devices has been designed to eliminate thermal equilibrium lag time and bias trimming in audio amplifier applications. They can also be used in other applications as transistor die protection devices.

Features

- Thermally Matched Bias Diode
- Instant Thermal Bias Tracking
- Absolute Thermal Integrity
- High Safe Operating Area
- Pb-Free Packages are Available*

Benefits

- Eliminates Thermal Equilibrium Lag Time and Bias Trimming
- Superior Sound Quality Through Improved Dynamic Temperature Response
- Significantly Improved Bias Stability
- Simplified Assembly
 - ♦ Reduced Labor Costs
 - ♦ Reduced Component Count
- High Reliability

Applications

- High-End Consumer Audio Products
 - ♦ Home Amplifiers
 - ♦ Home Receivers
- Professional Audio Amplifiers
 - ♦ Theater and Stadium Sound Systems
 - ♦ Public Address Systems (PAs)

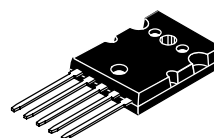
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ON Semiconductor®

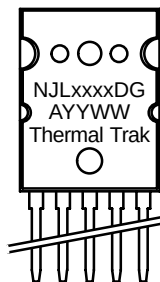
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**BIPOLAR POWER
TRANSISTORS**
15 AMP, 350 VOLT, 230 WATT

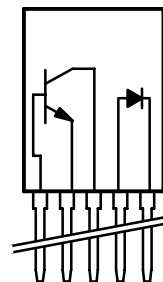


TO-264, 5 LEAD
CASE 340AA
STYLE 1

MARKING DIAGRAM



SCHEMATIC



NJLxxxD = Device Code
xxxx = 4281 or 4302
G = Pb-Free Package
A = Assembly Location
YY = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NJL4281D	TO-264	25 Units / Rail
NJL4281DG	TO-264 (Pb-Free)	25 Units / Rail
NJL4302D	TO-264	25 Units / Rail
NJL4302DG	TO-264 (Pb-Free)	25 Units / Rail

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	350	Vdc
Collector-Base Voltage	V_{CBO}	350	Vdc
Emitter-Base Voltage	V_{EBO}	5	Vdc
Collector-Emitter Voltage – 1.5 V	V_{CEX}	350	Vdc
Collector Current – Continuous – Peak (Note 1)	I_C	15 30	Adc
Base Current – Continuous	I_B	1.5	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above 25°C	P_D	230 1.84	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	– 65 to +150	$^\circ\text{C}$
DC Blocking Voltage	V_R	200	V
Average Rectified Forward Current	$I_{F(AV)}$	1.0	A

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.54	$^\circ\text{C/W}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Pulse Test: Pulse Width = 5 ms, Duty Cycle < 10%.

ATTRIBUTES

Characteristic	Value
ESD Protection Human Body Model Machine Model	>8000 V > 400 V
Flammability Rating	UL 94 V-0 @ 0.125 in

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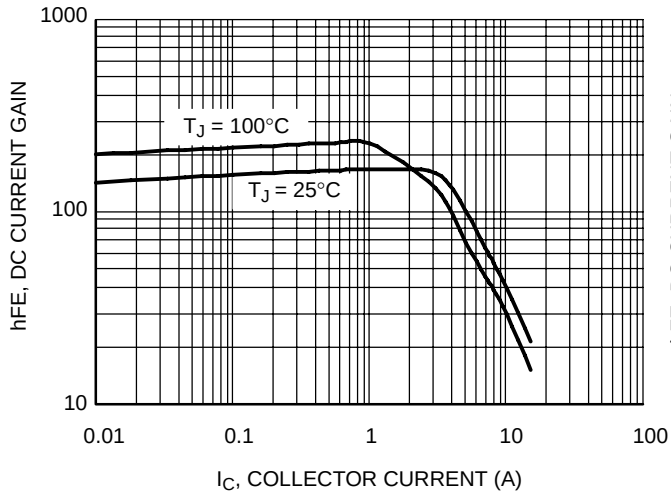
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector Emitter Sustaining Voltage (I _C = 50 mA, I _B = 0)	V _{CE(sus)}	350	–	Vdc
Collector Cut-off Current (V _{CE} = 200 V, I _B = 0)	I _{CEO}	–	100	μAdc
Collector Cutoff Current (V _{CB} = 350 Vdc, I _E = 0)	I _{CBO}	–	50	μAdc
Emitter Cutoff Current (V _{EB} = 5.0 Vdc, I _C = 0)	I _{EBO}	–	5.0	μAdc
SECOND BREAKDOWN				
Second Breakdown Collector with Base Forward Biased (V _{CE} = 50 Vdc, t = 1.0 s (non-repetitive) (V _{CE} = 100 Vdc, t = 1.0 s (non-repetitive)	I _{S/b}	4.5 1.0	– –	Adc
ON CHARACTERISTICS				
DC Current Gain (I _C = 100 mAdc, V _{CE} = 5.0 Vdc) (I _C = 1.0 Adc, V _{CE} = 5.0 Vdc) (I _C = 3.0 Adc, V _{CE} = 5.0 Vdc) (I _C = 5.0 Adc, V _{CE} = 5.0 Vdc) (I _C = 8.0 Adc, V _{CE} = 5.0 Vdc) (I _C = 15 Adc, V _{CE} = 5.0 Vdc)	h _{FE}	80 80 80 80 40 10	250 250 250 250 – –	–
Collector–Emitter Saturation Voltage (I _C = 8.0 Adc, I _B = 0.8 Adc)	V _{CE(sat)}	–	1.0	Vdc
Emitter–Base Saturation Voltage (I _C = 8.0 Adc, I _B = 0.8 A)	V _{BE(sat)}	–	1.4	Vdc
Base–Emitter ON Voltage (I _C = 8.0 Adc, V _{CE} = 5.0 Vdc)	V _{BE(on)}	–	1.5	Vdc
DYNAMIC CHARACTERISTICS				
Current–Gain – Bandwidth Product (I _C = 1.0 Adc, V _{CE} = 5.0 Vdc, f _{test} = 1.0 MHz)	f _T	35	–	MHz
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f _{test} = 1.0 MHz)	C _{ob}	–	600	pF
Maximum Instantaneous Forward Voltage (Note 2) (I _F = 1.0 A, T _J = 25°C) (I _F = 1.0 A, T _J = 150°C)	V _F	1.1 0.93		V
Maximum Instantaneous Reverse Current (Note 2) (Rated dc Voltage, T _J = 25°C) (Rated dc Voltage, T _J = 150°C)	i _R	10 100		μA
Maximum Reverse Recovery Time (I _F = 1.0 A, di/dt = 50 A/μs)	t _{rr}	100		ns

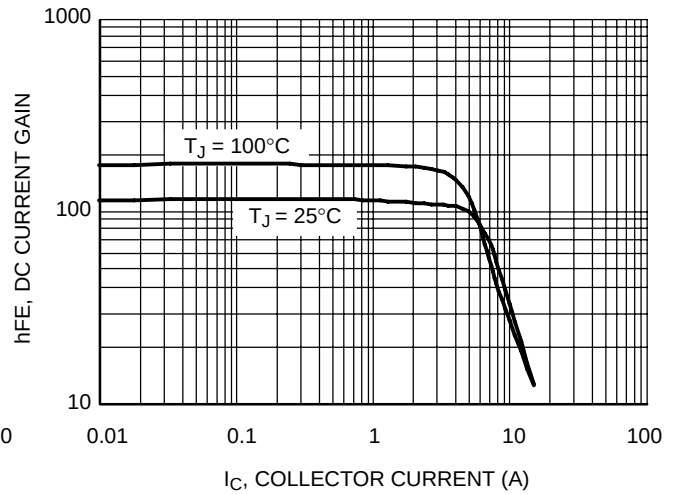
2. Diode Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2.0%.

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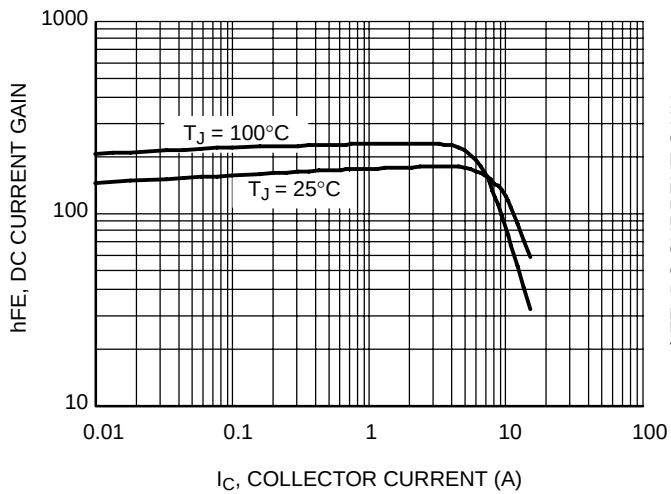
TYPICAL CHARACTERISTICS



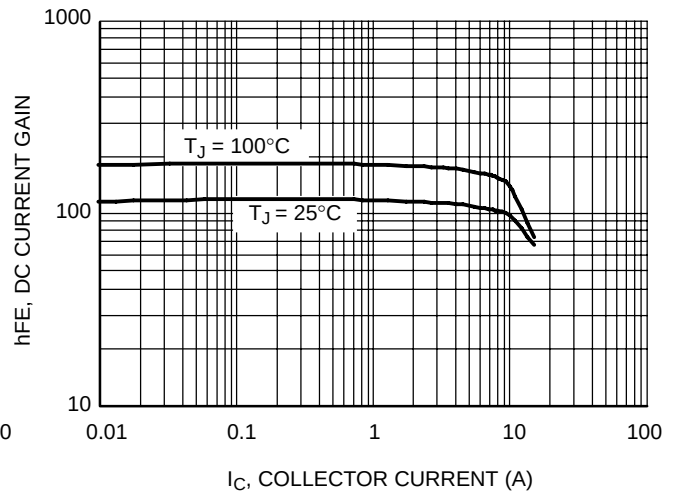
**Figure 1. DC Current Gain, $V_{CE} = 5$ V,
NPN NJL4281D**



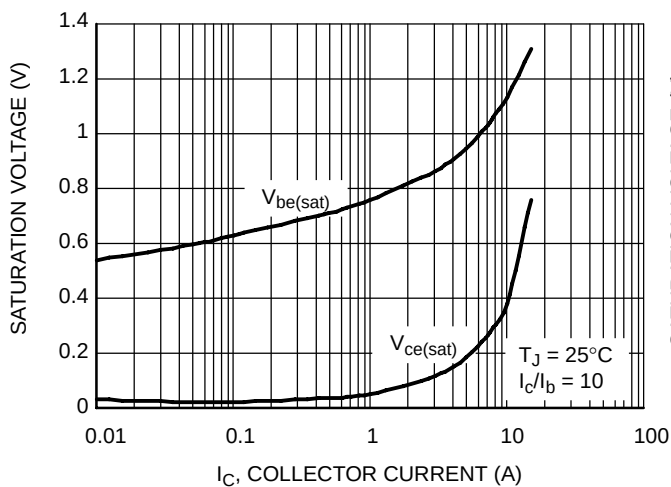
**Figure 2. DC Current Gain, $V_{CE} = 5$ V,
PNP NJL4302D**



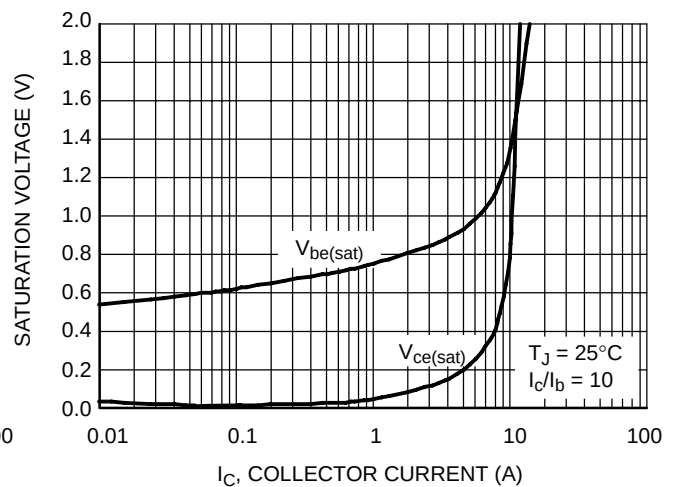
**Figure 3. DC Current Gain, $V_{CE} = 20$ V,
NPN NJL4281D**



**Figure 4. DC Current Gain, $V_{CE} = 20$ V,
PNP NJL4302D**



**Figure 5. Typical Saturation Voltage,
NPN NJL4281D**



**Figure 6. Typical Saturation Voltage,
PNP NJL4302D**

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TYPICAL CHARACTERISTICS

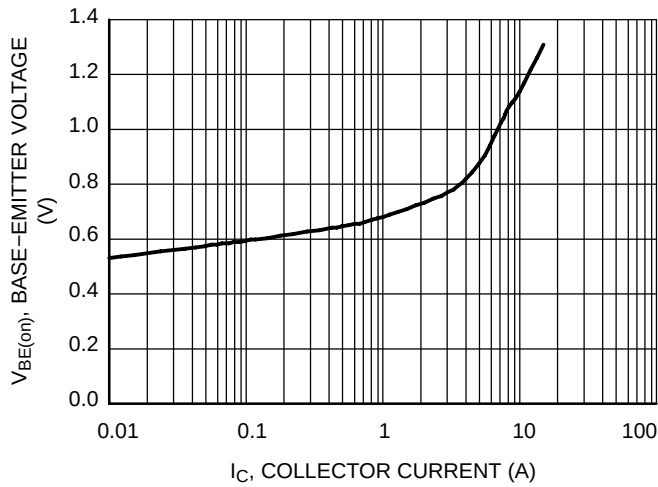


Figure 7. Typical Base-Emitter Voltages, NPN NJL4281D

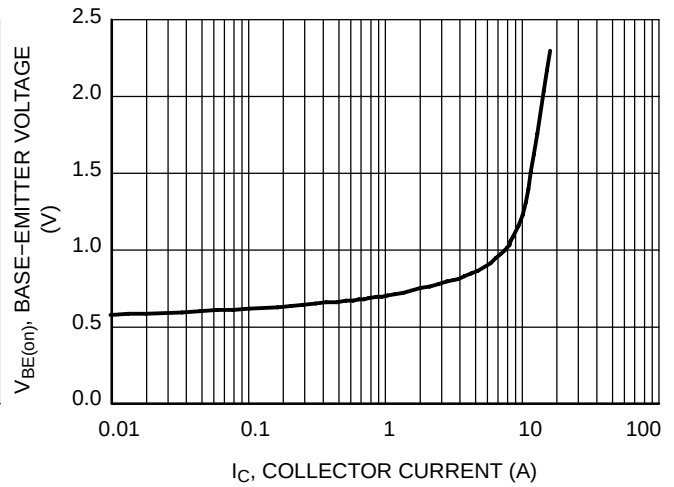


Figure 8. Typical Base-Emitter Voltages, PNP NJL4302D

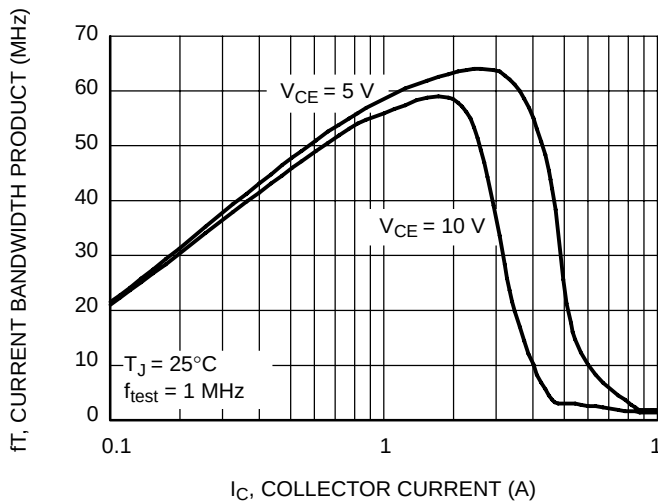


Figure 9. Typical Current Gain Bandwidth Product, NPN NJL4281D

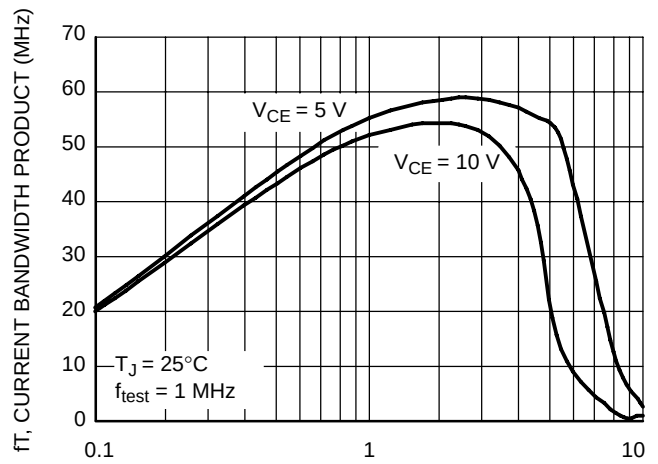


Figure 10. Typical Current Gain Bandwidth Product, PNP NJL4302D

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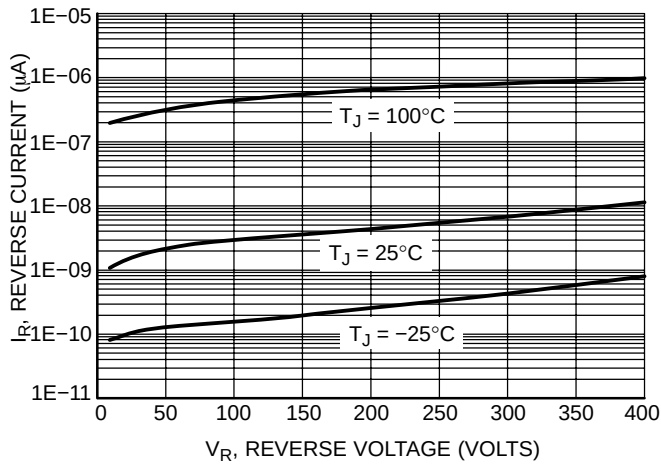


Figure 11. Typical Diode Reverse Current

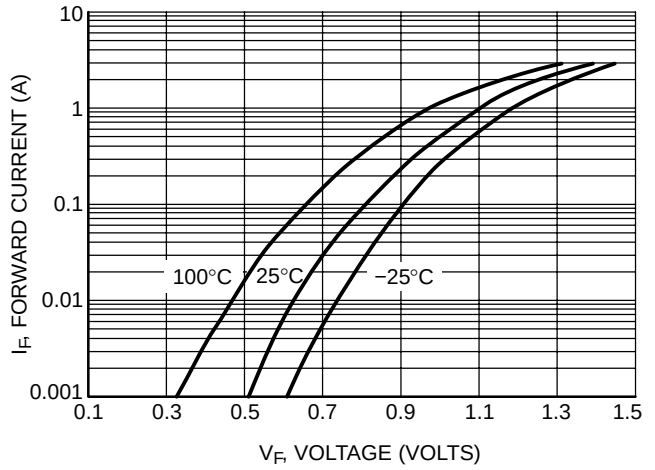


Figure 12. Typical Diode Forward Voltage

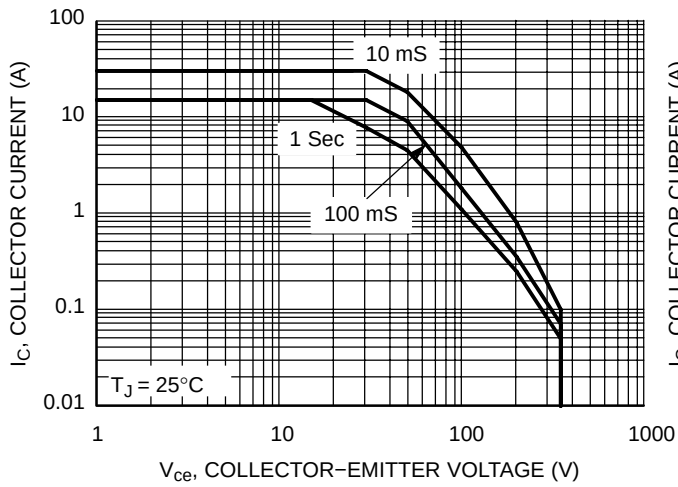


Figure 13. Active Region Safe Operating Area, NPN NJL4281D

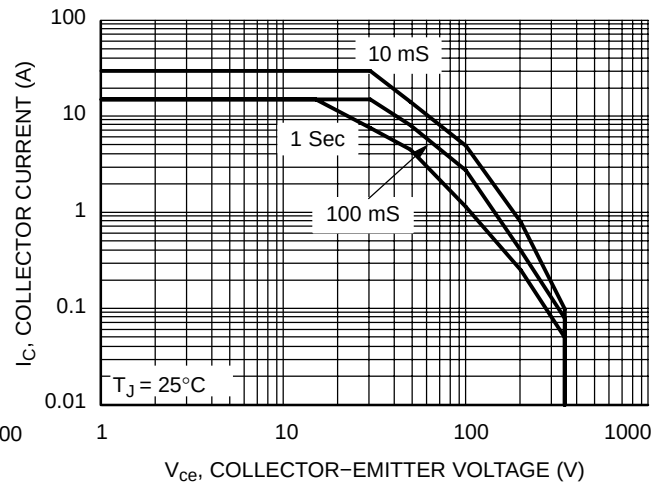
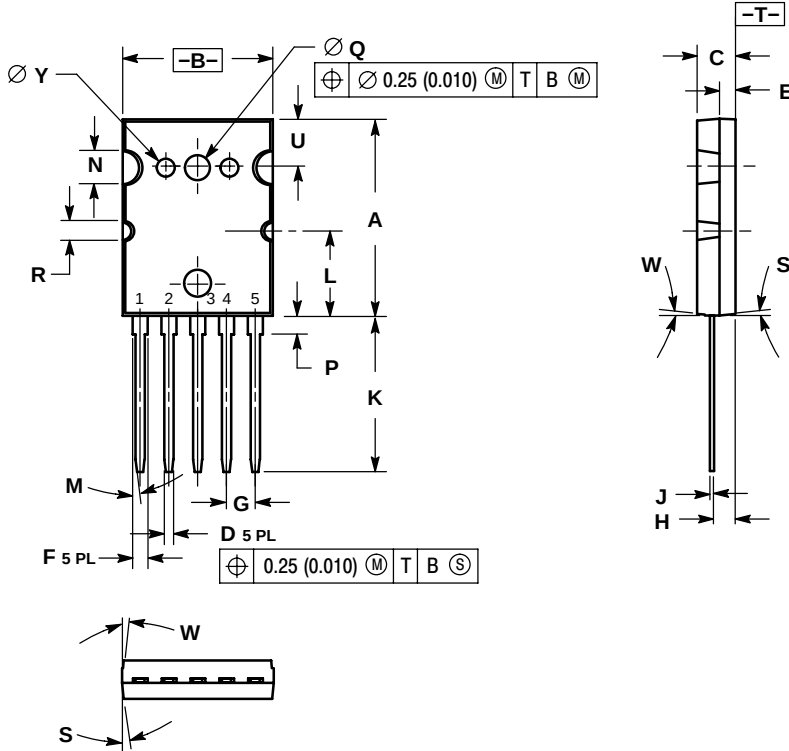


Figure 14. Active Region Safe Operating Area, PNP NJL4302D

NJL4281D (NPN) NJL4302D (PNP)

PACKAGE DIMENSIONS

TO-264, 5 LEAD
CASE 340AA-01
ISSUE O



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	25.857	25.984	26.111	1.018	1.023	1.028
B	19.761	19.888	20.015	0.778	0.783	0.788
C	4.928	5.055	5.182	0.194	0.199	0.204
D	1.219	BSC		0.0480	BSC	
E	2.032	2.108	2.184	0.0800	0.0830	0.0860
F	1.981	BSC		0.0780	BSC	
G	3.81	BSC		0.150	BSC	
H	2.667	2.718	2.769	0.1050	0.1070	0.1090
J	0.584	BSC		0.0230	BSC	
K	20.422	20.549	20.676	0.804	0.809	0.814
L	11.28	REF		0.444	REF	
M	0°	---	7°	0°	---	7°
N	4.57	REF		0.180	REF	
P	2.259	2.386	2.513	0.0889	0.0939	0.0989
Q	3.480	BSC		0.1370	BSC	
R	2.54	REF		0.100	REF	
S	0°	---	8°	0°	---	8°
U	6.17	REF		0.243	REF	
W	0°	---	6°	0°	---	6°
Y	2.388	BSC		0.0940	BSC	

STYLE 1:

1. BASE
2. EMITTER
3. COLLECTOR
4. ANODE
5. CATHODE

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