

Complementary Silicon Plastic Power Transistors

... designed for use in general-purpose amplifier and switching applications.

- DC Current Gain Specified to 15 Amperes —
 $h_{FE} = 20-150 @ I_C = 5.0 \text{ Adc}$
 $= 5.0 (\text{Min}) @ I_C = 15 \text{ Adc}$
- Collector-Emitter Sustaining Voltage —
 $V_{CEO(\text{sus})} = 60 \text{ Vdc (Min)} - 2N6487, 2N6490$
 $= 80 \text{ Vdc (Min)} - 2N6488, 2N6491$
- High Current Gain — Bandwidth Product
 $f_T = 5.0 \text{ MHz (Min)} @ I_C = 1.0 \text{ Adc}$
- TO-220AB Compact Package

NPN
2N6487

2N6488*
PNP
2N6490

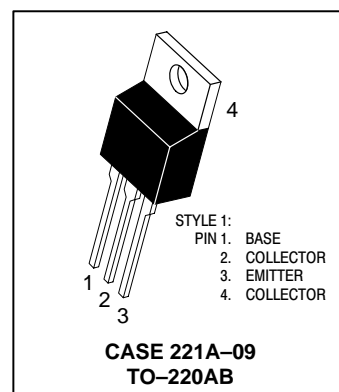
2N6491*

*ON Semiconductor Preferred Device

15 AMPERE
COMPLEMENTARY
SILICON
POWER TRANSISTORS
60-80 VOLTS
75 WATTS

MAXIMUM RATINGS (1)

Rating	Symbol	2N6487 2N6490	2N6488 2N6491	Unit
Collector-Emitter Voltage	V_{CEO}	60	80	Vdc
Collector-Base Voltage	V_{CB}	70	90	Vdc
Emitter-Base Voltage	V_{EB}	5.0		Vdc
Collector Current — Continuous	I_C	15		Adc
Base Current	I_B	5.0		Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	75	0.6	Watts W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	1.8	0.014	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150		$^\circ\text{C}$



THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.67	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	70	$^\circ\text{C/W}$

(1) Indicates JEDEC Registered Data.

Preferred devices are ON Semiconductor recommended choices for future use and best overall value.

2N6487 2N6488 2N6490 2N6491

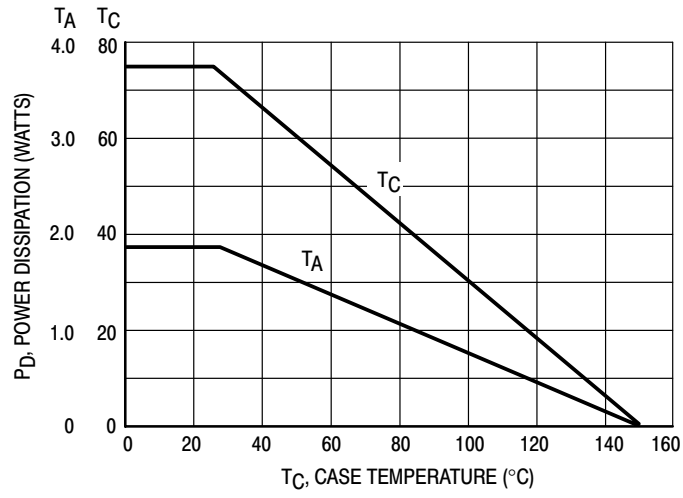


Figure 1. Power Derating

2N6487 2N6488 2N6490 2N6491

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

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (1) ($I_C = 200\text{ mA}_{dc}$, $I_B = 0$)	2N6487, 2N6490 2N6488, 2N6491	$V_{CEO(sus)}$	60 80	— —	Vdc
Collector–Emitter Sustaining Voltage (1) ($I_C = 200\text{ mA}_{dc}$, $V_{BE} = 1.5\text{ Vdc}$)	2N6487, 2N6490 2N6488, 2N6491	V_{CEX}	70 90	— —	Vdc
Collector Cutoff Current ($V_{CE} = 30\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 40\text{ Vdc}$, $I_B = 0$)	2N6487, 2N6490 2N6488, 2N6491	I_{CEO}	— —	1.0 1.0	mA _{dc}
Collector Cutoff Current ($V_{CE} = 65\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 85\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) ($V_{CE} = 80\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$)	2N6487, 2N6490 2N6488, 2N6491 2N6487, 2N6490 2N6488, 2N6491	I_{CEX}	— — — —	500 500 5.0 5.0	μA_{dc}
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)		I_{EBO}	—	1.0	mA _{dc}
ON CHARACTERISTICS					
DC Current Gain ($I_C = 5.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 15\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)		h_{FE}	20 5.0	150 —	—
Collector–Emitter Saturation Voltage ($I_C = 5.0\text{ Adc}$, $I_B = 0.5\text{ Adc}$) ($I_C = 15\text{ Adc}$, $I_B = 5.0\text{ Adc}$)		$V_{CE(sat)}$	— —	1.3 3.5	Vdc
Base–Emitter On Voltage ($I_C = 5.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 15\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)		$V_{BE(on)}$	— —	1.3 3.5	Vdc
DYNAMIC CHARACTERISTICS					
Current–Gain — Bandwidth Product (2) ($I_C = 1.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$)		f_T	5.0	—	MHz
Small–Signal Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$, $f = 1.0\text{ kHz}$)		h_{fe}	25	—	—

*Indicates JEDEC Registered Data.

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

(2) $f_T = |h_{fe}| \cdot f_{test}$.

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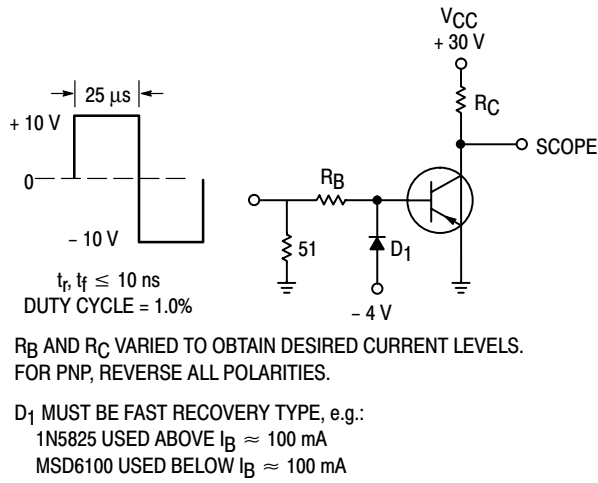


Figure 2. Switching Time Test Circuit

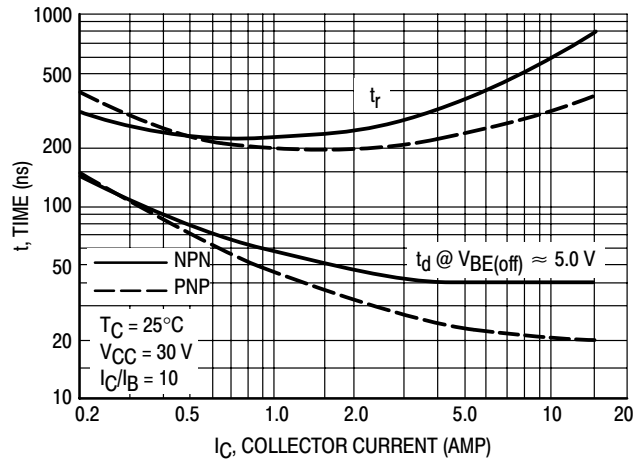


Figure 3. Turn-On Time

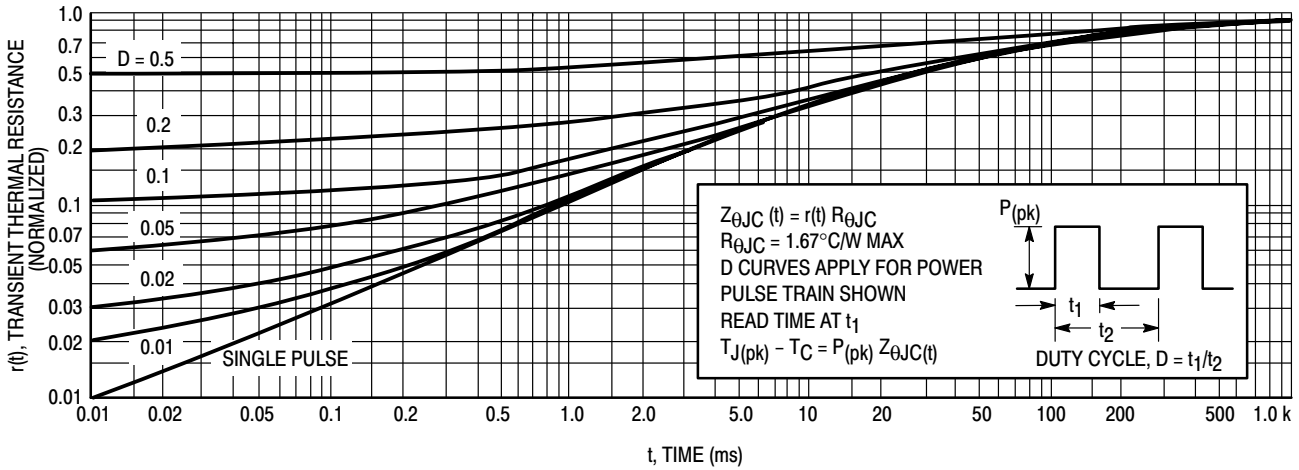


Figure 4. Thermal Response

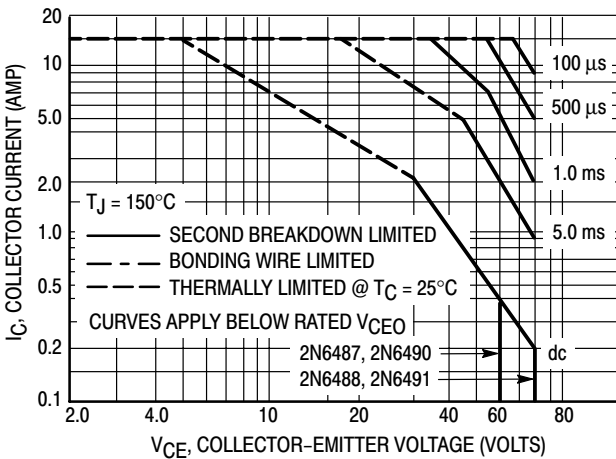
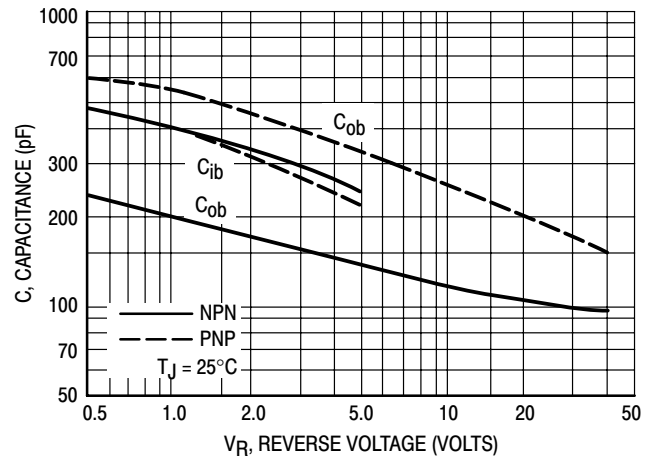
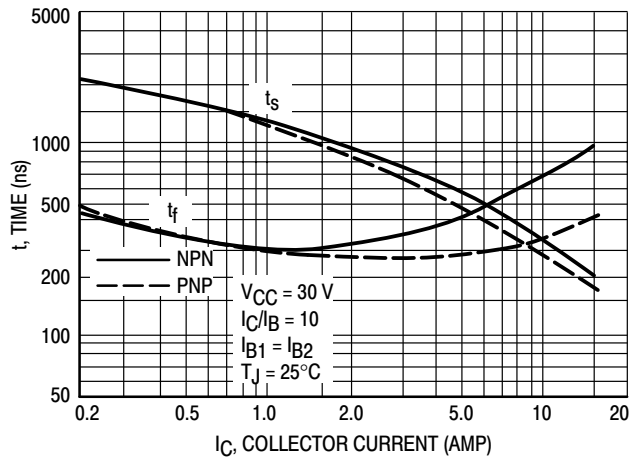


Figure 5. Active-Region Safe Operating Area

There are two limitations on the power handling ability of a transistors average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on $T_J(pk) = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_J(pk) \leq 150^\circ\text{C}$. $T_J(pk)$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown

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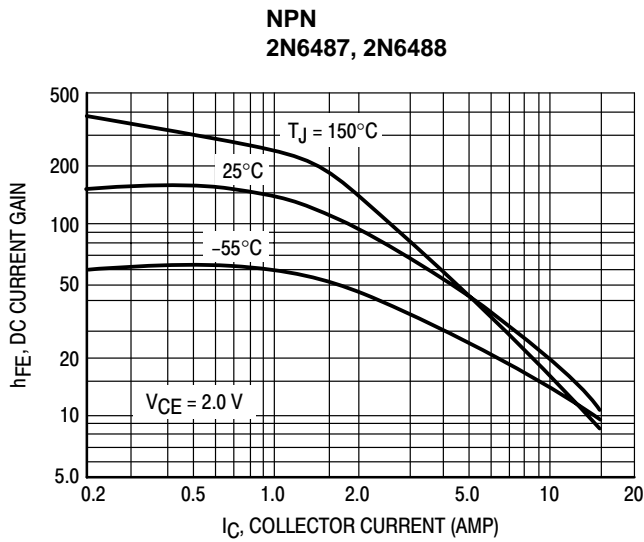


Figure 8. DC Current Gain

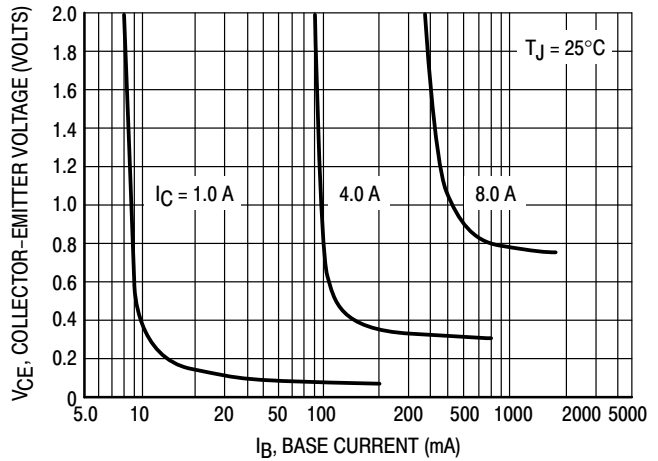
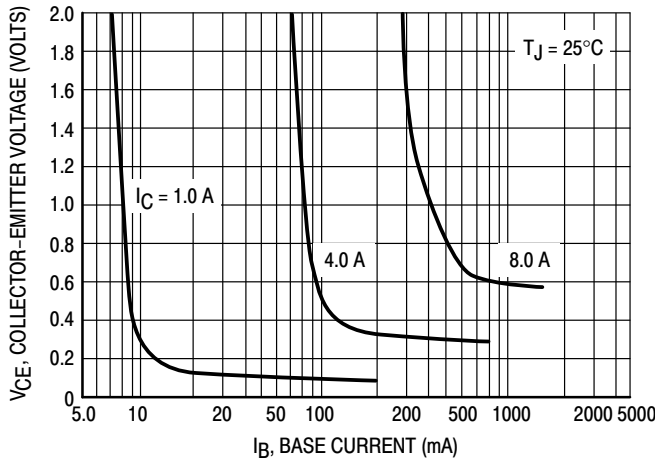


Figure 9. Collector Saturation Region

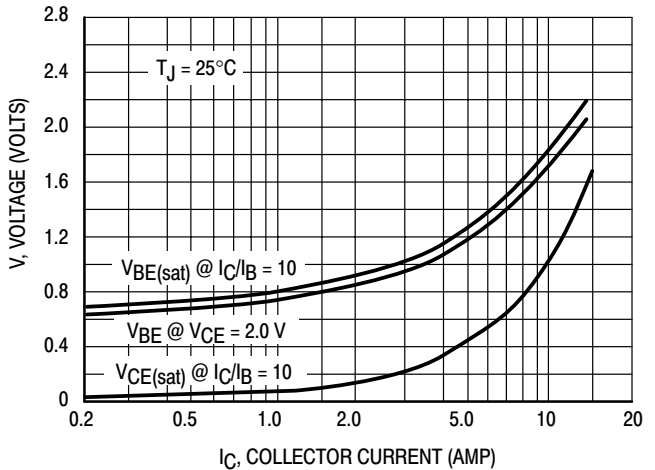
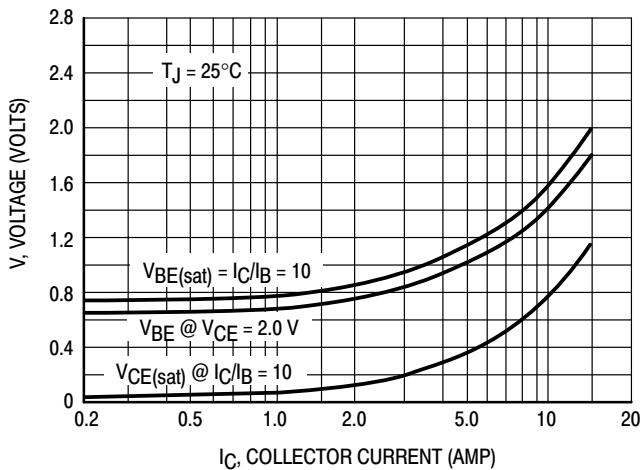
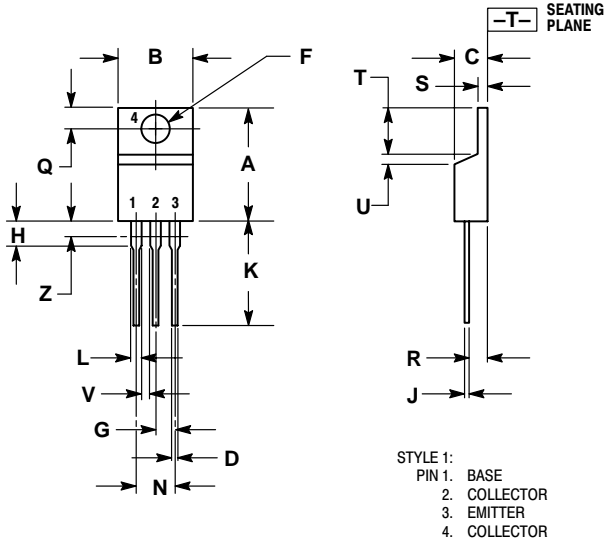


Figure 10. "On" Voltages

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PACKAGE DIMENSIONS

TO-220AB CASE 221A-09 ISSUE AA



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

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