

# 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

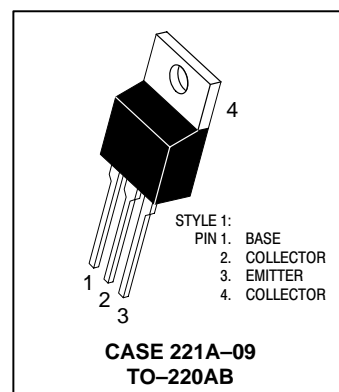
**NPN**  
**2N6487**  
  
**2N6488\***  
**PNP**  
**2N6490**  
  
**2N6491\***

\*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 $25^\circ\text{C}$	$P_D$	75	0.6	Watts W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	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

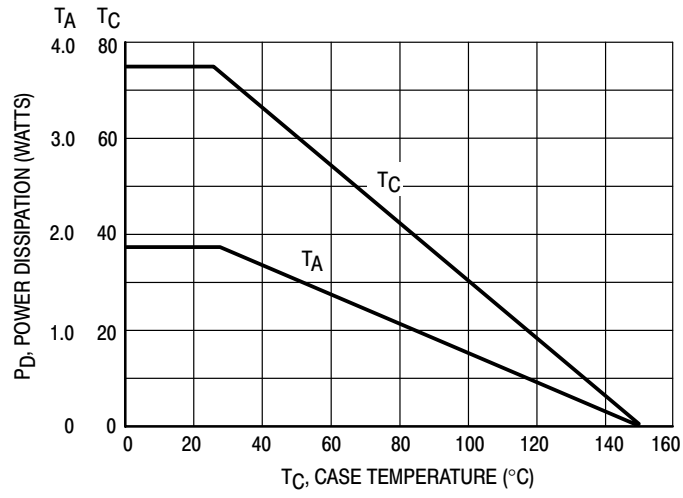


Figure 1. Power Derating

## 2N6487 2N6488 2N6490 2N6491

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

Characteristic	Symbol	Min	Max	Unit	
<b>OFF CHARACTERISTICS</b>					
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	$\mu\text{A dc}$
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$	—	1.0	mA dc
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 5.0\text{ A dc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 15\text{ A dc}$ , $V_{CE} = 4.0\text{ Vdc}$ )		$h_{FE}$	20 5.0	150 —	—
Collector–Emitter Saturation Voltage ( $I_C = 5.0\text{ A dc}$ , $I_B = 0.5\text{ A dc}$ ) ( $I_C = 15\text{ A dc}$ , $I_B = 5.0\text{ A dc}$ )		$V_{CE(sat)}$	— —	1.3 3.5	Vdc
Base–Emitter On Voltage ( $I_C = 5.0\text{ A dc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 15\text{ A dc}$ , $V_{CE} = 4.0\text{ Vdc}$ )		$V_{BE(on)}$	— —	1.3 3.5	Vdc
<b>DYNAMIC CHARACTERISTICS</b>					
Current–Gain — Bandwidth Product (2) ( $I_C = 1.0\text{ A dc}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f_{test} = 1.0\text{ MHz}$ )		$f_T$	5.0	—	MHz
Small–Signal Current Gain ( $I_C = 1.0\text{ A dc}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )		$h_{fe}$	25	—	—

\*Indicates JEDEC Registered Data.

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

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

2N6487 2N6488 2N6490 2N6491

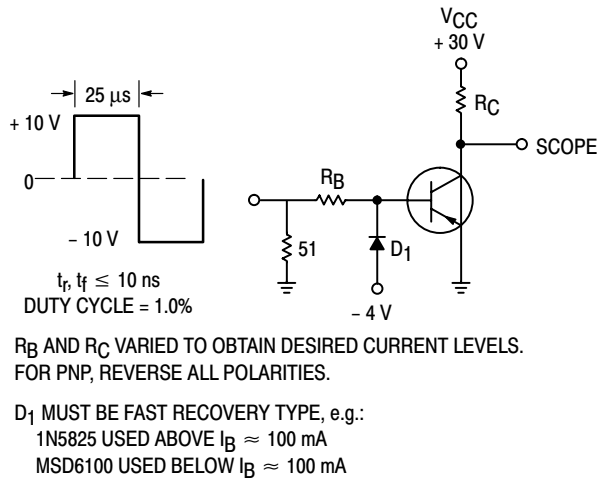


Figure 2. Switching Time Test Circuit

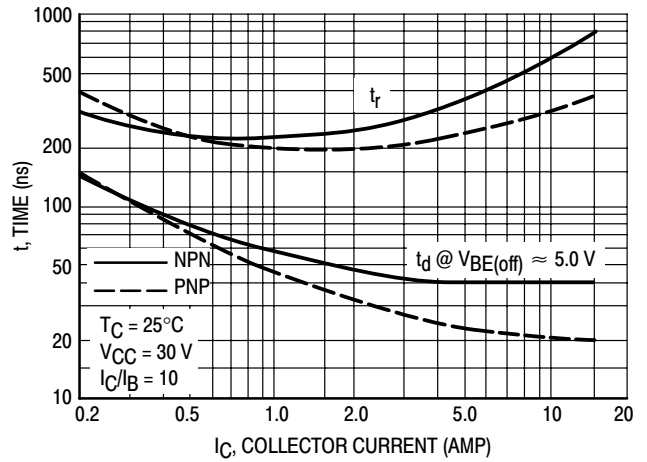


Figure 3. Turn-On Time

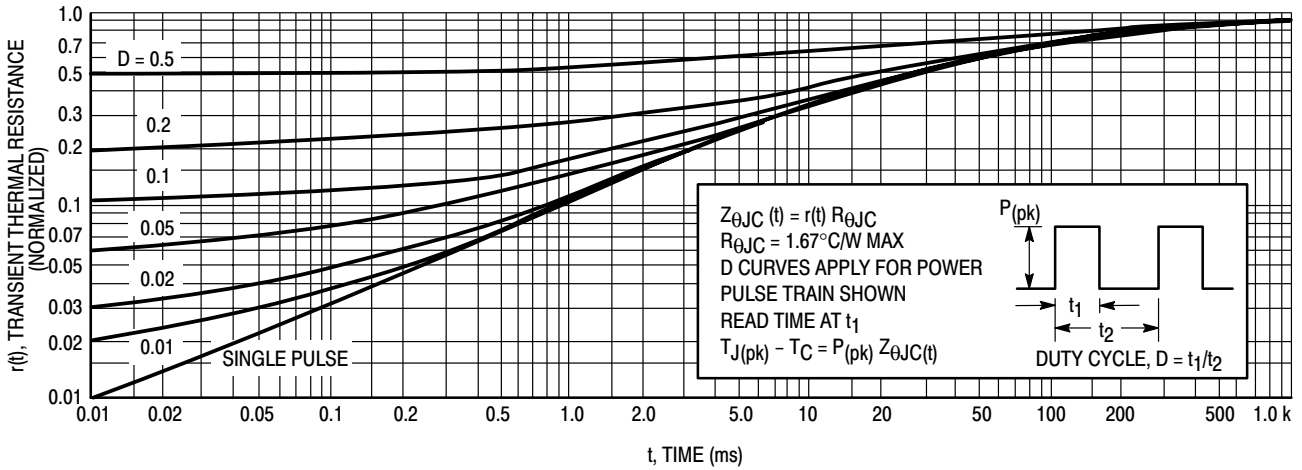


Figure 4. Thermal Response

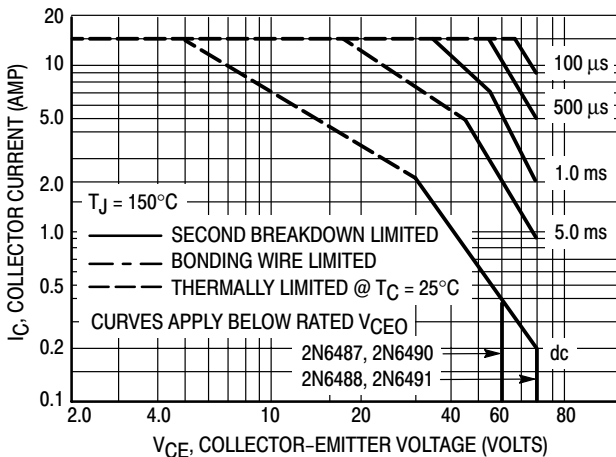
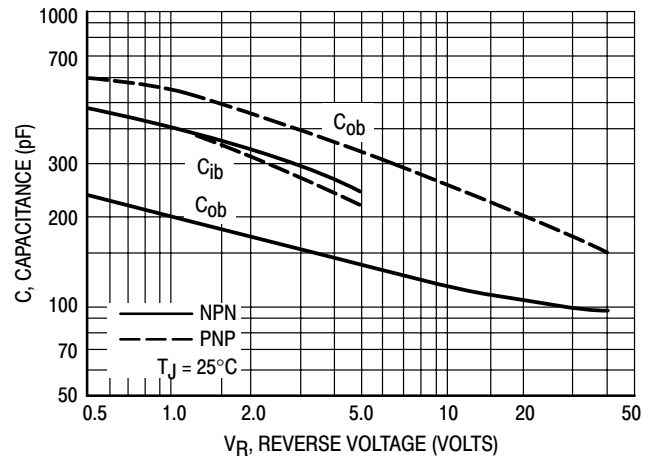
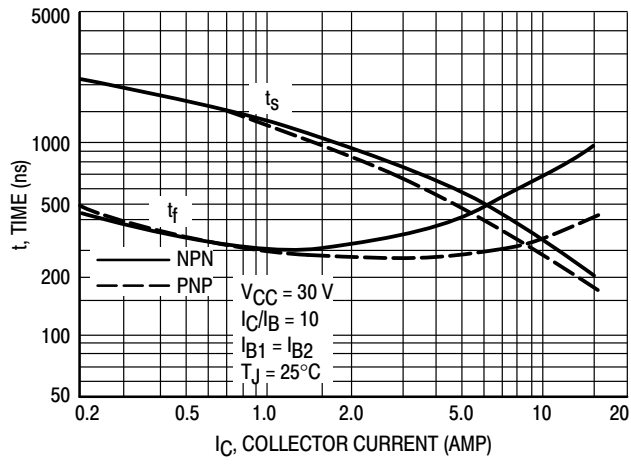


Figure 5. Active-Region Safe Operating Area

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

2N6487 2N6488 2N6490 2N6491



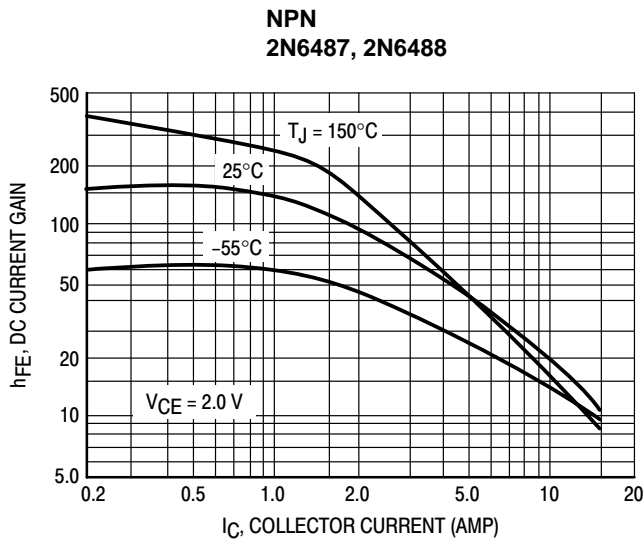


Figure 8. DC Current Gain

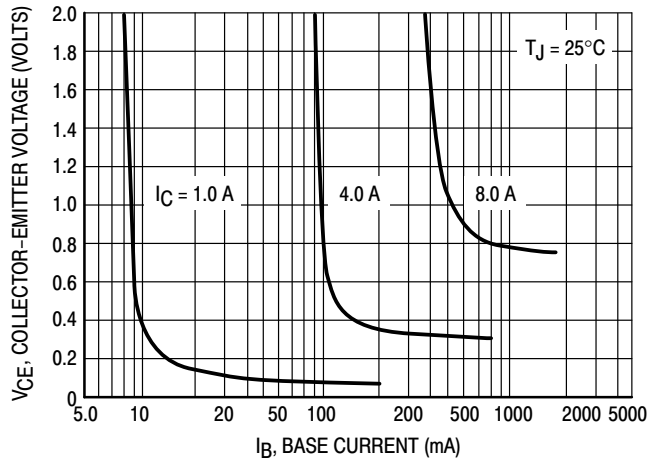
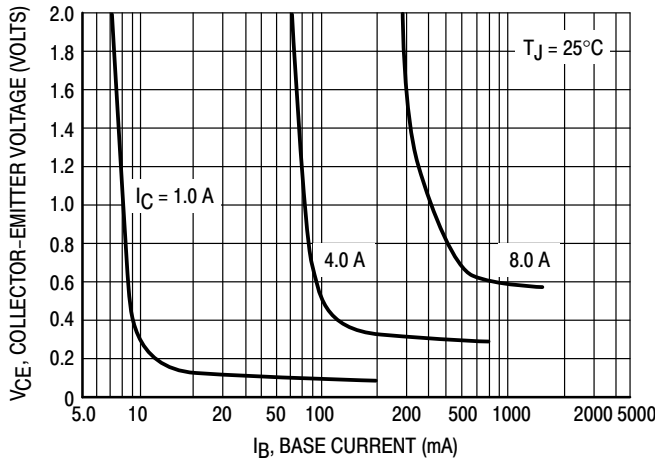


Figure 9. Collector Saturation Region

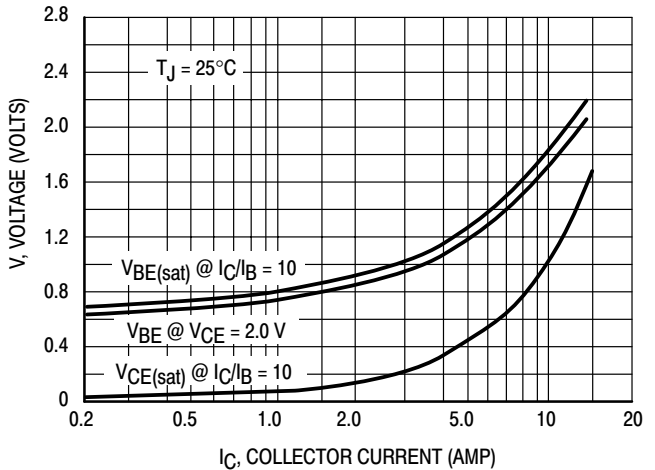
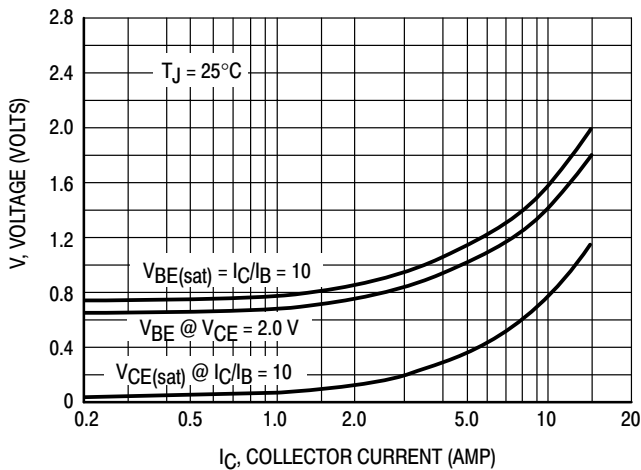
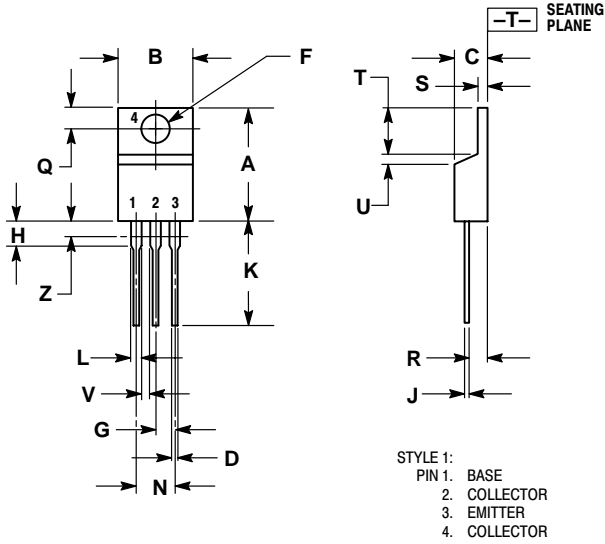


Figure 10. "On" Voltages

# 2N6487 2N6488 2N6490 2N6491

## 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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