

# Bipolar Transistor

50 V, 5 A, Low  $V_{CE(sat)}$ , NPN TO-220-3L

**2SD1060**

## Features

- Low Collector-to-Emitter Saturation Voltage :  $V_{CE(sat)} = 0.3 \text{ V max}$  /  $I_C = 3 \text{ A}$ ,  $I_B = 0.3 \text{ A}$

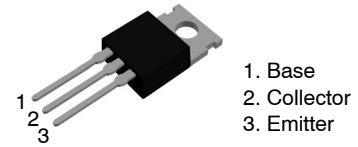
## Applications

- Suitable for Relay Drivers, High-Speed Inverters, Converters, and Other General Large-Current Switching

## ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

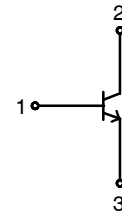
Symbol	Parameter	Conditions	Ratings	Unit
$V_{CBO}$	Collector-to-Base Voltage	–	60	V
$V_{CEO}$	Collector-to-Emitter Voltage	–	50	V
$V_{EBO}$	Emitter-to-Base Voltage	–	6	V
$I_C$	Collector Current	–	5	A
$I_{CP}$	Collector Current (Pulse)	–	9	A
$P_C$	Collector Dissipation	–	1.75	W
		$T_C = 25^\circ\text{C}$	30	W
$T_J$	Junction Temperature	–	150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature	–	–55 to +150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

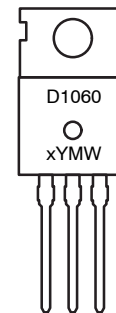


TO-220, 3L  
CASE 221AU

## ELECTRICAL CONNECTION



## MARKING DIAGRAM



D1060x = Specific Device Code  
 x = S/R  
 Y = Year of Production  
 M = Assembly Operation Month  
 W = Work Week Number

## ORDERING INFORMATION

Device	Package	Shipping
2SD1060R-1E	TO-220-3L (Pb-Free)	50 Units / Tube
2SD1060S-1E	TO-220-3L (Pb-Free)	50 Units / Tube

## 2SD1060

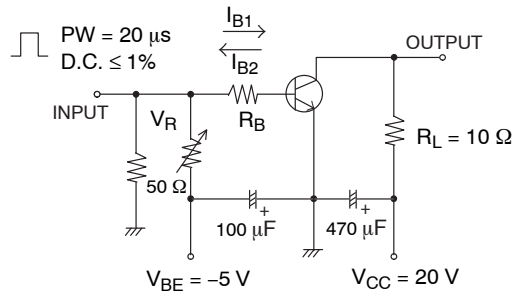
### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Conditions	Ratings			Unit
			Min	Typ	Max	
$I_{CBO}$	Collector Cutoff Current	$V_{CB} = 40\text{ V}, I_E = 0\text{ A}$	–	–	0.1	mA
$I_{EBO}$	Emitter Cutoff Current	$V_{EB} = 4\text{ V}, I_C = 0\text{ A}$	–	–	0.1	mA
$h_{FE1}$	DC Current Gain	$V_{CE} = 2\text{ V}, I_C = 1\text{ A}$	100*	–	280*	
$h_{FE2}$		$V_{CE} = 2\text{ V}, I_C = 2\text{ A}$	80	–	–	
$f_T$	Gain-Bandwidth Product	$V_{CE} = 5\text{ V}, I_C = 1\text{ A}$	–	30	–	MHz
$C_{ob}$	Output Capacitance	$V_{CB} = 10\text{ V}, f = 1\text{ MHz}$	–	100	–	pF
$V_{CE(sat)}$	Collector-to-Emitter Saturation Voltage	$I_C = 3\text{ A}, I_B = 0.3\text{ A}$	–	–	0.3	V
$V_{(BR)CBO}$	Collector-to-Base Breakdown Voltage	$I_C = 1\text{ mA}, I_E = 0\text{ A}$	60	–	–	V
$V_{(BR)CEO}$	Collector-to-Emitter Breakdown Voltage	$I_C = 1\text{ mA}, R_{BE} = \infty$	50	–	–	V
$V_{(BR)EBO}$	Emitter-to-Base Breakdown Voltage	$I_E = 1\text{ mA}, I_C = 0\text{ A}$	6	–	–	V
$t_{on}$	Turn-ON Time	See specified Test Circuit	–	0.1	–	$\mu\text{s}$
$t_{stg}$	Storage Time		–	1.4	–	$\mu\text{s}$
$t_f$	Fall Time		–	0.2	–	$\mu\text{s}$

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

\* The 2SD1060 is classified by 1 A  $h_{FE}$  as follows:

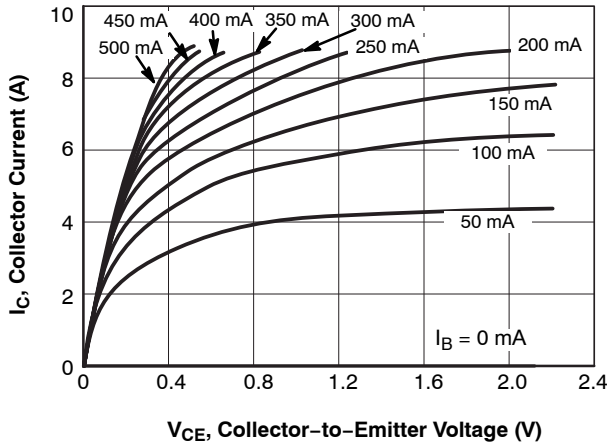
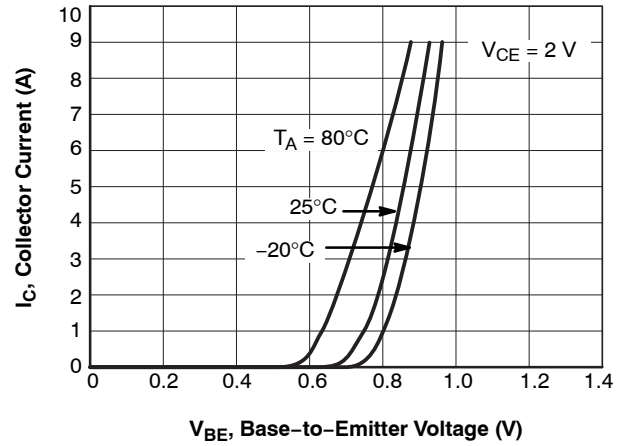
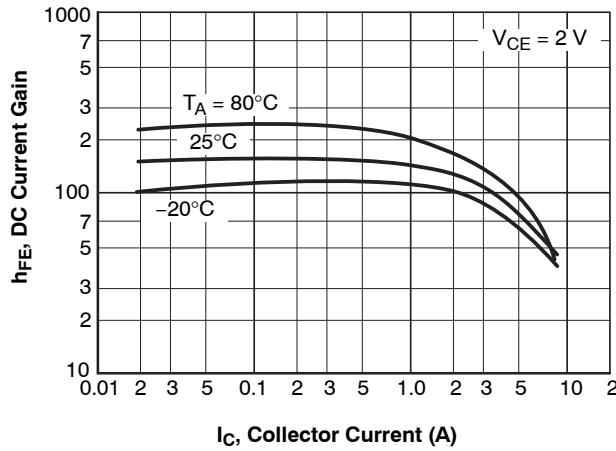
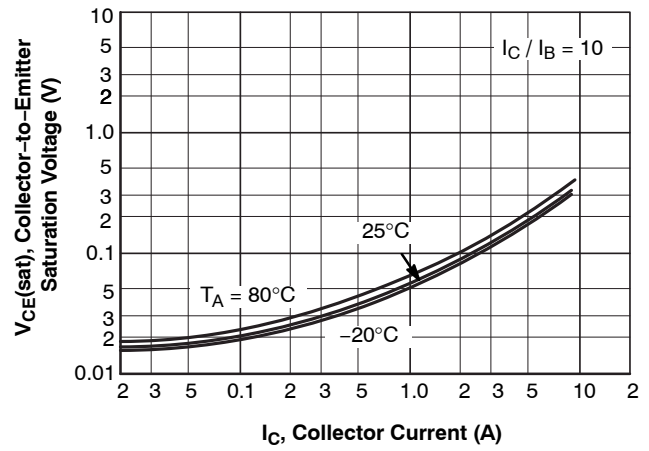
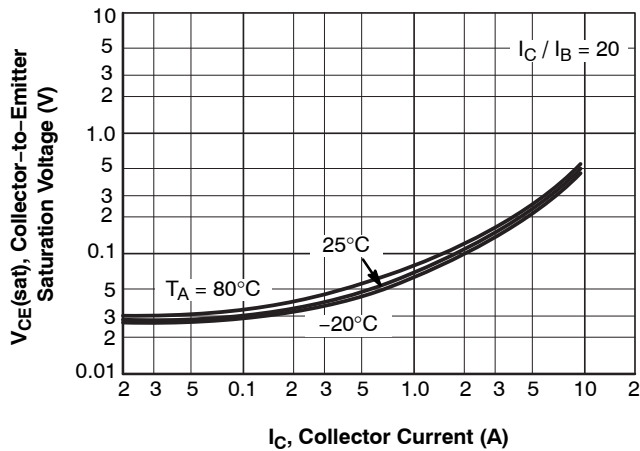
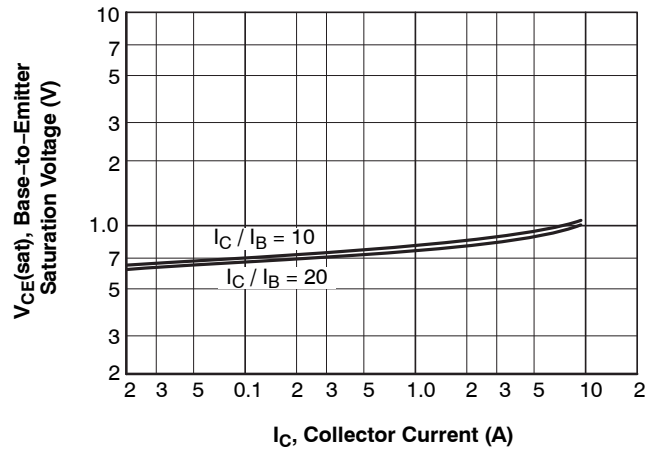
Rank	R	S
$h_{FE}$	100 to 200	140 to 280



$$I_C = 10I_{B1} = -10I_{B2} = 2\text{ A}$$

**Figure 1. Switching Time Test Circuit**

## TYPICAL CHARACTERISTICS

Figure 2.  $I_C - V_{CE}$ Figure 3.  $I_C - V_{BE}$ Figure 4.  $h_{FE} - I_C$ Figure 5.  $V_{CE(sat)} - I_C$ Figure 6.  $V_{CE(sat)} - I_C$ Figure 7.  $V_{BE(sat)} - I_C$

TYPICAL CHARACTERISTICS (continued)

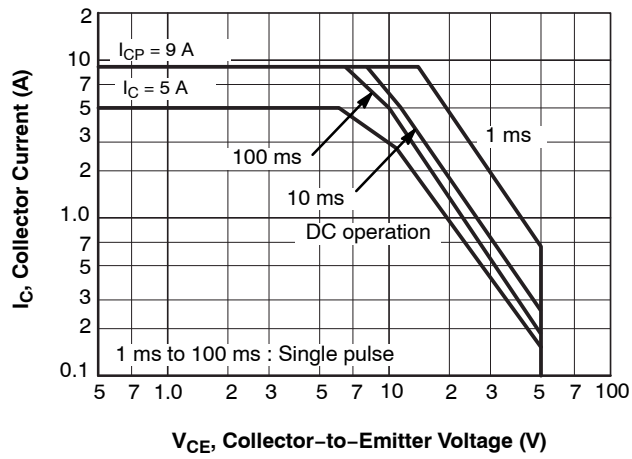


Figure 8. ASO

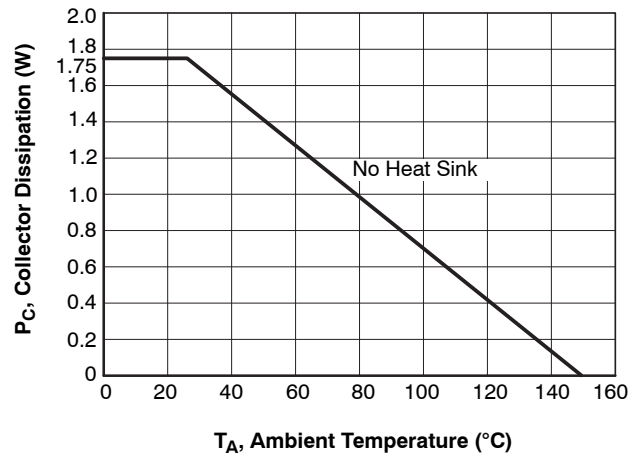


Figure 9.  $P_C - T_A$

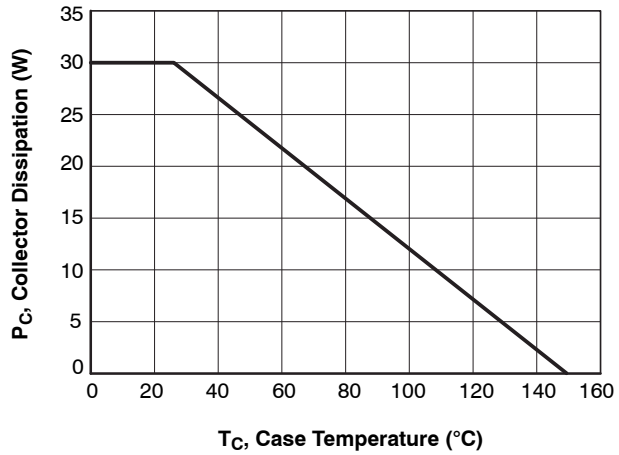
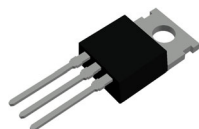
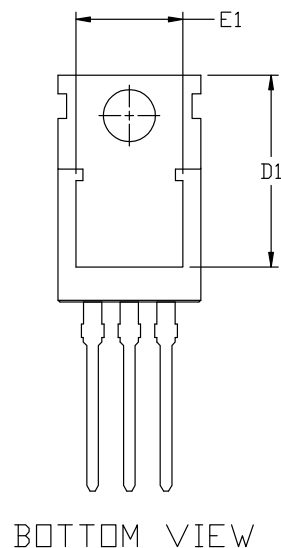
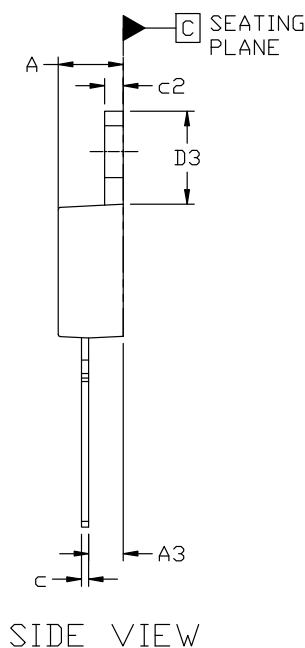
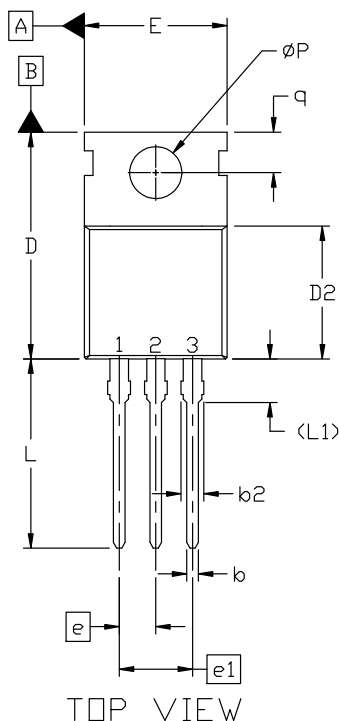


Figure 10.  $P_C - T_C$



TO-220, 3L, 10.00x9.20x4.50, 2.45P  
CASE 221AU  
ISSUE B

DATE 18 JAN 2024



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	4.30	4.50	4.70
A3	2.20	2.40	2.60
b	0.70	0.80	0.90
b2	1.17	1.27	1.37
c	0.45	0.50	0.60
c2	1.20	1.30	1.40
D	15.50	15.70	15.90
D1	13.10	13.30	13.50
D2	9.00	9.20	9.40
D3	6.30	6.50	6.70
E	9.80	10.00	10.20
E1	---	---	8.90
e	2.54 BSC		
e1	5.08 BSC		
L	12.88	13.08	13.28
L1	2.80	3.00	3.20
$\phi P$	3.40	3.60	3.80
q	2.70	2.80	2.90

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
4. MAXIMUM WIDTH FOR F102 DEVICES = 1.37MM.
5. DIMENSION "A3" TO BE MEASURED IN THE REGION DEFINED BY L1.

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