

## DATA SHEET

### 2SD965/965A

#### NPN PLASTIC ENCAPSULATE TRANSISTORS

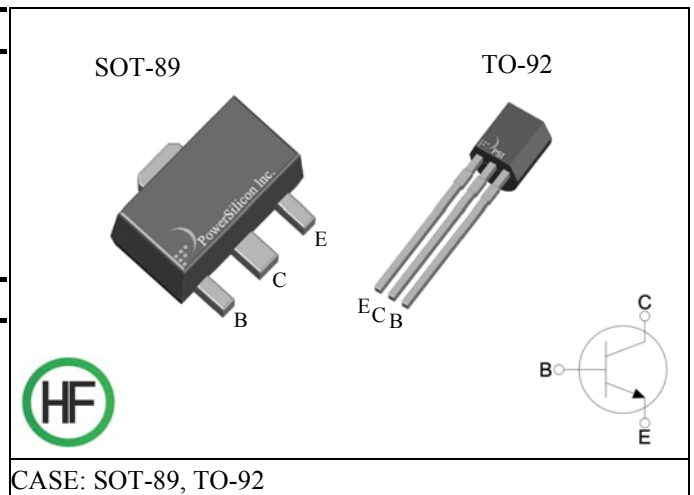
**VOLTAGE** 20~30 V **CURRENT** 5 A

#### FEATURES

- LOW VOLTAGE AND HIGH CURRENT
- EXCELLENT  $h_{FE}$  CHARACTERISTICS
- COLLECTOR-EMITTER VOLTAGE 20V FOR 2SD965
- COLLECTOR-EMITTER VOLTAGE 30V FOR 2SD965A
- LEAD FREE AND HALOGEN-FREE

#### MECHANICAL DATA

- CASE: SOT-89, TO-92
- SOLDERABILITY: MIL-STD-202, Method 208
- APPROX. WEIGHT: 0.045 GRAMS FOR SOT-89
- APPROX. WEIGHT: 0.02 GRAMS FOR TO-92



CASE: SOT-89, TO-92

#### ABSOLUTE MAXIMUM RATINGS

$T_A = 25^\circ\text{C}$ , UNLESS OTHERWISE NOTED.

PARAMETER	SYMBOL	VALUE	UNITS
COLLECTOR-BASE VOLTAGE	$V_{CBO}$	40	V
COLLECTOR-EMITTER VOLTAGE	$V_{CEO}$	20	V
		30	V
EMITTER-BASE VOLTAGE	$V_{EBO}$	7	V
COLLECTOR CURRENT-CONTINUOUS	$I_C$	5	A
COLLECTOR POWER DISSIPATION	$P_C$	750	mW
THERMAL RESISTANCE, JUNCTION TO AMBIENT	$R_{\theta JA}$	167	$^\circ\text{C}/\text{W}$
JUNCTION TEMPERATURE	$T_J$	150	$^\circ\text{C}$
STORAGE TEMPERATURE RANGE	$T_{STG}$	- 55 to + 150	$^\circ\text{C}$

**NOTE:**

1. THE VALUE OF  $R_{\theta JA}$  IS MEASURED WITH DEVICE MOUNTED ON 1 IN<sup>2</sup> FR-4 BOARD WITH 2 OZ. COPPER.

## ELECTRICAL CHARACTERISTICS

T<sub>A</sub> = 25°C, UNLESS OTHERWISE NOTED.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP	MAX.	UNIT	
COLLECTOR-BASE BREAKDOWN VOLTAGE	V <sub>(BR)CBO</sub>	I <sub>C</sub> =0.1mA, I <sub>E</sub> =0	40	-	-	V	
COLLECTOR-EMITTER BREAKDOWN VOLTAGE	V <sub>(BR)CEO</sub>	I <sub>C</sub> =1mA, I <sub>B</sub> =0	2SD965	20	-	-	V
			2SD965A	30	-	-	
EMITTER-BASE BREAKDOWN VOLTAGE	V <sub>(BR)EBO</sub>	I <sub>E</sub> =10μA, I <sub>C</sub> =0	7	-	-	V	
COLLECTOR CUT-OFF CURRENT	I <sub>CBO</sub>	V <sub>CB</sub> =10V, I <sub>E</sub> =0	-	-	0.1	μA	
EMITTER CUT-OFF CURRENT	I <sub>EBO</sub>	V <sub>EB</sub> =7V, I <sub>C</sub> =0	-	-	0.1	μA	
DC CURRENT GAIN	h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =1mA	-	200	-	-	
		V <sub>CE</sub> =2V, I <sub>C</sub> =500mA	230	-	800		
		V <sub>CE</sub> =2V, I <sub>C</sub> =2A	150	-	-		
COLLECT-EMITTER SATURATION VOLTAGE	V <sub>CE(SAT)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.1A	-	-	1	V	
TRANSITION FREQUENCY	f <sub>T</sub>	V <sub>CE</sub> =6V, I <sub>C</sub> =50mA	-	150	-	MHz	
COLLECTOR OUTPUT CAPACITANCE	C <sub>ob</sub>	V <sub>CB</sub> =20V, I <sub>E</sub> =0, f=1MHz	-	-	50	pF	

## ORDERING INFORMATION

PART NUMBER	PACKAGE	SHIPPING
2SD965-▲-T89R	SOT-89	TAPE REEL
2SD965A-▲-T89R	SOT-89	TAPE REEL
2SD965-▲-T92	TO-92	BULK
2SD965-▲-T92B	TO-92	TAPE BOX
2SD965A-▲-T92	TO-92	BULK
2SD965A-▲-T92B	TO-92	TAPE BOX

### NOTE:

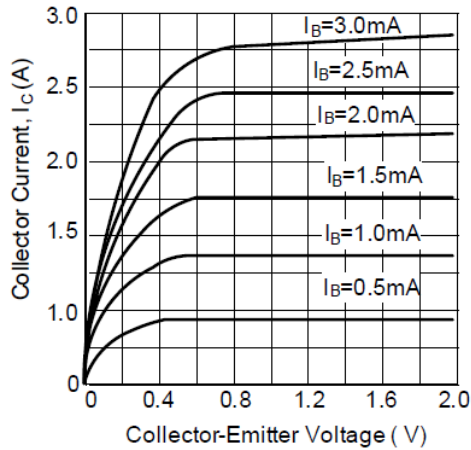
- ▲: RANK OF h<sub>FE</sub>, SEE CLASSIFICATION OF h<sub>FE</sub>

## CLASSIFICATION OF h<sub>FE</sub>

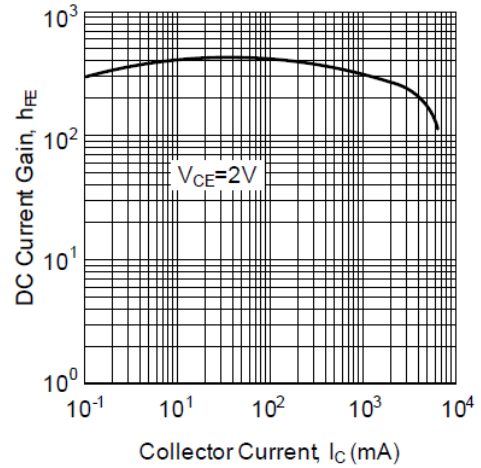
RANK	Q	R	S
RANGE	230~380	340~600	560~800

## TYPICAL PERFORMANCE CHARACTERISTICS

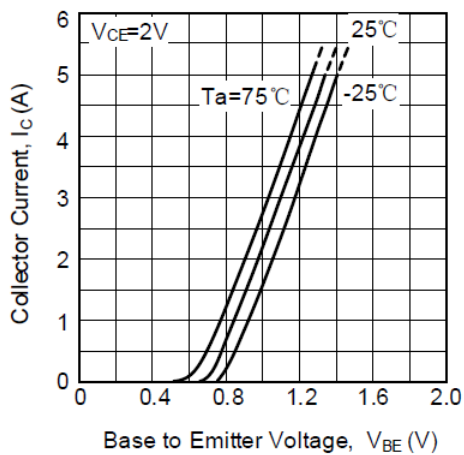
Static Characteristics



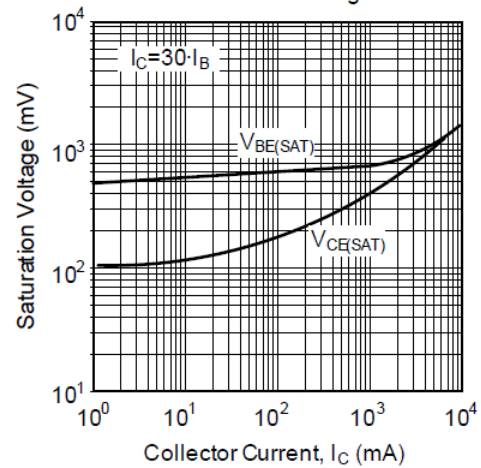
DC Current Gain



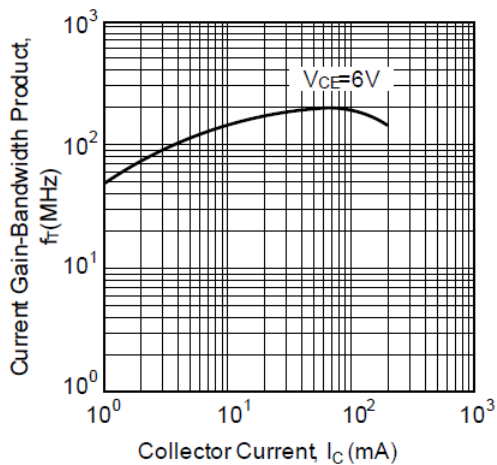
Base-Emitter on Voltage



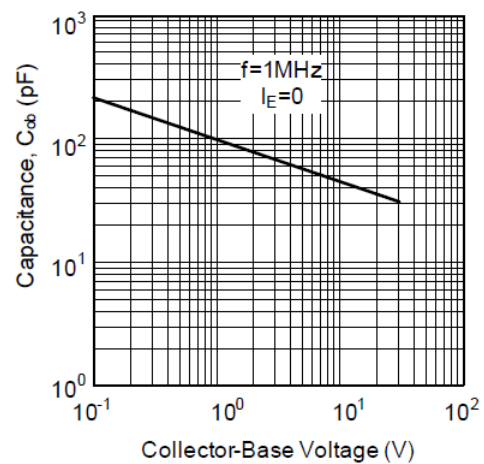
Saturation Voltage

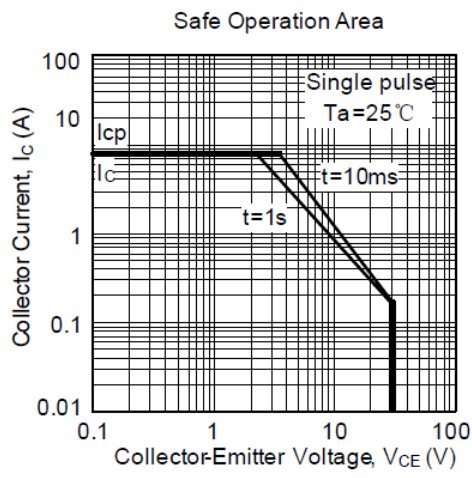


Current Gain-Bandwidth Product

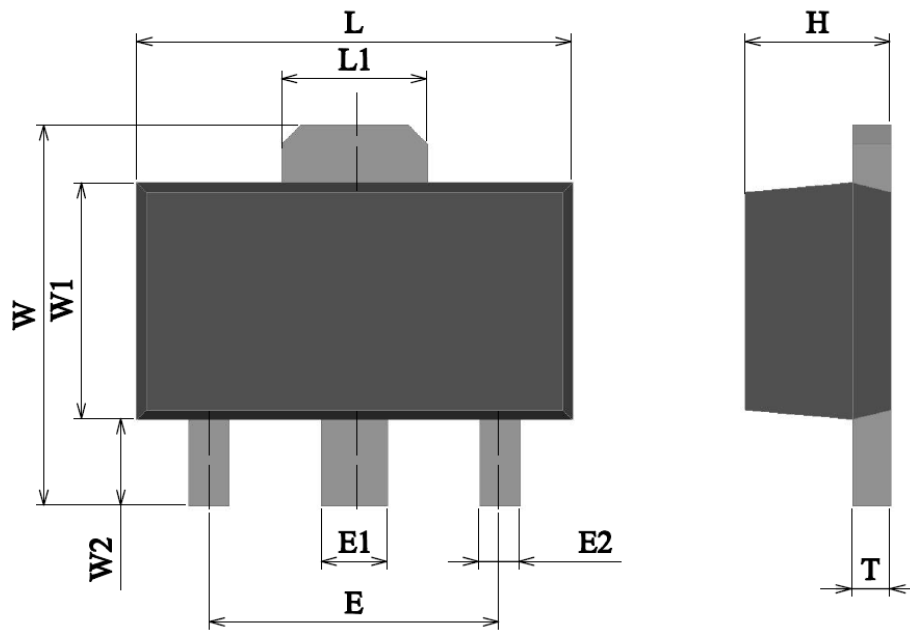


Collector Output Capacitance



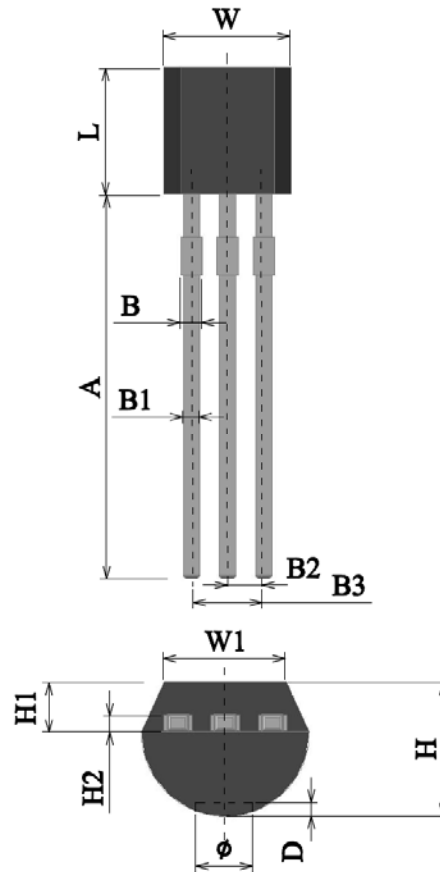


## SOT-89 DIMENSION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
L	4.40	4.70	0.173	0.185
L1	1.55	1.75	0.061	0.069
E	3.00 TYP		0.118 TYP	
E1	0.40	0.58	0.016	0.023
E2	0.32	0.52	0.013	0.020
W	3.94	4.25	0.155	0.167
W1	2.30	2.60	0.091	0.102
W2	0.90	1.20	0.035	0.047
H	1.45	1.60	0.057	0.063
T	0.35	0.44	0.014	0.017

## TO-92 DIMENSION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
L	4.30	4.70	0.169	0.185
W	4.40	4.70	0.173	0.185
W1	3.43	-	0.135	-
A	13.80	14.20	0.543	0.559
B	0.40	0.60	0.016	0.024
B1	0.38	0.55	0.015	0.022
B2	1.27 TYP		0.050 TYP	
B3	2.44	2.64	0.096	0.104
H	3.30	3.70	0.130	0.146
H1	1.10	1.40	0.043	0.055
H2	0.36	0.51	0.014	0.020
D	0.38	-	0.015	-
φ	1.60	-	0.063	-