New Jersey Semi-Conductor Products, Inc.

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TELEPHONE: (201) 376-2922
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NPN
2N3583 thru 2N3585
2N4240
PNP
2N6420 thru 2N6422

COMPLEMENTARY MEDIUM-POWER HIGH VOLTAGE POWER TRANSISTORS

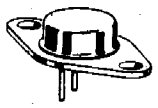
. . . designed for high-speed switching and linear amplifier applications for high-voltage operational amplifiers, switching regulators, converters, inverters, deflection stages and high fidelity amplifiers.

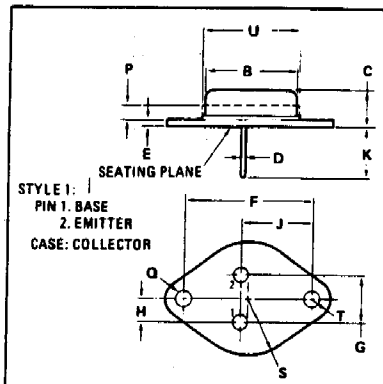
- Collector-Emitter Sustaining Voltage –
  $V_{CEO(sus)}$ = 175 to 300 Vdc @ I_C = 200 mAdc
- Second Breakdown Collector Current –
  $I_{s/b}$ = 350 mAdc @ V_{CE} = 100 Vdc – NPN
  = 150 mAdc @ V_{CE} = 100 Vdc – PNP
- Usable DC Current Gain to 2.0 Adc

1.0 AND 2.0 AMPERE

POWER TRANSISTORS COMPLEMENTARY SILICON

250-500 VOLTS
35 WATTS





DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
B	11.94	12.70	0.470	0.500
C	6.35	8.64	0.250	0.340
D	0.71	0.86	0.028	0.034
E	1.27	1.91	0.050	0.075
F	24.33	24.43	0.958	0.962
G	4.83	5.33	0.190	0.210
H	2.41	2.67	0.095	0.105
J	14.48	14.99	0.570	0.590
K	9.14	–	0.360	–
P	–	1.27	–	0.050
Q	3.61	3.96	0.142	0.152
S	–	8.89	–	0.350
T	–	3.68	–	0.145
U	–	15.75	–	0.620

All JEDEC Dimensions and and Notes Apply.

(TO-66)

*MAXIMUM RATINGS

Rating	Symbol	2N3583 2N6420	2N3584 2N6421	2N3585 2N6422	2N4240	Unit
Collector-Emitter Voltage	V_{CEO}	175	250	300	300	Vdc
Collector-Base Voltage	V_{CB}	250	375	500	500	Vdc
Emitter-Base Voltage	V_{EB}	6.0				Vdc
Collector Current—Continuous	I_C	1.0	2.0			Adc
—Peak (1)		5.0	5.0			
Base Current	I_B	1.0				Adc
Total Power Dissipation @ T_C = 25°C	P_D	35				Watts
Derate above 25°C		0.2				W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200				°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	5.0	°C/W

*Indicates JEDEC Registered Data

(1) Pulse Test: Pulse Width = 5.0 ms, Duty Cycle ≤ 10%.

Quality Semi-Conductors

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2N3583 thru 2N3585 • 2N4240 — NPN
2N6420 thru 2N6422 — PNP

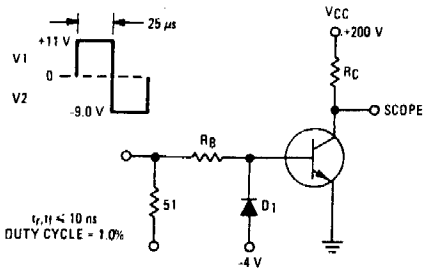
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

Characteristic	NPN	PNP	Symbol	NPN Min	NPN Max	PNP Min	PNP Max	Unit
DYNAMIC CHARACTERISTICS								
*Current Gain — Bandwidth Product[1] (I_C = 200 mAdc, V_{CE} = 10 Vdc, f_{test} = 5.0 MHz)	2N3583 2N3584 2N3585 2N4240	2N6420 2N6421 2N6422	f_T	10 15	– –	10 15	– –	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)	All		C_{ob}	–	120	–	120	pF
*Small-Signal Current Gain (I_C = 100 mAdc, V_{CE} = 30 Vdc, f = 1.0 kHz)	2N3583	2N6420	h_{fe}	25	350	25	350	–
***SWITCHING CHARACTERISTICS**								
Rise Time (V_{CC} = 200 Vdc, I_C = 1.0 Adc, R_L = 200 Ohms, I_{B1} = 100 mAdc) (V_{CC} = 200 Vdc, I_C = 0.75 Adc, R_L = 267 Ohms, I_{B1} = 75 mAdc)	2N3584 2N3585 2N4240	2N6421 2N6422	t_r	– –	3.0 0.5	– –	3.0 0.5	μs
Storage Time (V_{CC} = 200 Vdc, I_C = 1.0 Adc, I_{B1} = I_{B2} = 100 mAdc) (V_{CC} = 200 Vdc, I_C = 0.75 Adc, I_{B1} = I_{B2} = 75 mAdc)	2N3584 2N3585 2N4240	2N6421 2N6422	t_s	– –	4.0 6.0	– –	4.0 6.0	μs
Fall Time (V_{CC} = 200 Vdc, I_C = 1.0 Adc, I_{B1} = I_{B2} = 100 mAdc) (V_{CC} = 200 Vdc, I_C = 0.75 Adc, I_{B1} = I_{B2} = 75 mAdc)	2N3584 2N3585 2N4240	2N6421 2N6422	t_f	– –	3.0 3.0	– –	3.0 3.0	μs
Second Breakdown Collector Current (V_{CE} = 100 Vdc)	All	All	$I_{s/b}$	350	–	150	–	mAdc

*Indicates JEDEC Registered Data

[1] $f_T = |h_{fe}| \bullet f_{test}$.

FIGURE 1 – SWITCHING TIME TEST CIRCUIT



R_B and R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS
D_1 MUST BE FAST RECOVERY TYPE, eg:
MBD5300 USED ABOVE I_B ≈ 100 mA
MSD6100 USED BELOW I_B ≈ 100 mA
FOR t_d and t_r, D1 IS DISCONNECTED AND V_2 = 0.
FOR PNP TEST CIRCUIT, REVERSE DIODE AND VOLTAGE POLARITIES.

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

Characteristic	NPN	PNP	Symbol	NPN Min	NPN Max	PNP Min	PNP Max	Unit
***OFF CHARACTERISTICS (1)**								
Collector-Emitter Sustaining Voltage	2N3583	2N6420	$V_{CEO(sus)}$	175	–	175	–	Vdc
(I_C = 200 mAdc, I_B = 0) NPN	2N3584	2N6421		250	–	250	–	
	2N3585	2N6422		300	–	300	–	
(I_C = 50 mAdc, I_B = 0) PNP	2N4240			300	–	300	–	
Collector Cutoff Current			I_{CEO}					mAdc
(V_{CE} = 150 Vdc, I_B = 0)	2N3583	2N6420		–	10	–	10	
	2N3584	2N6421		–	5.0	–	5.0	
	2N3585	2N6422		–	5.0	–	5.0	
	2N4240			–	5.0	–	5.0	
Collector Cutoff Current			I_{CEX}					mAdc
(V_{CE} = 225 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N3583	2N6420		–	1.0	–	1.0	
(V_{CE} = 340 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N3584	2N6421		–	1.0	–	1.0	
(V_{CE} = 450 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N3585	2N6422		–	1.0	–	1.0	
	2N4240			–	2.0	–	2.0	
(V_{CE} = 225 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 150°C)	2N3583	2N6420		–	3.0	–	3.0	
(V_{CE} = 300 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 150°C)	2N3584	2N6421		–	3.0	–	3.0	
	2N3585	2N6422		–	3.0	–	3.0	
	2N4240			–	5.0	–	5.0	
Emitter Cutoff Current			I_{EBO}					mAdc
(V_{BE} = 6.0 Vdc, I_C = 0)	2N3583	2N6420		–	5.0	–	5.0	
	2N3584	2N6421		–	0.5	–	0.5	
	2N3585	2N6422		–	0.5	–	0.5	
	2N4240			–	0.5	–	0.5	
ON CHARACTERISTICS (1)								
DC Current Gain	All	All	h_{FE}	40	–	40	–	
(I_C = 0.1 Adc, V_{CE} = 10 Vdc)								
*(I_C = 0.5 Adc, V_{CE} = 10 Vdc)	2N3583	2N6420		40	200	40	200	
*(I_C = 0.75 Adc, V_{CE} = 2.0 Vdc)	2N4240			10	100	10	100	
(I_C = 0.75 Adc, V_{CE} = 10 Vdc)	2N4240			30	150	30	150	
*(I_C = 1.0 Adc, V_{CE} = 2.0 Vdc)	2N3584	2N6421		8.0	80	8.0	80	
	2N3585	2N6422		8.0	80	8.0	80	
(I_C = 1.0 Adc, V_{CE} = 10 Vdc)	2N3583*	2N6420		10	–	10	–	
	2N3584	2N6421		25	100	25	100	
	2N3585	2N6422		25	100	25	100	
*Collector-Emitter Saturation Voltage			$V_{CE(sat)}$					Vdc
(I_C = 0.75 Adc, I_B = 75 mAdc)	2N4240			–	1.0	–	1.0	
(I_C = 1.0 Adc, I_B = 125 mAdc)	2N3583	2N6420		–	5.0	–	5.0	
	2N3584	2N6421		–	0.75	–	0.75	
	2N3585	2N6422		–	0.75	–	0.75	
*Base-Emitter Saturation Voltage			$V_{BE(sat)}$					Vdc
(I_C = 0.75 Adc, I_B = 75 mAdc)	2N4240			–	1.8	–	1.8	
(I_C = 1.0 Adc, I_B = 100 mAdc)	2N3584	2N6421		–	1.4	–	1.4	
	2N3585	2N6422		–	1.4	–	1.4	
Base-Emitter On Voltage	All	All	$V_{BE(on)}$	–	1.4	–	1.4	Vdc
(I_C = 1.0 Adc, V_{CE} = 10 Vdc)								

*Indicates JEDEC Registered Data.

(1) Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2%.