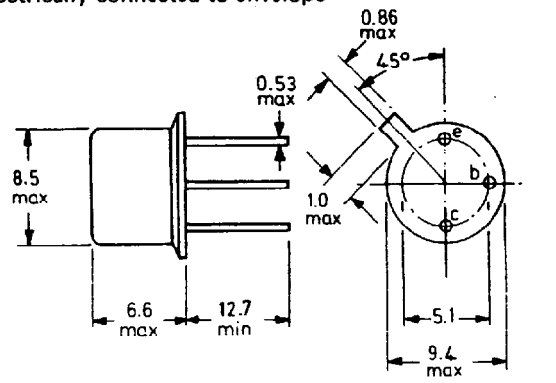


BRITISH STANDARDS INSTITUTION 2, PARK STREET, LONDON, W1A 2BS	BS CECC 50 002-131 CECC 50 002-131 ISSUE 1, AUGUST 1979
Specification available from:- MULLARD LIMITED Mullard House, Torrington Place, London, WC1E 7HD Telephone: 01-580-6633 Telex: 264341	 Page 1 of 15 pages
ELECTRONIC COMPONENTS OF ASSESSED QUALITY DETAIL SPECIFICATION IN ACCORDANCE WITH BS CECC 50 000 (1977) Generic specification for discrete semiconductor devices	MANUFACTURER'S TYPE NUMBER BSV15, BSV16, BSV17 (Gain groups 6, 10, 16) 2N4030, 2N4031, 2N4032, 2N4033 See PD 9002 and CECC 00200
Outline and dimensions Third angle projection BS 3934 SO-134A Collector is electrically connected to envelope  Marking information see page 4 All dimensions in mm	For ordering information see Page 4 P-N-P AMBIENT RATED SILICON PLANAR TRANSISTOR IN HERMETICALLY SEALED METAL CASE LEVEL F PLUS ADDITIONAL TESTS

4. LIMITING VALUES (Absolute maximum system)

(Over the operating temperature range unless otherwise stated)

		Min.	Max.	Unit
T _{amb}	Operating ambient temperature	-65	200	°C
T _{stg}	Storage temperature	-65	200	°C
P _{tot}	Power dissipation at T _{amb} ≤25°C*		800	mW
P _{tot}	Power dissipation at T _{case} ≤25°C* (*See derating curves Figs.1 and 2)		5	W

		BSV15	BSV16	BSV17	2N4030 2N4032	2N4031 2N4033	Unit
-V _{CBO}	Collector-base continuous (direct) voltage	—	—	—	60	80	V
-V _{CEO}	Collector-emitter continuous (direct) voltage	40	60	80	60	80	V
-V _{CES}	Collector-emitter continuous (direct) voltage with base short circuit to emitter	40	60	90	—	—	V
-V _{EBO}	Emitter-base continuous (direct) voltage	5	5	5	5	5	V
-I _C	Continuous (direct) collector current	1	1	1	1	1	A
-I _B	Continuous (direct) base current	0.2	0.2	0.2	0.2	0.2	A

Refer to Qualified Products List PD 9002 and/or CECC 00200 for details of manufacturers approved to this specification.

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5. CHARACTERISTICS at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated

The parameters marked with sign + are tested for inspection, in the test groups A and C.

			Min.	Max.	Unit
+ $-I_{CES(1)}$	Collector cut-off current with base short circuit to emitter $V_{EB} = 0, -V_{CE} = 40\text{ V}$ 60 V 80 V	BSV15	—	100	nA
		BSV16	—	100	nA
		BSV17	—	100	nA
+ $-I_{CBO(1)}$	Collector cut-off current with emitter open circuit $I_E = 0, V_{CB} = -50\text{ V}$ -60 V	2N4030, 2N4032	—	50	nA
		2N4031, 2N4033	—	50	nA
+ $-I_{CES(2)}$	$V_{EB} = 0, T_{amb} = 150^{\circ}\text{C}, -V_{CE} = 40\text{ V}$ 60 V 80 V	BSV15	—	50	μA
		BSV16	—	50	μA
		BSV17	—	50	μA
+ $-I_{CBO(2)}$	$I_E = 0, T_{amb} = 150^{\circ}\text{C}, -V_{CE} = 50\text{ V}$ 60 V	2N4030, 2N4032	—	50	μA
		2N4031, 2N4033	—	50	μA
+ $-V_{(BR)CEO}$	Collector-emitter breakdown voltage with base open circuit $I_B = 0, -I_C = 50\text{ mA}^*$ 10 mA*	BSV15	40	—	V
		BSV16	60	—	V
		BSV17	80	—	V
		2N4030, 2N4032	60	—	V
		2N4031, 2N4033	80	—	V
+ $-I_{EBO}$	Emitter-base leakage current $I_C = 0, -V_{EB} = 4\text{ V}$ 5 V	BSV15	—	50	nA
		BSV16	—	50	nA
		BSV17	—	50	nA
		2N4030-33	—	10	μA
+ $h_{21E(1)}$	Static forward current transfer ratio $V_{CE} = -5\text{ V}, I_C = -100\text{ mA}^*$	2N4030, 2N4031	40	120	
		2N4032, 2N4033	100	300	
	$V_{CE} = -1\text{ V}, I_C = -100\text{ mA}^*$	BSV15, 16, 17			
		Group 6	40	100	
		Group 10	63	160	
		BSV15, 16			
		Group 16	100	250	
+ $h_{21E(3)}$	Static forward current transfer ratio $V_{CE} = -5\text{ V}, I_C = -500\text{ mA}^*$	2N4030, 2N4031	25	—	
		2N4032, 2N4033	70	—	
	$V_{CE} = -1\text{ V}, I_C = -500\text{ mA}^*$	BSV15, 16, 17			
		Group 6	20	—	
		Group 10	25	—	
		BSV15, 16			
		Group 16	35	—	

*Pulsed $t_p = 300\text{ }\mu\text{s}$ $\delta \leq 2\%$

CHARACTERISTICS (contd.)

			Min.	Max.	Unit
$h_{21E(4)}$	Static forward current transfer ratio $V_{CE} = -5 \text{ V}, I_C = -100 \mu\text{A}$	2N4030, 2N4031 2N4032, 2N4033 BSV15, 16, 17 Group 6 Group 10 BSV15, 16 Group 16	30 75 15 20 30	— — — — —	
$^{+}V_{CE(sat)1}$	Collector-emitter saturation voltage $-I_C = 500 \text{ mA}, -I_B = 25 \text{ mA}^*$ $-I_C = 500 \text{ mA}, -I_B = 50 \text{ mA}^*$	BSV15, 16, 17 2N4030-33	0.25 —	1.0 0.5	V V
$^{+}V_{CE(sat)2}$	Collector-emitter saturation voltage $-I_C = 1 \text{ A}, -I_B = 100 \text{ mA}^*$	2N4030 2N4032	— —	1.0 1.0	V V
$^{+}V_{BE(sat)1}$	Base-emitter saturation voltage $-I_C = 150 \text{ mA}, -I_B = 15 \text{ mA}^*$	2N4030-33	—	0.9	V
$^{+}V_{BE}$	Base-emitter voltage $-I_C = 100 \text{ mA}, -V_{CE} = 1 \text{ V}^*$ $-I_C = 500 \text{ mA}, -V_{CE} = 0.5 \text{ V}^*$	BSV15, 16, 17 2N4030-33	— —	1.0 1.1	V V
$^{+}C_{22b}$	Common-base output capacitance $I_E = 0, -V_{CB} = 10 \text{ V}, f = 1 \text{ MHz}$	BSV15 BSV16 BSV17 2N4030-33	— — — —	30 30 25 20	pF pF pF pF
$^{+}C_{11e}$	Common-emitter input capacitance $I_C = 0, -V_{EB} = 0.5 \text{ V}, f = 1 \text{ MHz}$	BSV15, 16, 17 2N4030-33	— —	180 110	pF pF
$^{+}f_T$	Transition frequency $-I_C = 50 \text{ mA}, -V_{CE} = 10 \text{ V}, f = 20 \text{ MHz}^*$	BSV15, 16, 17 2N4030-31 2N4032-33	50 100 150	— 400 500	MHz MHz MHz
$^{+}t_{on}$	Turn-on time** $-I_C = 100 \text{ mA}, -I_B = 5 \text{ mA}$ $-I_C = 500 \text{ mA}, -I_B = 50 \text{ mA}$	BSV15, 16, 17 2N4030-33	— —	500 100	ns ns
$^{+}t_s$	Storage time** $-I_C = 100 \text{ mA}, -I_{B1} = +I_{B2} = 5 \text{ mA}$ $-I_C = 500 \text{ mA}, -I_{B1} = +I_{B2} = 50 \text{ mA}$	BSV15, 16, 17 2N4030-33	— —	500 350	ns ns
$^{+}t_f$	Fall time** $-I_C = 100 \text{ mA}, -I_{B1} = +I_{B2} = 5 \text{ mA}$ $-I_C = 500 \text{ mA}, -I_{B1} = +I_{B2} = 50 \text{ mA}$	BSV15, 16, 17 2N4030-33	— —	150 50	ns ns

*Pulsed $t_p = 300 \mu\text{s}$ $\delta \leq 2\%$

(**For switching circuits see Figs.3 and 4)

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MARKING

Each device shall bear the following markings:

- (a) Type number, e.g., 2N4030
- (b) Date code, e.g., 7901
- (c) Manufacturer's trade mark or factory identification code, QDG.

Each package containing one or more of these transistors shall bear the above marking and in addition, this detail specification number CECC 50 002-131.

ORDERING INFORMATION

Orders for this transistor should include the following minimum information:

Transistor type, e.g., 2N4030 to CECC 50 002-131

For BSV15, 16, 17 add gain code 6, 10 or 16 as applicable, e.g., BSV15-6

RELATED DOCUMENTS

BSE 9000	General requirements for electronic components of assessed quality.
CECC 50 000	Generic specification for discrete semiconductor devices.
CECC 00-007	Sampling plans and procedures for inspection by attributes.
PD 9002	
CECC 00-200	Qualified products list.
BS 2011/IEC68	Methods for the environmental testing of electronic components.
BS 3934	Dimensions of semiconductor devices.

6. TEST CONDITIONS AND INSPECTION REQUIREMENTS

All reference to clause numbers are to CECC 50-000 unless otherwise stated.

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GROUP A - Lot by lot

All tests are non-destructive (3.5.6)

Examination or test	Ref.	Conditions at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated	Inspection requirements				
			Limits		Units	Levels	IL
			Min.	Max.			
Subgroup A1 Visual inspection	4.2.1.	All types	As 4.2.1.				I 0.65
Examination or Test	Ref.	Conditions at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated	Inspection requirements				
			Limits		Units	Levels	I.L
			min.	max.			
Subgroup A2a Non-operatives short circuit $-I_{CES}(1)$	4.3.4 T.009	Conditions as in Subgroup A2b BSV15, BSV16, BSV17	-	10	μA		II 0.15
$-I_{CBO}(1)$	4.3.4 T.001	Conditions as in Subgroup A2b 2N4030, 2N4031, 2N4032, 2N4033	-	5	μA		
open circuit $h_{21E}(1)$	4.3.4 T.006	Conditions as in Subgroup A2b	5	-			
Subgroup A2(b)							
$-I_{CES}(1)$	4.3.4 T.009	$-V_{CE} = 40\text{ V}, V_{EB} = 0$ BSV15 = 60 V BSV16 = 80 V BSV17	-	100	nA		II 1.0
$-I_{CBO}(1)$	4.3.4 T.001	$-V_{CE} = 50\text{ V}, I_E = 0$ 2N4030/32 = 60 V 2N4031/33	-	100.50 100.50	nA		
$-V_{(BR)CEO}$	App.A	$-I_C = 50\text{ mA}, I_B = 0$ BSV15 BSV16 BSV17 = 10 mA* 2N4030/32 2N4031/33	40 60 80 60 80	- - - - -	V V V V V		
$h_{21E}(1)$	4.3.4 T.006	$-V_{CE} = 5\text{ V}, -I_C = 100\text{ mA}^*$ 2N4030/31 2N4032/33 $-V_{CE} = 1\text{ V}, -I_C = 100\text{ mA}^*$ BSV15, 16, 17 Group 6 Group 10 BSV15, 16 Group 16	40 100 300 40 63 100	120 300 100 100 160 250			
$h_{21E}(3)$	4.3.4 T.006	$-V_{CE} = 5\text{ V}, -I_C = 500\text{ mA}^*$ 2N4030/31 2N4032/33 $-V_{CE} = 1\text{ V}, -I_C = 500\text{ mA}^*$ BSV15, 16, 17 Group 6 Group 10 BSV15, 16 Group 16	25 70 20 25 35	- - - - -			

*Pulsed $t_p = 300\text{ }\mu\text{s}$ $\delta \leq 2\%$.

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GROUP A – Lot by lot (contd.)

Examination or test	Ref.	Conditions at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated	Inspection requirements					
			Limits		Units	Levels	IL	AQL %
			Min.	Max.				
Subgroup A3							I	2.5
$-I_{EBO}$	4.3.4. T-002	$-V_{EB} = 4\text{ V}, -I_C = 0$ BSV15, 16, 17 $= 5\text{ V}$ 2N4030-33	—	50	nA			
			—	10	μA			
$-V_{BE}$	4.3.4. T-005	$-I_C = 100\text{ mA}, -V_{CE} = 1\text{ V}^*$ BSV15, 16, 17	—	1.0	V			
		$-I_C = 500\text{ mA}, -V_{CE} = 0.5\text{ V}^*$ 2N4030-33	—	1.1	V			
Subgroup A4							S4	4.0
f_T	4.3.4. T-041	$-I_C = 50\text{ mA}, -V_{CE} = 10\text{ V}^*$ $f = 20\text{ MHz}$ BSV15, 16, 17 2N4030/31 2N4032/33	50 100 150	— 400 500	MHz MHz MHz			

*Pulsed $t_p = 300\text{ }\mu\text{s}$. $\delta \leq 2\%$