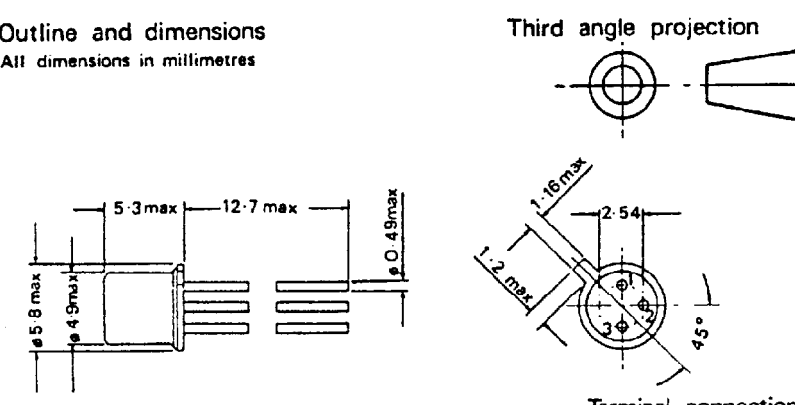
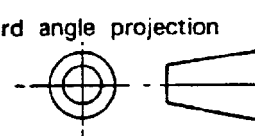


BRITISH STANDARDS INSTITUTION 2 PARK STREET, LONDON W1A 2BS	BS CECC 50 012-001
Specification available from:- as shown in PD 9002, CECC 00200 and SILICONIX LIMITED MORRISTON, SWANSEA (UK), SA6 6NE TELEPHONE 0792 74681 TELEX 48197	ISSUE 2 MAR 1982  <i>Page 1 of 14 pages</i>
ELECTRONIC COMPONENTS OF ASSESSED QUALITY DETAIL SPECIFICATION IN ACCORDANCE WITH BS CECC 50 000:1980	MANUFACTURER'S TYPE NUMBER 2N3970 2N3971 2N3972
Outline and dimensions All dimensions in millimetres  For detail dimensions see:- IEC 191-2 B11 and C7 Marking information see clause 6	For ordering information see clause 7
	SINGLE GATE FIELD EFFECT TRANSISTOR
	SILICON N-CHANNEL JUNCTION-GATE TYPE FOR SWITCHING AND CHOPPER APPLICATIONS AMBIENT RATED METAL CASE
Third angle projection  Terminal connections 1. Source 2. Drain 3. Gate (connected to case)	LEVELS OF QUALITY ASSESSMENT E - F - L

4 LIMITING VALUES (absolute maximum system)

These apply over the operating temperature range, unless otherwise stated.

		Min.	Max.	Unit
4.1	T_{amb} Ambient operating temperature range	-65	150	$^{\circ}\text{C}$
4.2	T_{stg} Storage temperature range	-65	200	$^{\circ}\text{C}$
4.3	V_{DSS} Drain-source voltage ($T_{amb} = 25^{\circ}\text{C}$)		40	V
4.4	$-V_{GSR}$ Gate-source reverse voltage ($V_{DS} = 0$)		40	V
4.5	$-V_{GDO}$ Gate-drain reverse voltage with source open-circuited		40	V
4.6	I_{GF} Forward gate current		50	mA
4.7	I_D Drain current		200	mA
4.8.1	P_{tot} Total power dissipation ($T_{amb} = 25^{\circ}\text{C}$) See Appendix 1 for derating curve		0.3	W
	P_{tot} Total power dissipation ($T_{case} = 25^{\circ}\text{C}$)		1.8	W
	Lead temperature 1.5 mm from case for 60 s.		300	$^{\circ}\text{C}$

Refer to Qualified Products List PD9002 or CECC 00 200 for availability of components approved to this detail specification.

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5 CHARACTERISTICS

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

† = Characteristics verified under inspection requirements.

PARAMETER AND TEST CONDITIONS		Min.	Max.	Unit
$-I_{GD0(1)}$	Maximum leakage current with source open-circuited † $V_{GD} = 20\text{ V}$ $I_S = 0$ All types		250	pA
$-I_{GD0(2)}$	Maximum leakage current with source open-circuited † $V_{GD} = 20\text{ V}$ $I_S = 0$ $T_{amb} = 150^{\circ}\text{C}$ All types		500	nA
$-V_{GSoff}$	Minimum and maximum gate-source cut-off voltage † $V_{DS} = 20\text{ V}$ $I_D = 1\text{ nA}$			
	2N3970	4.0	10.0	V
	2N3971	2.0	5.0	V
	2N3972	0.5	3.0	V
$I_{DSX(1)}$	Maximum drain cut-off current † $V_{DS} = 20\text{ V}$ $-V_{GS} = 12\text{ V}$ All types		250	pA
$I_{DSX(2)}$	Maximum drain cut-off current † $V_{DS} = 20\text{ V}$ $-V_{GS} = 12\text{ V}$ $T_{amb} = 150^{\circ}\text{C}$ All types		500	nA
I_{DSS}^*	Minimum and maximum drain current † $V_{DS} = 20\text{ V}$ $V_{GS} = 0$			
	2N3970	50	150	mA
	2N3971	25	75	mA
	2N3972	5	30	mA
V_{DSsat} ($V_{DS(ON)}$)	Maximum drain-source saturation voltage † $V_{GS} = 0$ $I_D = 20\text{ mA}$ 2N3970 $V_{GS} = 0$ $I_D = 10\text{ mA}$ 2N3971 $V_{GS} = 0$ $I_D = 5\text{ mA}$ 2N3972		1.0 1.5 2.0	V V V

* Pulse test required, pulse width = 300 μs , duty cycle = 3 %

5 CHARACTERISTICS

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

† = Characteristics verified under inspection requirements.

PARAMETER AND TEST CONDITIONS		Min.	Max.	Unit
C_{iss}	Maximum small signal common-source input capacitance † $V_{DS} = 20\text{ V}$ $V_{GS} = 0$ $f = 1\text{ MHz}$ All types		25	pF
C_{22ss}	Maximum small signal common-source output capacitance † $V_{DS} = 20\text{ V}$ $-V_{GS} = 12\text{ V}$ $f = 1\text{ MHz}$ All types		5	pF
C_{12ss}	Maximum small signal common-source reverse transfer capacitance † $V_{DS} = 0$ $-V_{GS} = 12\text{ V}$ $f = 1\text{ MHz}$ All types		6	pF
$t_{d(on)}$	Turn-on delay time **† $V_{DD} = 10\text{ V}$ $V_{GS(ON)} = 0$ $C_L = 0$ $-V_{GS(off)} = 10\text{ V}$ $R_L = 450\ \Omega$ 2N3970 $-V_{GS(off)} = 5\text{ V}$ $R_L = 850\ \Omega$ 2N3971 $-V_{GS(off)} = 3\text{ V}$ $R_L = 1.6\text{ k}\Omega$ 2N3972		10 15 40	ns ns ns
t_{off}	Turn-off time **† $V_{DD} = 10\text{ V}$ $V_{GS(ON)} = 0$ $C_L = 0$ $-V_{GS(off)} = 10\text{ V}$ $R_L = 450\ \Omega$ 2N3970 $-V_{GS(off)} = 5\text{ V}$ $R_L = 850\ \Omega$ 2N3971 $-V_{GS(off)} = 3\text{ V}$ $R_L = 1.6\text{ k}\Omega$ 2N3972		30 60 100	ns ns ns
t_r	Rise time **† $V_{DD} = 10\text{ V}$ $V_{GS(ON)} = 0$ $C_L = 0$ $-V_{GS(off)} = 10\text{ V}$ $R_L = 450\ \Omega$ 2N3970 $-V_{GS(off)} = 5\text{ V}$ $R_L = 850\ \Omega$ 2N3971 $-V_{GS(off)} = 3\text{ V}$ $R_L = 1.6\text{ k}\Omega$ 2N3972		10 15 40	ns ns ns
$r_{DS(ON)}$	Maximum drain-source on-state resistance † $I_D = 1\text{ mA}$ $V_{GS} = 0$ 2N3970 2N3971 2N3972 $-I_D = 1\text{ mA}$ $V_{GS} = 0$ 2N3970 2N3971 2N3972		30 60 100 30 60 100	Ω Ω Ω Ω Ω Ω

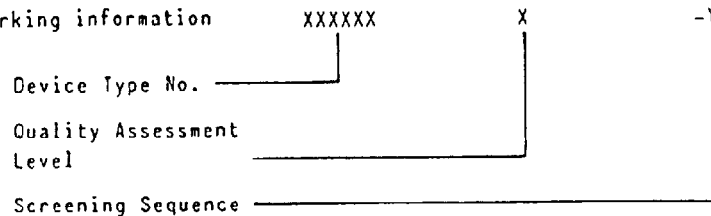
** For pulse waveforms see Appendix 2.

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6 MARKING

- 1) Each transistor shall bear the following marking:
 - a) The manufacturer's type number (see Table 1).
 - b) The factory identification code.
 - c) The date code.
- 2) Each package containing one or more of these transistors shall bear all the above markings except (b) and in addition
 - d) The detail specification number (see Table 1).
- 3) Interpretation of marking information



KEY:

Quality Assessment Level
(CECC 50,000 ISSUE III APPENDIX IIA)

E
F
L

Screening Sequence
(CECC 50,000 ISSUE III APPENDIX VI)

BLANK
A
B
C
D

No Screening
Sequence A
Sequence B
Sequence C
Sequence D

5. ORDERING INFORMATION

The following minimum information is necessary to order a specific device, unless otherwise specified:

- precise type number
- CECC reference of detail specification with issue number and/or date when relevant
- level of quality assessment as defined in Appendix II A of CECC 50 000, and, if required, screening sequence as defined in Appendix VI of CECC 50 000
- any other particulars

Orders for these transistors shall contain the following minimum information

TABLE 1

ORDER TYPE	SPECIFICATION NUMBER	MARKING
BS 2N3970X - Y to	BS CECC 50 012 - 001 Issue 2 dated Mar. 1982	2N3970X - Y
BS 2N3971X - Y to	BS CECC 50 012 - 001 Issue 2 dated Mar. 1982	2N3971X - Y
BS 2N3972X - Y to	BS CECC 50 012 - 001 Issue 2 dated Mar. 1982	2N3972X - Y

TEST CONDITIONS AND INSPECTION REQUIREMENTS

GROUP A LOT-BY-LOT

ND = NON-DESTRUCTIVE TESTS (See 3.5.6 of BS CECC 50 000)

AQL = given in %

EXAMINATION OR TEST	D or ND	REF. BS CECC 50 000	CONDITIONS $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated	INSPECTION REQUIREMENTS								
				LIMITS			LEVELS					
				Min.	Max.	Unit	E		F		L	
							IL	AQL	IL	AQL	IL	AQL
SUBGROUP A1												
Visual inspection	ND	4.2.1					I	0.65	I	0.65	I	0.65
SUBGROUP A2a												
Leakage current with source open-circuited $-I_{GSS}(1)$	ND	4.3.4 T.071	$V_{GD} = 20\text{ V}$ $I_S = 0$ All types		2.5	nA	II	0.15	II	0.15	II	0.15
Drain cut-off current $I_{DSX}(1)$	ND	4.3.4 T.073	$V_{DS} = 20\text{ V}$ $-V_{GS} = 12\text{ V}$ All types		2.5	nA						
SUBGROUP A2b												
Leakage current with source open-circuited $-I_{GDO}(1)$	ND	4.3.4 T.071	$V_{GD} = 20\text{ V}$ $I_S = 0$ All types		250	pA	II	0.4	II	1.0	II	1.0
Gate-source cut-off voltage $-V_{GSoff}$	ND	4.3.4 T.074	$V_{DS} = 20\text{ V}$ $I_D = 1\text{ nA}$ 2N3970 2N3971 2N3972	4.0 2.0 0.5	10.0 5.0 3.0	V V V						
Drain current I_{DSS}^*	ND	4.3.4 T.072	$V_{DS} = 20\text{ V}$ $V_{GS} = 0$ 2N3970 2N3971 2N3972	50 25 5	150 75 30	mA mA mA						
Drain cut-off current $I_{DSX}(1)$	ND	4.3.4 T.073	$V_{DS} = 20\text{ V}$ $-V_{GS} = 12\text{ V}$ All types		250	pA						
Drain-source saturation voltage V_{DSsat} ($V_{DS(ON)}$)	ND	4.3.4 T.085 IEC 147-2G Clause 15	$V_{GS} = 0$ $I_D = 20\text{ mA}$ 2N3970 $V_{GS} = 0$ $I_D = 10\text{ mA}$ 2N3971 $V_{GS} = 0$ $I_D = 5\text{ mA}$ 2N3972		1.0 1.5 2.0	V V V						
Drain-source on-state resistance $r_{DS(ON)}$	ND	4.3.4 T.082	$V_{GS} = 0$ $I_D = 1\text{ mA}$ 2N3970 2N3971 2N3972 $V_{GS} = 0$ $-I_D = 1\text{ mA}$ 2N3970 2N3971 2N3972		30 60 100 30 60 100	Ω Ω Ω Ω Ω Ω						

* Pulse test required, pulse width = 300 μs , duty cycle = 3 %