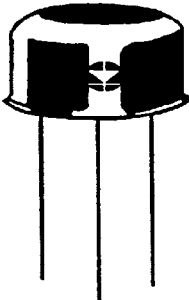


BRITISH STANDARDS INSTITUTION 2 Park Street, London W1A 2BS	BS CECC 50012-027 Issue 2 August 1985 Page 1 of 19 Reprinted February, 1991																																																																											
Electronic Components as Assessed Quality in accordance with CECC 50000, Issue 3.	DETAIL SPECIFICATION FOR:- Single Gate Field Effect Transistor, N Channel, enhanced gate. <table border="0"> <tr> <td>Type Numbers</td> <td>Similar to</td> </tr> <tr> <td>2N6782</td> <td>IRFF110</td> </tr> <tr> <td>2N6784</td> <td>IRFF210</td> </tr> <tr> <td>2N6786</td> <td>IRFF310</td> </tr> </table> ORDERING INFORMATION:- See Clause 7 of this document		Type Numbers	Similar to	2N6782	IRFF110	2N6784	IRFF210	2N6786	IRFF310																																																																		
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Specification available from:- As shown in PD 9002, CECC 00200 and INTERNATIONAL RECTIFIER CO (GB) LTD Hurst Green, Oxted, Surrey RH8 9BB.	2: Semiconductor Material : Silicon. Encapsulation : Hermetically Sealed Metal Can. Application : a. Low frequency amplification. : b. Switching. Power : Case rated : 15W @ $T_{case} = 25^{\circ}C$																																																																											
Tel: (0883) 713215. Tlx:95219. Fax: (0883) 714234.																																																																												
1: MECHANICAL DESCRIPTION CAUTION: Static Sensitive. Devices, see Clause 9. OUTLINE:  For detail dimensions and terminal identification see Appendix III. MARKING: See Clause 6 of this document.	3: LEVELS OF QUALITY ASSESSMENT: E, plus additional tests. Screening level A, B, C or D.																																																																											
	4: LIMITING VALUES (Absolute maximum rating system). These apply over the operating temperature range unless otherwise stated.																																																																											
<table border="1"> <thead> <tr> <th rowspan="2">CECC 50012 REFERENCE</th> <th rowspan="2"></th> <th rowspan="2">SYMBOL</th> <th colspan="3">VALUE</th> </tr> <tr> <th>MIN</th> <th>MAX</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>4.1</td> <td>Operating temperature range</td> <td>T_{case}</td> <td>-55</td> <td>+ 150</td> <td>$^{\circ}C$</td> </tr> <tr> <td>4.2</td> <td>Storage temperature range</td> <td>T_{stg}</td> <td>-55</td> <td>+ 150</td> <td>$^{\circ}C$</td> </tr> <tr> <td>4.3</td> <td>Drain-source voltage at $V_{GS} = 0$ $T_J = 25^{\circ}C$ to $150^{\circ}C$</td> <td>V_{DSS}</td> <td>-</td> <td>100 200 400</td> <td>V V V</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4.4</td> <td>Reverse gate-source voltage at $V_{DS} = 0$</td> <td>$-V_{GSR}$</td> <td>-</td> <td>20</td> <td>V</td> </tr> <tr> <td>4.5</td> <td>Gate-drain voltage with source open circuit</td> <td>V_{GDO}</td> <td>-</td> <td>20</td> <td>V</td> </tr> <tr> <td>4.7</td> <td>Continuous drain current @ $T_{case} = 25^{\circ}C$</td> <td>I_D</td> <td>-</td> <td>3.5 2.25 1.25</td> <td>A A A</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4.71</td> <td>Pulsed drain current @ $T_{case} = 25^{\circ}C$</td> <td>I_{DM}</td> <td>-</td> <td>8.0 5.0 2.4</td> <td>A A A</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4.8</td> <td>Power dissipation (see derating curve page 15) $T_{case} = 25^{\circ}C$</td> <td>P_{tot}</td> <td>-</td> <td>15</td> <td>W</td> </tr> </tbody> </table>	CECC 50012 REFERENCE		SYMBOL	VALUE			MIN	MAX	UNIT	4.1	Operating temperature range	T_{case}	-55	+ 150	$^{\circ}C$	4.2	Storage temperature range	T_{stg}	-55	+ 150	$^{\circ}C$	4.3	Drain-source voltage at $V_{GS} = 0$ $T_J = 25^{\circ}C$ to $150^{\circ}C$	V_{DSS}	-	100 200 400	V V V							4.4	Reverse gate-source voltage at $V_{DS} = 0$	$-V_{GSR}$	-	20	V	4.5	Gate-drain voltage with source open circuit	V_{GDO}	-	20	V	4.7	Continuous drain current @ $T_{case} = 25^{\circ}C$	I_D	-	3.5 2.25 1.25	A A A							4.71	Pulsed drain current @ $T_{case} = 25^{\circ}C$	I_{DM}	-	8.0 5.0 2.4	A A A							4.8	Power dissipation (see derating curve page 15) $T_{case} = 25^{\circ}C$	P_{tot}	-	15	W	See the relevant Qualified Products List for the availability of Components qualified under this detail specification
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5: CHARACTERISTICS

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

+ - Indicates verified in inspection testing Clause 10.

CECC 50012 REFERENCE	PARAMETER AND TEST CONDITIONS	SYMBOL	MIN	MAX	UNITS
SECTION 1					
+ 5.1	Leakage current with drain short circuit to source @ $V_{GSR} = 20\text{V}$	$I_{GSS(1)}$	-	100	nA
+ 5.2	Leakage current with drain short circuit to source @ $V_{GSR} = 15\text{V}$, $T_{case} = 125^{\circ}\text{C}$	$I_{GSS(2)}$	-	200	nA
+ 5.5	Gate-source threshold voltage @ $V_{DS} = 20\text{V}$, $I_D = 250\mu\text{A}$	$V_{GS(TO)(1)}$	2.0	4.0	V
+ 5.5.1	Gate-source threshold voltage @ $T_{case} = 125^{\circ}\text{C}$, $V_{DS} = 20\text{V}$, $I_D = 250\mu\text{A}$	$V_{GS(TO)(2)}$	1.0	-	V
+ 5.5.2	Gate-source threshold voltage @ $T_{case} = -55^{\circ}\text{C}$, $V_{DS} = 20\text{V}$, $I_D = 250\mu\text{A}$	$V_{GS(TO)(3)}$	-	5.0	V
+ 5.6	On-state drain current @ $V_{GS} = 7\text{V}$, $V_{DS} = 10\text{V}$	I_D			
			1.35	13.5	A
			1.2	12.0	A
			0.95	9.3	A
+ 5.7	Input capacitance, $f = 1\text{ MHz}$, $V_{DS} = 25\text{V}$, $V_{GS} = 0\text{V}$	C_{iss}			
			-	200	pF
			-	200	pF
			-	200	pF
+ 5.9	Short circuit forward transconductance	g_{21s}			
	$I_D = 2.25\text{A}$ $V_{DS} = 5\text{V}$ 2N6782		1.0	3.0	S
	$I_D = 1.50\text{A}$ $V_{DS} = 5\text{V}$ 2N6784		0.9	2.7	S
	$I_D = 0.80\text{A}$ $V_{DS} = 5\text{V}$ 2N6786		0.7	2.1	S
	Pulse conditions $t_p < 300\mu\text{s}$, duty cycle $< 2\%$.				
	See Appendix II for test circuit.				

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5: CHARACTERISTICS

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

+ - Indicates verified in inspection testing Clause 10.

CECC 50012 REFERENCE	PARAMETER AND TEST CONDITIONS	SYMBOL	MIN	MAX	UNITS
SECTION 3					
+ 5.7	Drain cut-off current @ $V_{\text{GS}} = 0\text{V}$ $V_{\text{DS}} = 100\text{V}$ 2N6782 $V_{\text{DS}} = 200\text{V}$ 2N6784 $V_{\text{DS}} = 400\text{V}$ 2N6786	$I_{\text{DSX}(1)}$	- - -	250 250 250	μA μA μA
+ 5.7.1	Drain cut-off current @ $V_{\text{GS}} = 0\text{V}$, $T_{\text{C}} = 125^{\circ}\text{C}$ $V_{\text{DS}} = 80\text{V}$ 2N6782 $V_{\text{DS}} = 160\text{V}$ 2N6784 $V_{\text{DS}} = 320\text{V}$ 2N6786	$I_{\text{DSX}(2)}$	- - -	1.0 1.0 1.0	mA mA mA
+ 5.8	Drain-source on-state voltage @ $V_{\text{GS}} = 10\text{V}$ $I_{\text{D}} = 2.25\text{A}$ 2N6782 $I_{\text{D}} = 1.50\text{A}$ 2N6784 $I_{\text{D}} = 0.80\text{A}$ 2N6786	$V_{\text{DS(on)}}$	- - -	1.35 2.25 2.88	V V V
+ 5.9	Small signal common source, capacitance @ $f = 1\text{MHz}$, $V_{\text{DS}} = 25\text{V}$, $V_{\text{GS}} = 0\text{V}$	$C_{22\text{ss}}$	-	100 80 50	pF pF pF
+ 5.9.2	Output capacitance 2N6782 2N6784 2N6786				
+ 5.9.3	Reverse transfer capacitance 2N6782 2N6784 2N6786	$C_{12\text{ss}}$	- - -	25 25 15	pF pF pF
+ 5.10	Switching times @ $V_{\text{GS(on)}} = 10\text{V}$ Turn-on delay time $I_{\text{D}} = 2.25\text{A}$, $V_{\text{DD}} = 34\text{V}$ 2N6782 $I_{\text{D}} = 1.50\text{A}$, $V_{\text{DD}} = 75\text{V}$ 2N6784 $I_{\text{D}} = 0.80\text{A}$, $V_{\text{DD}} = 170\text{V}$ 2N6786	$t_{\text{d(on)}}$	- - -	15 15 15	ns ns ns
	Rise time $I_{\text{D}} = 2.25\text{A}$, $V_{\text{DD}} = 34\text{V}$ 2N6782 $I_{\text{D}} = 1.50\text{A}$, $V_{\text{DD}} = 75\text{V}$ 2N6784 $I_{\text{D}} = 0.80\text{A}$, $V_{\text{DD}} = 170\text{V}$ 2N6786	t_{r}	- - -	25 20 20	ns ns ns

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5: CHARACTERISTICS

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

+ - Indicates verified in inspection testing Clause 10.

CECC 50012 REFERENCE	PARAMETER AND TEST CONDITIONS	SYMBOL	MIN	MAX	UNITS
SECTION 3 + 5.10(cont)	Fall time	t_f			
	$I_D = 2.25\text{A}, V_{DD} = 34\text{V}$ 2N6782		-	20	ns
	$I_D = 1.50\text{A}, V_{DD} = 75\text{V}$ 2N6784		-	20	ns
	$I_D = 0.80\text{A}, V_{DD} = 170\text{V}$ 2N6786		-	30	ns
	Turn-off delay time	$t_{d(off)}$			
	$I_D = 2.25\text{A}, V_{DD} = 34\text{V}$ 2N6782		-	25	ns
	$I_D = 1.50\text{A}, V_{DD} = 75\text{V}$ 2N6784		-	30	ns
	$I_D = 0.80\text{A}, V_{DD} = 170\text{V}$ 2N6786		-	35	ns
See Appendix II for test circuit					
SECTION 1 AND 3					
+ 5.11	Thermal resistance, junction to ambient Thermal resistance, junction to case	$R_{th(j-amb)}$ $R_{th(j-case)}$	- -	175 8.33	K/W K/W
+ 5.6	Drain-source on-state resistance @ $V_{GS} = 10\text{V}$	$r_{DS(on)(1)}$			
	$I_D = 2.25\text{A}$ 2N6782		-	0.60	Ω
	$I_D = 1.50\text{A}$ 2N6784		-	1.50	Ω
	$I_D = 0.80\text{A}$ 2N6786		-	3.60	Ω
+ 5.6.1	Drain-source on-state resistance @ $T_C = 125^{\circ}\text{C}$	$r_{DS(on)(2)}$			
	$I_D = 2.25\text{A}$ 2N6782		-	1.08	Ω
	$I_D = 1.50\text{A}$ 2N6784		-	2.81	Ω
	$I_D = 0.80\text{A}$ 2N6786		-	7.92	Ω

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6: MARKING

The following shall be marked on the device, in the following order of precedence, as space permits.
All the information shall appear on the primary pack used as initial protection or wrapping for delivery:-

1. The manufacturer's type number.
2. Date Code.
3. Factory identification code.
4. Level of quality assessment and screening level (if required).
Mark of conformity unless a certificate of conformity is used.

Each package containing one or more of these transistors shall contain all the above markings and in addition:-

5. This detail specification number (CECC 50012-027) followed by the letter defining the level of assessment and, if applicable the letter identifying the screening sequence.
6. A 'STATIC SENSITIVE' warning label.

7: ORDERING INFORMATION

The following minimum information is necessary to order a specific device.

1. Precise type number.
2. This detail specification number, issue number and date.
3. Level of quality assessment and screening level (if required).

Example:-

to CECC 50012-027 Issue 2 Level E/B

8: RELATED DOCUMENTS

CECC 50000	Generic Specification for discrete semiconductors.
CECC 00007	Basic Specification. Sampling plans and procedures for inspection by attributes.
IEC 68-2	Environmental testing of electronic components and electronic equipment.
IEC 191-2	Mechanical standardization of semiconductor devices dimensions.

9: RECOMMENDED HANDLING PRECAUTIONS: STATIC SENSITIVE DEVICES

To prevent damage by static discharge to these devices during handling, the procedures specified in BS 5783 'Handling procedures for static sensitive devices' should be followed.

10: TEST CONDITIONS AND INSPECTION REQUIREMENTS

These are given in the following tables, where the values and exact test conditions to be used should be specified as required for a given type in line with the indications given in CECC 50000 for the relevant test.

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GROUP A Lot by Lot AQL given in % All tests are non-destructive (3.5.6 of CECC 50000) Clause numbers are made with respect to CECC 50000 unless otherwise stated Pulse tests: $t_p < 300\mu s$, duty cycle $< 2\%$ where indicated.							
EXAMINATION OR TEST	REF	CONDITIONS @T_{case} = 25°C UNLESS OTHERWISE STATED	INSPECTION REQUIREMENTS				
			LIMITS			LEVEL E	
			MIN	MAX	UNIT	IL	AQL
SUBGROUP A1 Visual inspection	4.2.1					I	0.65
SUBGROUP A2a Non-operative $I_{GSS(1)}$ $V_{GS(TO)(1)}$	4.3.4 T-071 4.3.4 T-075	Short or open circuit $V_{GSR} = 20V$ $V_{DS} = 20V$	- 0.2	1.0 12	μA V	II	0.15
SUBGROUP A2b Leakage current $I_{GSS(1)}$ Drain cut off current $I_{DSX(1)}$ Gate source threshold voltage $V_{GS(TO)(1)}$ Drain current I_D	4.3.4 T-071 4.3.4 T-073 4.3.4 T-075 4.3.4 T-072	$V_{GSR} = 20V$ $V_{DS} = 0V$ $V_{GS} = 0V$ $V_{DS} = 100V$ 2N6782 $V_{DS} = 200V$ 2N6784 $V_{DS} = 400V$ 2N6786 $V_{DS} = 20V$ $I_D = 250\mu A$ $V_{GS} = 7V$ $V_{DS} = 10V$	- 2.0 1.35 1.2 0.95	100 4.0 13.5 12.0 9.3	nA V A A A	II	0.4