

BRITISH STANDARDS INSTITUTION

2, PARK STREET, LONDON W1A 2BS

Specification available from:- AS SHOWN IN PD9002, AND CECC 00200

SEMELAB LIMITED
COVENTRY ROAD
LUTTERWORTH
LEICS. LE17 4JB

TEL: 0455 552505 FAX: 0455 552612

BS CECC 50 004 – 152

ISSUE 2 February 1991



Page 1 of 20 pages

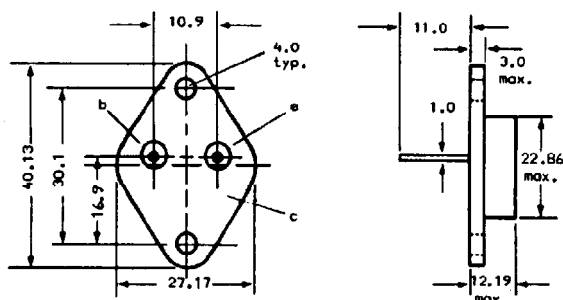
ELECTRONIC COMPONENTS OF ASSESSED QUALITY
DETAIL SPECIFICATION IN ACCORDANCE WITH
BS CECC 50 000 1981

MANUFACTURER'S TYPE NUMBER

TIPL777, TIPL777A, TIPL777B
 R3366

1. Outline and dimensions

Third angle projection



For detail dimensions see IEC 191-2 B18 and C14A

Equivalent to BS3934 SO-127A JEDEC TO-3

Marking information see clause 6

For ordering information
 see clause 7

2. Case rated DARLINGTON connected
power transistors for high voltage
switching applications.

NPN triple diffused Silicon Planar
 transistors in hermetically sealed
 metal case.

3. Assessment level F
 plus additional tests.

4. LIMITING VALUES (absolute maximum system)

These apply over the operating temperature range unless otherwise stated.

4.1	T_{CASE}	Case operating temperature range	-65°C to +200°C
4.2	T_{stg}	Storage temperature range	-65°C to +200°C

Voltage Ratings ($T_{CASE} = -65^{\circ}\text{C}$ to $+125^{\circ}\text{C}$. See Fig. 6)

Voltage Ratings (T _{case} = –65 °C to +125 °C. See Fig. 6)			TIPL777	TIPL777A R3366	TIPL777B
4.3	V _{CBO}	Collector-base continuous (direct) voltage I _E = 0	950V	1050V	1150V
4.4	V _{CES}	Collector-emitter continuous (direct) voltage V _{BE} = 0	950V	1050V	1150V
4.4	V _{CEO}	Collector-emitter continuous (direct) voltage I _B = 0	600V	700V	800V
4.5	V _{EBO}	Emitter-base continuous (direct) voltage I _C = 0	6V	6V	6V
4.6	I _C	Continuous collector current	20A	20A	20A
	I _{CM}	Peak collector current (note 1)	55A	55A	55A

4.9 Power Ratings

4.9.1.	P_{tot}	Maximum continuous power dissipation at 25°C (see Figs. 2, 3, 4, 5 and 7)	150W	150W	150W
4.10	F.B.S.O.A	See figure 8.			

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

**Documents**

Document Sharing Hub

5 CHARACTERISTICS at 25°C unless otherwise specified (not for inspection purposes)

		<u>TIPL777</u>	<u>TIPL777A</u> <u>R3366</u>	<u>TIPL777B</u>
	$V_{CE(sus)}$ Collector-emitting sustaining voltage (note 2) $I_C = 100mA$ $L = 25mH$	600V min.	700V min.	800V min.
	$V_{CEX(sus)}$ Collector-emitter sustaining voltage (Fig. 1A) $I_{BOFF} = 1A$ $I_C = 6A$	710V min.	860V min.	970V min.
5.1	$h_{2IE(1)}$ Forward current transfer ratio* $V_{CE} = 5V$ $I_C = 700mA$	50 min.	50 min.	50 min.
5.2	$V_{CE(sat)(1)}$ Collector-emitter saturation voltage* $I_C = 15A$ $I_B = 300mA$ $I_C = 12.5A$ $I_B = 250mA$ $I_C = 10.0A$ $I_B = 200mA$	3.0V max.	3.0V max.	3.0V max.
	$V_{CE(sat)(2)}$ $I_C = 700mA$ $I_B = 250mA$	3.0V max.	3.0V max.	3.0V max.
5.3	$V_{BE(sat)(1)}$ Base-emitter saturation voltage $I_C = 15A$ $I_B = 300mA$ $I_C = 12.5A$ $I_B = 250mA$ $I_C = 10.0A$ $I_B = 200mA$	3.5V max.	3.5V max.	3.5V max.
5.4	$V_{CE(sat)(3)}$ Collector-emitter saturation voltage* $I_C = 10A$ $I_B = 200mA$ $I_C = 7.5A$ $I_B = 150mA$ $I_C = 5.0A$ $I_B = 100mA$	2.5V max.	2.5V max.	2.5V max.
	$V_{CE(sat)(4)}$ $I_C = 3A$ $I_B = 60mA$ $I_C = 2.5A$ $I_B = 50mA$ $I_C = 1.0A$ $I_B = 20mA$	2.0V max.	2.0V max.	2.0V max.
	$V_{BE(sat)(3)}$ Base-emitter saturation voltage* $I_C = 10A$ $I_B = 200mA$ $I_C = 7.5A$ $I_B = 150mA$ $I_C = 5.0A$ $I_B = 100mA$	3.5V max.	3.5V max.	3.5V max.
	$V_{BE(sat)(4)}$ $I_C = 3.0A$ $I_B = 60mA$ $I_C = 2.5A$ $I_B = 50mA$ $I_C = 1.0A$ $I_B = 20mA$	3.0V max.	3.0V max.	3.0V max.
5.5	Leakage Currents			
	$I_{CES(1)}$ Collector-emitter cut-off current $V_{BE} = 0$ $V_{CE} = 950V$ $V_{CE} = 1050V$ $V_{CE} = 1150V$	100 μA max.	100 μA max.	100 μA max.
	$I_{CEX(1)}$ Collector-emitter cut-off current. $1.5V < V_{EB} < 6V$ $V_{CE} = 950V$ $V_{CE} = 1050V$ $V_{CE} = 1150V$	100 μA max.	100 μA max.	100 μA max.
	I_{CEO} Collector cut-off current $I_B = 0$ $V_{CE} = 600V$ $V_{CE} = 700V$ $V_{CE} = 800V$	100 μA max.	100 μA max.	100 μA max.

5 CHARACTERISTICS at 25°C unless otherwise specified (not for inspection purposes)

			<u>TIPL777</u>	<u>TIPL777A</u> <u>R3366</u>	<u>TIPL777B</u>
5.5	I_{EBO}	Emitter cut-off current $V_{EB} = 6V$ $I_C = 0$	10mA max.	10mA max.	10mA max.
5.6	$I_{CES(2)}$	Collector cut-off current $T_{case} = 100^\circ C$ $V_{CE} = 950V$ $V_{CE} = 1050V$ $V_{CE} = 1150V$	1.0mA max.	1.0mA max.	1.0mA max.

5.7 †**Switching Characteristics** (see Figs. 1 & 2)
Inductive Load (See Fig. 1b)

5.7.1. **TIPL777**

t_{rv}	Turn on time	$I_C = 15.0A$ $I_{BOFF} = 1.5A$ $T_{case} = 25^\circ C$ $I_{BON} = 150mA$ Nominal*	$V_{CE} = 300V$	0.50 μs	max.
t_{sv}	Storage time			2.80 μs	max.
t_{fi}	Fall time			0.30 μs	max.
t_{rv}	Turn on time	$I_C = 15.0A$ $I_{BOFF} = 1.5A$ $T_{case} = 100^\circ C$ $I_{BON} = 150mA$ Nominal*	$V_{CE} = 300V$	1.50 μs	max.
t_{sv}	Storage time			4.80 μs	max.
t_{fi}	Fall time			0.50 μs	max.

TIPL777A

t_{rv}	Turn on time	$I_C = 12.5A$ $I_{BOFF} = 1.5A$ $T_{case} = 25^\circ C$ $I_{BON} = 150mA$ Nominal*	$V_{CE} = 300V$	0.50 μs	max.
t_{sv}	Storage time			3.00 μs	max.
t_{fi}	Fall time			0.30 μs	max.
t_{rv}	Turn on time	$I_C = 12.5A$ $I_{BOFF} = 1.5A$ $T_{case} = 100^\circ C$ $I_{BON} = 150mA$ Nominal*	$V_{CE} = 300V$	1.50 μs	max.
t_{sv}	Storage time			5.00 μs	max.
t_{fi}	Fall time			0.50 μs	max.

TIPL777B

t_{rv}	Turn on time	$I_C = 10.0A$ $I_{BOFF} = 1.5A$ $T_{case} = 25^\circ C$ $I_{BON} = 150mA$ Nominal*	$V_{CE} = 300V$	0.50 μs	max.
t_{sv}	Storage time			3.20 μs	max.
t_{fi}	Fall time			0.30 μs	max.
t_{rv}	Turn on time	$I_C = 10.0A$ $I_{BOFF} = 1.5A$ $T_{case} = 100^\circ C$ $I_{BON} = 150mA$ Nominal*	$V_{CE} = 300V$	1.50 μs	max.
t_{sv}	Storage time			5.20 μs	max.
t_{fi}	Fall time			0.50 μs	max.

5.7.1. R3366

t_{rv}	Turn on time	$I_C = 12.5A$ $V_{CE} = 300V$ $I_{BOFF} = 1.5A$ $T_{case} = 25^\circ C$ $I_{BON} = 150mA$ Nominal*	0.50 μs	max.
t_{sv}	Storage time		3.00 μs	max.
t_{fi}	Fall time		0.30 μs	max.
t_{rv}	Turn on time	$I_C = 12.5A$ $V_{CE} = 300V$ $I_{BOFF} = 1.5A$ $T_{case} = 100^\circ C$ $I_{BON} = 150mA$ Nominal*	1.50 μs	max.
t_{sv}	Storage time		5.00 μs	max.
t_{fi}	Fall time		0.50 μs	max.
t_{rv}	Turn on time	$I_C = 8.0A$ $V_{CE} = 750V$ $I_{BOFF} = 3.0A$ $T_{case} = 100^\circ C$ $I_{BON} = 150mA$ Nominal*	0.50 μs	max.
t_{sv}	Storage time		2.70 μs	max.
t_{fi}	Fall time		0.30 μs	max.
t_{xo}	Crossover time		0.80 μs	max.

5.8 R_{thjc} Thermal resistance junction-case
TIPL777/TIPL777A/R3366/TIPL777B

0.97°C/W

† Measured in Groups A or C

* These parameters are measured using pulse techniques, pulse width < 300 μs , Duty Cycle < 2%.Note 1: Pulse test, pulse duration = 10 μs .

Note 2: Inductive loop switching measurement.

6.0 MARKING

6.1 Each device shall bear the following markings:-

- (a) Terminal identification
- (b) Type Number
- (c) Date Code
- (d) Manufacturer's trade mark or factory identification code

6.2 Each package containing one or more of these transistors shall bear the above markings b, c and d, and in addition, this detail specification number BS CECC 50 004-152, followed by the letter defining the level of quality assessment and, if applicable, the letter identifying the screening sequence.

7.0 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 IIA of CECC 50 000, and, if required, screening sequence as defined in Appendix VI of CECC 50 000
- any other particulars

Example:- Type number – Detail specification number – Issue number – Level.

RELATED DOCUMENTS

BS 2011/IEC 68	Methods for the environmental testing of electronic components and electronic equipment.
BS 3934/IEC 191	Dimensions of semiconductor devices.
BS E9000/CECC 00 100 to 00 113	General requirements for electronic components of assessed quality.
BS E9007/CECC 00 007	Sampling plans and procedures for inspection by attributes.
BS/CECC 50 000	Harmonised generic specification for discrete semiconductor devices.
IEC 147-2	General principles of measuring methods.
PD 9002/CECC 00 200	Component selection guide.

8 INSPECTION REQUIREMENTS – All Group A tests are non-destructive

EXAMINATION OR TEST	BS CECC 50000 REF	CONDITIONS at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated	INSPECTION REQUIREMENTS				
			LIMITS			LEVEL OF ASSESSMENT	
			MIN	MAX	UNIT	IL	AQL %
SUBGROUP A1 Visual Inspection	4.2.1					I	0.65
SUBGROUP A2a Non-operative Open Circuit Short Circuit	4.3.4	A device is considered to be open circuit if $h_{21E(1)} < 5$ A device is considered to be short circuit if $I_{CES(1)} > 10\text{mA}$				II	0.15
SUBGROUP A2b Collector-emitter cutoff current $I_{CES(1)}$	4.3.4. T.009	$V_{BE} = 0$ $V_{CE} = 950\text{V}$ TIPL777 $V_{CE} = 1050\text{V}$ TIPL777A/R3366 $V_{CE} = 1150\text{V}$ TIPL777B		100.0 100.0 100.0	μA μA μA	II	0.65
Collector-emitter cut-off current $I_{CEX(1)}$		$V_{EB} = 6.0\text{V}$ $V_{CE} = 950\text{V}$ TIPL777 $V_{CE} = 1050\text{V}$ TIPL777A/R3366 $V_{CE} = 1150\text{V}$ TIPL777B		100.0 100.0 100.0	μA μA μA		
Collector-emitter cut-off current $I_{CEO(1)}$		$I_B = 0$ $V_{CE} = 600\text{V}$ TIPL777 $V_{CE} = 700\text{V}$ TIPL777A/R3366 $V_{CE} = 800\text{V}$ TIPL777B		100.0 100.0 100.0	μA μA μA		
Collector-emitter saturation voltage $V_{CE(SAT)(1)}$	4.3.4 T.003	$I_C = 15\text{A}$ $I_B = 300\text{mA}$ TIPL777 $I_C = 12.5\text{A}$ $I_B = 250\text{mA}$ TIPL777A/R3366 $I_C = 10.0\text{A}$ $I_B = 200\text{mA}$ TIPL777B		3.0 3.0 3.0	V V V		
SUBGROUP A3 Static forward current transfer ratio $h_{21E(1)}$	4.3.4 T.006	$V_{CE} = 5.0\text{V}$ $I_{CE} = 700\text{mA}$	50.0			I	2.5
Collector-emitter saturation voltage $V_{CE(SAT)(2)}$	4.3.4 T.003	$I_C = 700\text{mA}$ $I_B = 250\text{mA}$ TIPL777/A/B R3366		3.0	V		
$V_{CE(SAT)(3)}$		$I_C = 10.0$ $I_B = 200\text{mA}$ TIPL777 $I_C = 7.5\text{A}$ $I_B = 150\text{mA}$ TIPL777A/R3366 $I_C = 5.0\text{A}$ $I_B = 100\text{mA}$ TIPL777B		2.5 2.5 2.5	V V V		
Collector-emitter sustaining voltage V_{CEX}		$I_{BOFF} = 1\text{A}$ $I_C = 6\text{A}$ TIPL777 TIPL777A/R3366 TIPL777B	710 860 970		V V V		
Collector-emitter saturation voltage $V_{CE(SAT)(4)}$	4.3.4 T.003	$I_C = 3\text{A}$ $I_B = 60\text{mA}$ TIPL777 $I_C = 2.5\text{A}$ $I_B = 50\text{mA}$ TIPL777A/R3366 $I_C = 1.0\text{A}$ $I_B = 20\text{mA}$ TIPL777B		2.0 2.0 2.0	V V V		
Base-emitter saturation voltage $V_{BE(SAT)(3)}$	4.3.4 T.004	$I_C = 10\text{A}$ $I_B = 200\text{mA}$ TIPL777 $I_C = 7.5\text{A}$ $I_B = 150\text{mA}$ TIPL777A/R3366 $I_C = 5.0\text{A}$ $I_B = 100\text{mA}$ TIPL777B		3.5 3.5 3.5	V V V		
$V_{BE(SAT)(4)}$		$I_C = 3.0\text{A}$ $I_B = 60\text{mA}$ TIPL777 $I_B = 2.5\text{A}$ $I_B = 50\text{mA}$ TIPL777A/R3366 $I_C = 1.0\text{A}$ $I_B = 20\text{mA}$ TIPL777B		3.0 3.0 3.0	V V V		