

# Thyristors logic level for RCD/ GFI/ LCCB applications

## BT168 series

### GENERAL DESCRIPTION

Passivated, sensitive gate thyristors in a plastic envelope, intended for use in Residual Current Devices/ Ground Fault Interrupters/ Leakage Current Circuit Breakers (RCD/ GFI/ LCCB) applications where a minimum  $I_{GT}$  limit is needed. These devices may be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

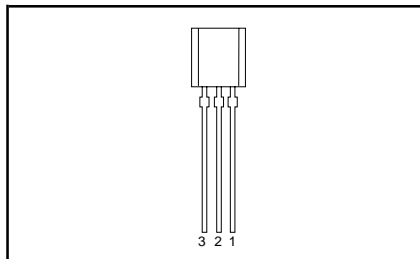
### QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	<b>BT168</b>	<b>E</b>	<b>G</b>	
$V_{DRM}, V_{RRM}$	Repetitive peak off-state voltages	500	600	V
$I_{T(AV)}$	Average on-state current	0.5	0.5	A
$I_{T(RMS)}$	RMS on-state current	0.8	0.8	A
$I_{TSM}$	Non-repetitive peak on-state current	8	8	A

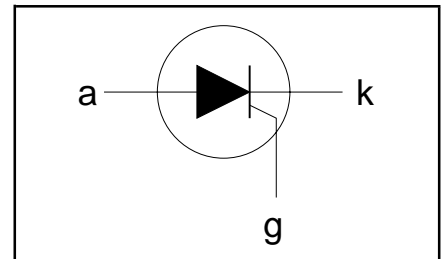
### PINNING - TO92 variant

PIN	DESCRIPTION
1	anode
2	gate
3	cathode

### PIN CONFIGURATION



### SYMBOL



### LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
				E	G	
$V_{DRM}, V_{RRM}$	Repetitive peak off-state voltages		-	500 <sup>1</sup>	600 <sup>1</sup>	V
$I_{T(AV)}$	Average on-state current	half sine wave; $T_{lead} \leq 83\text{ }^\circ\text{C}$	-	0.5		A
$I_{T(RMS)}$	RMS on-state current	all conduction angles	-	0.8		A
$I_{TSM}$	Non-repetitive peak on-state current	$t = 10\text{ ms}$	-	8		A
		$t = 8.3\text{ ms}$	-	9		A
$I^2t$	$I^2t$ for fusing	half sine wave; $T_j = 25\text{ }^\circ\text{C}$ prior to surge	-	0.32		A <sup>2</sup> s
$di_T/dt$	Repetitive rate of rise of on-state current after triggering	$t = 10\text{ ms}$ $I_{TM} = 2\text{ A}; I_G = 10\text{ mA};$ $di_G/dt = 100\text{ mA}/\mu\text{s}$	-	50		A/ $\mu\text{s}$
$I_{GM}$	Peak gate current		-	1		A
$V_{GM}$	Peak gate voltage		-	5		V
$V_{RGM}$	Peak reverse gate voltage		-	5		V
$P_{GM}$	Peak gate power		-	2		W
$P_{G(AV)}$	Average gate power	over any 20 ms period	-	0.1		W
$T_{stg}$	Storage temperature		-40	150		$^\circ\text{C}$
$T_j$	Operating junction temperature		-	125		$^\circ\text{C}$

<sup>1</sup> Although not recommended, off-state voltages up to 800V may be applied without damage, but the thyristor may switch to the on-state. The rate of rise of current should not exceed 15 A/ $\mu\text{s}$ .

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### THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{th\ j-lead}$	Thermal resistance junction to lead		-	-	60	K/W
$R_{th\ j-a}$	Thermal resistance junction to ambient	pcb mounted; lead length = 4mm	-	150	-	K/W

### STATIC CHARACTERISTICS

 $T_j = 25\text{ °C}$  unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{GT}$	Gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 10\text{ mA}$ ; gate open circuit	20	50	200	$\mu\text{A}$
$I_L$	Latching current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.5\text{ mA}$ ; $R_{GK} = 1\text{ k}\Omega$	-	2	6	$\text{mA}$
$I_H$	Holding current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.5\text{ mA}$ ; $R_{GK} = 1\text{ k}\Omega$	-	2	5	$\text{mA}$
$V_T$	On-state voltage	$I_T = 1\text{ A}$	-	1.2	1.35	$\text{V}$
$V_{GT}$	Gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 10\text{ mA}$ ; gate open circuit	-	0.5	0.8	$\text{V}$
		$V_D = V_{DRM(max)}$ ; $I_T = 10\text{ mA}$ ; $T_j = 125\text{ °C}$ ; gate open circuit	0.2	0.3	-	$\text{V}$
$I_D, I_R$	Off-state leakage current	$V_D = V_{DRM(max)}$ ; $V_R = V_{RRM(max)}$ ; $T_j = 125\text{ °C}$ ; $R_{GK} = 1\text{ k}\Omega$	-	0.05	0.1	$\text{mA}$

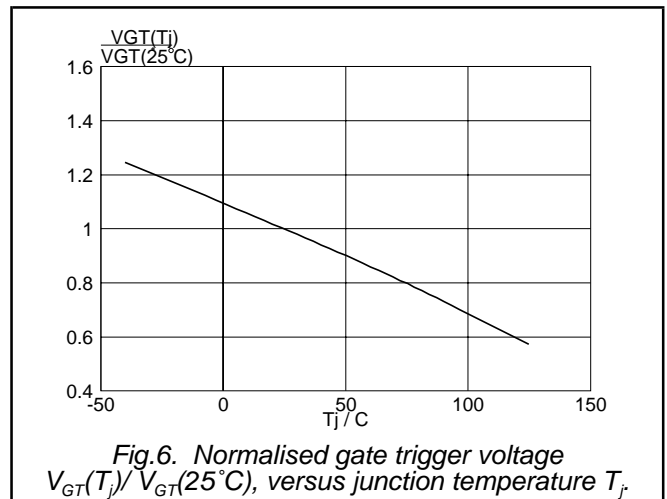
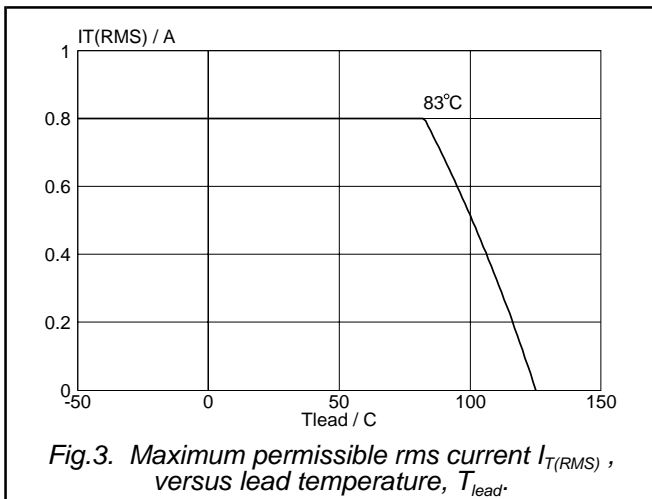
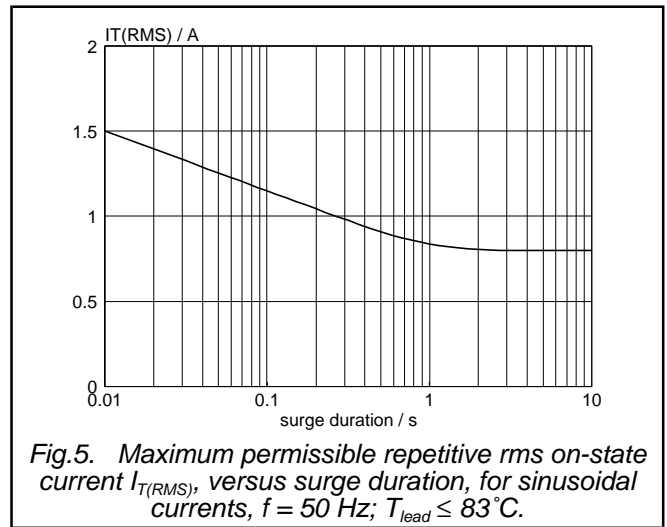
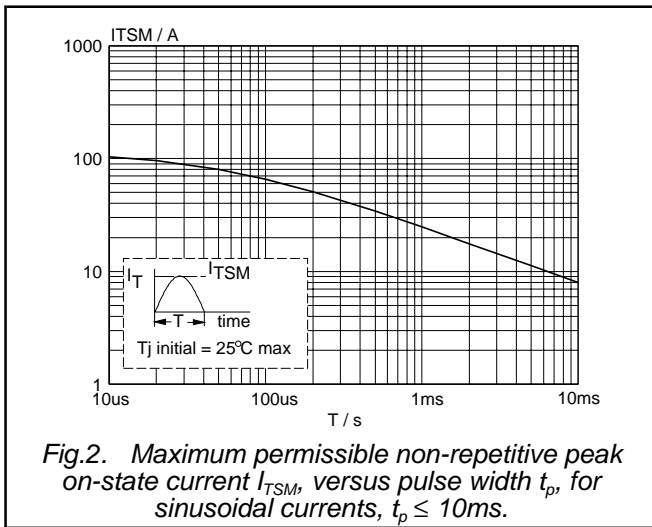
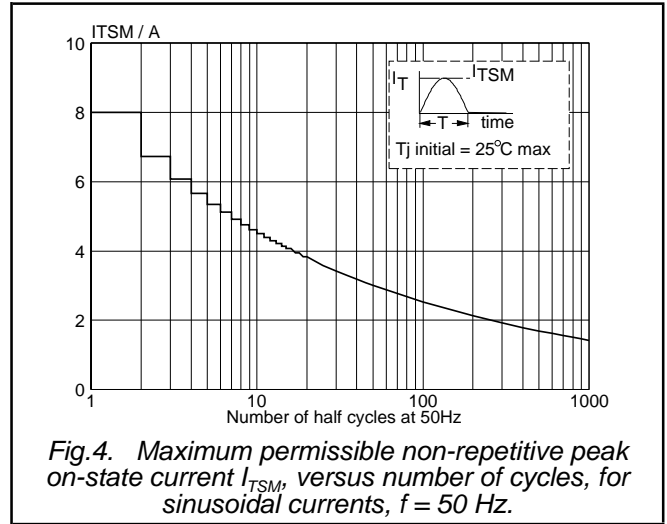
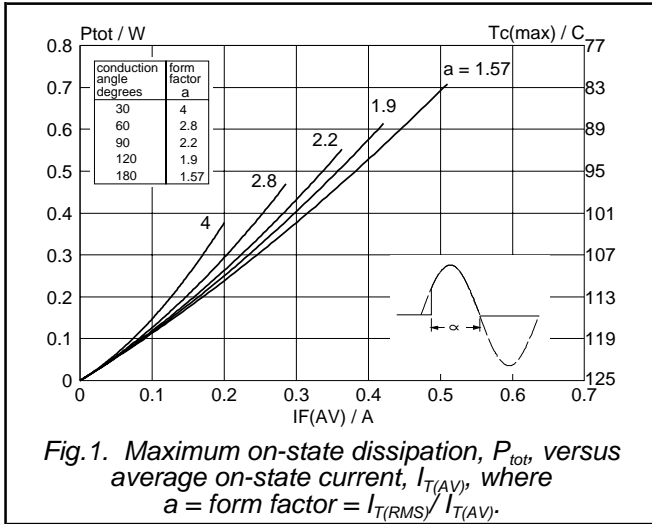
### DYNAMIC CHARACTERISTICS

 $T_j = 25\text{ °C}$  unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$dV_D/dt$	Critical rate of rise of off-state voltage	$V_{DM} = 67\% V_{DRM(max)}$ ; $T_j = 125\text{ °C}$ ; exponential waveform; $R_{GK} = 1\text{ k}\Omega$	500	800	-	$\text{V}/\mu\text{s}$
$t_{gt}$	Gate controlled turn-on time	$I_{TM} = 2\text{ A}$ ; $V_D = V_{DRM(max)}$ ; $I_G = 10\text{ mA}$ ; $dI_G/dt = 0.1\text{ A}/\mu\text{s}$	-	2	-	$\mu\text{s}$
$t_q$	Circuit commutated turn-off time	$V_D = 67\% V_{DRM(max)}$ ; $T_j = 125\text{ °C}$ ; $I_{TM} = 1.6\text{ A}$ ; $V_R = 35\text{ V}$ ; $dI_{TM}/dt = 30\text{ A}/\mu\text{s}$ ; $dV_D/dt = 2\text{ V}/\mu\text{s}$ ; $R_{GK} = 1\text{ k}\Omega$	-	100	-	$\mu\text{s}$

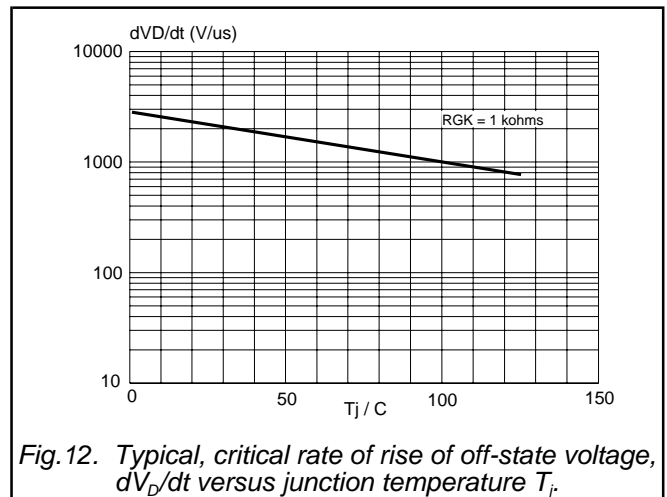
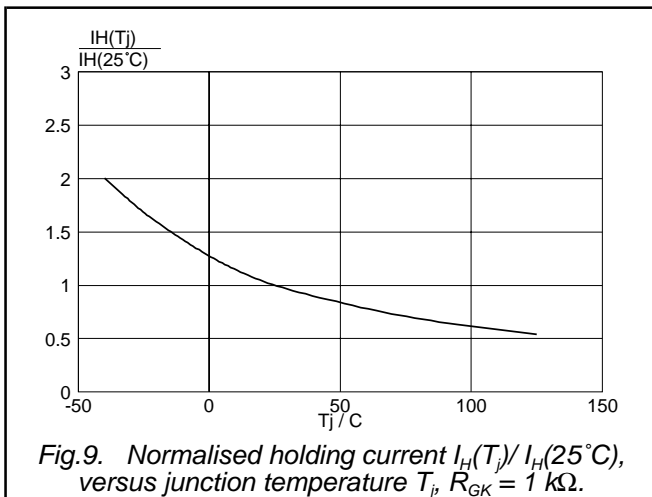
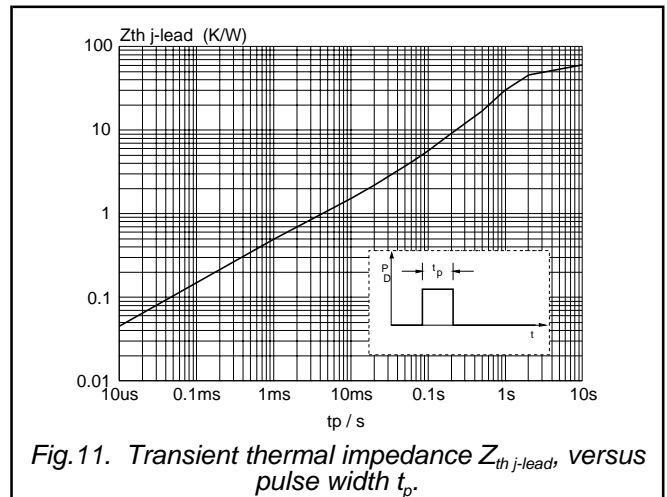
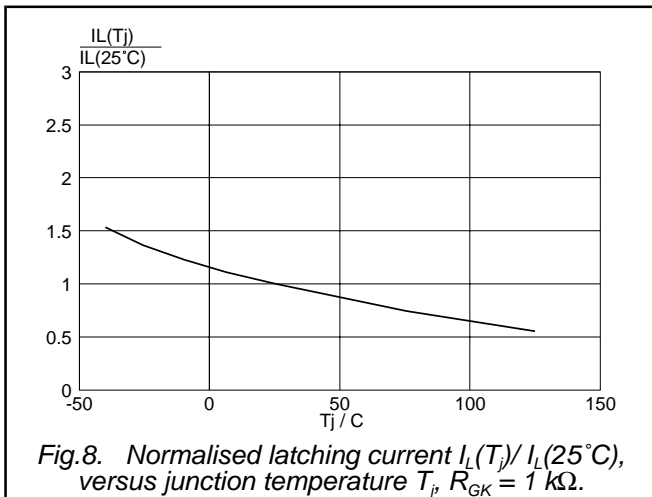
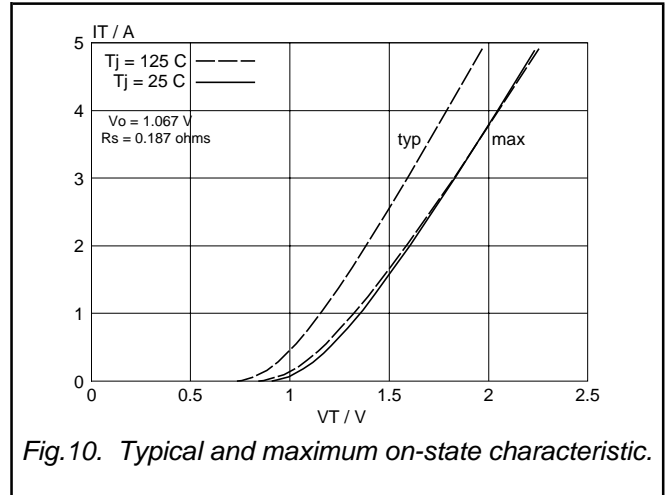
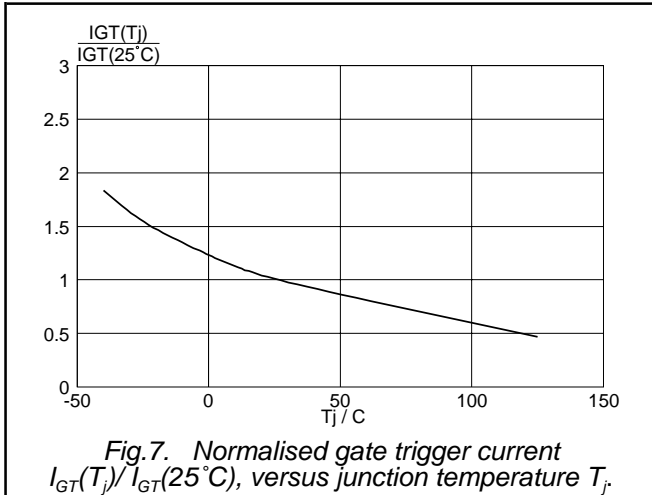
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**MECHANICAL DATA**

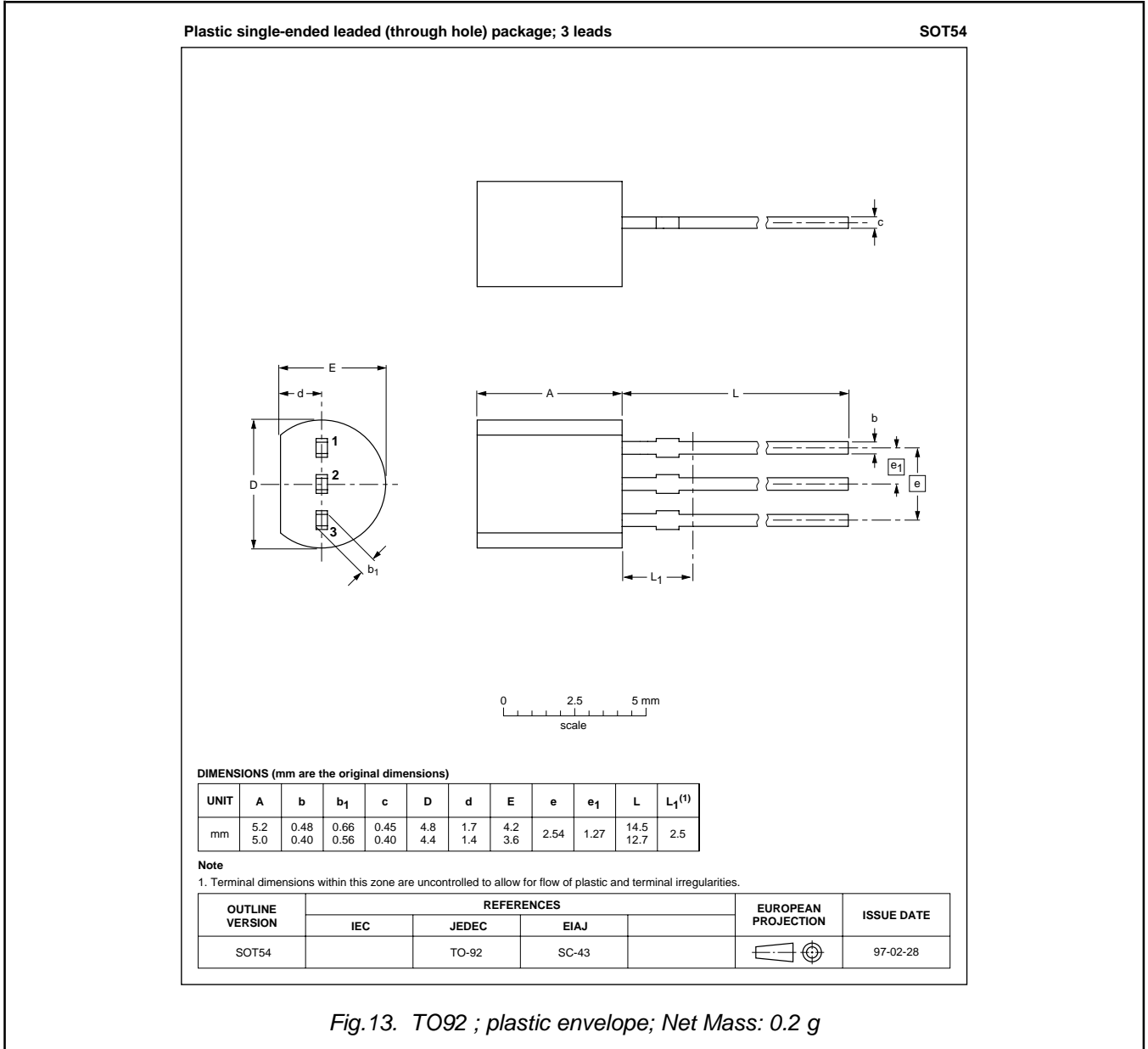


Fig.13. TO92 ; plastic envelope; Net Mass: 0.2 g

**Notes**

1. Epoxy meets UL94 V0 at 1/8".

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### DEFINITIONS

DATA SHEET STATUS		
DATA SHEET STATUS <sup>2</sup>	PRODUCT STATUS <sup>3</sup>	DEFINITIONS
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A
<b>Limiting values</b>		
Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.		
<b>Application information</b>		
Where application information is given, it is advisory and does not form part of the specification.		
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