

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- SGS-THOMSON PREFERRED SALESTYPES
- HIGH VOLTAGE CAPABILITY
- VERY HIGH SWITCHING SPEED

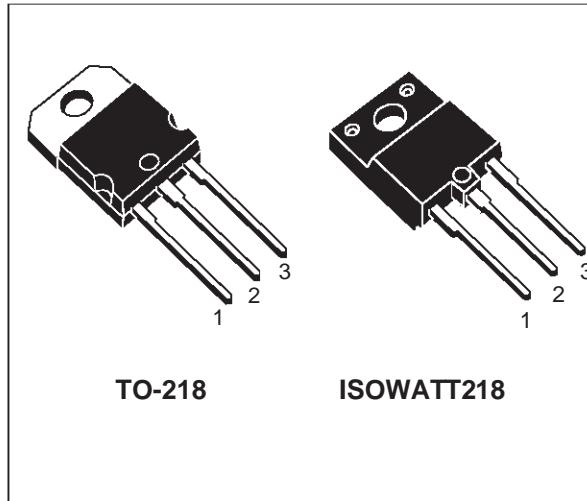
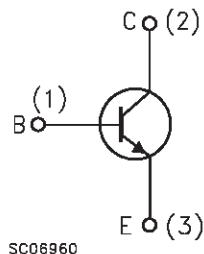
**APPLICATIONS:**

- HORIZONTAL DEFLECTION FOR COLOUR TV AND MONITORS

**DESCRIPTION**

The BUH1015 and BUH1015HI are manufactured using Multiepitaxial Mesa technology for cost-effective high performance and uses a Hollow Emitter structure to enhance switching speeds.

The BUH series is designed for use in horizontal deflection circuits in televisions and monitors.


**INTERNAL SCHEMATIC DIAGRAM**

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-Base Voltage ( $I_E = 0$ )	1500	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	700	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	10	V
$I_C$	Collector Current	14	A
$I_{CM}$	Collector Peak Current ( $t_p < 5 \text{ ms}$ )	18	A
$I_B$	Base Current	8	A
$I_{BM}$	Base Peak Current ( $t_p < 5 \text{ ms}$ )	11	A
$P_{tot}$	Total Dissipation at $T_c = 25^\circ\text{C}$	160	W
$T_{stg}$	Storage Temperature	-65 to 150	$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	150	$^\circ\text{C}$

# BUH1015/BUH1015HI

## THERMAL DATA

		<b>TO-218</b>	<b>ISOWATT218</b>	
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	0.78	1.8 °C/W

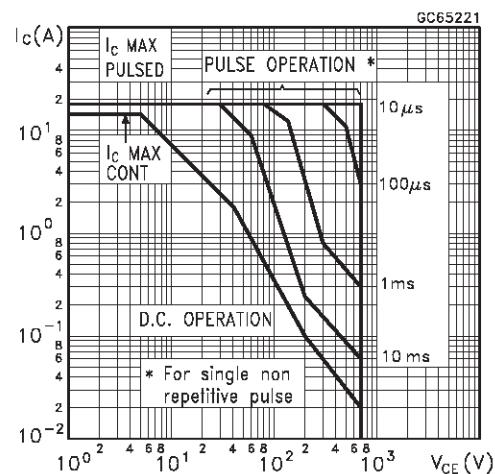
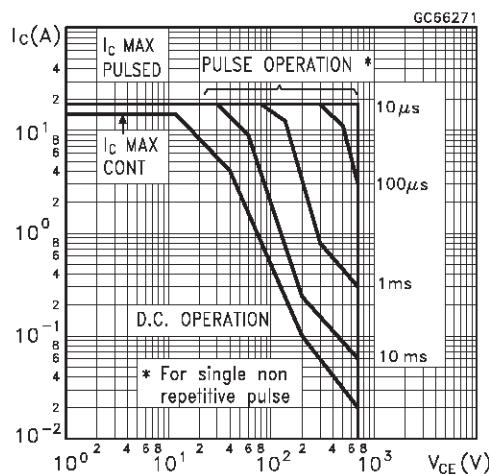
## ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CES</sub>	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 1500 \text{ V}$ $V_{CE} = 1500 \text{ V} \quad T_j = 125^\circ\text{C}$			0.2 2	mA mA
I <sub>EBO</sub>	Emitter Cut-off Current ( $I_C = 0$ )	$V_{EB} = 5 \text{ V}$			100	µA
V <sub>CEO(sus)</sub>	Collector-Emitter Sustaining Voltage	$I_C = 100 \text{ mA}$	700			V
V <sub>EBO</sub>	Emitter-Base Voltage ( $I_C = 0$ )	$I_E = 10 \text{ mA}$	10			V
V <sub>CE(sat)*</sub>	Collector-Emitter Saturation Voltage	$I_C = 10 \text{ A} \quad I_B = 2 \text{ A}$			1.5	V
V <sub>BE(sat)*</sub>	Base-Emitter Saturation Voltage	$I_C = 10 \text{ A} \quad I_B = 2 \text{ A}$			1.5	V
$h_{FE}^*$	DC Current Gain	$I_C = 10 \text{ A} \quad V_{CE} = 5 \text{ V}$ $I_C = 10 \text{ A} \quad V_{CE} = 5 \text{ V} \quad T_j = 100^\circ\text{C}$	7 5	10	14	
t <sub>s</sub> t <sub>f</sub>	RESISTIVE LOAD Storage Time Fall Time	$V_{CC} = 400 \text{ V} \quad I_C = 10 \text{ A}$ $I_{B1} = 2 \text{ A} \quad I_{B2} = -6 \text{ A}$		1.5 110		µs ns
t <sub>s</sub> t <sub>f</sub>	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 10 \text{ A} \quad f = 31250 \text{ Hz}$ $I_{B1} = 2 \text{ A} \quad I_{B2} = -6 \text{ A}$ $V_{ceflyback} = 1200 \sin\left(\frac{\pi}{5} 10^6\right) t \text{ V}$		4 220		µs ns
t <sub>s</sub> t <sub>f</sub>	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 6 \text{ A} \quad f = 64 \text{ KHz}$ $I_{B1} = 1 \text{ A}$ $V_{beoff} = -2 \text{ V}$ $V_{ceflyback} = 1100 \sin\left(\frac{\pi}{5} 10^6\right) t \text{ V}$		3.7 200		µs ns

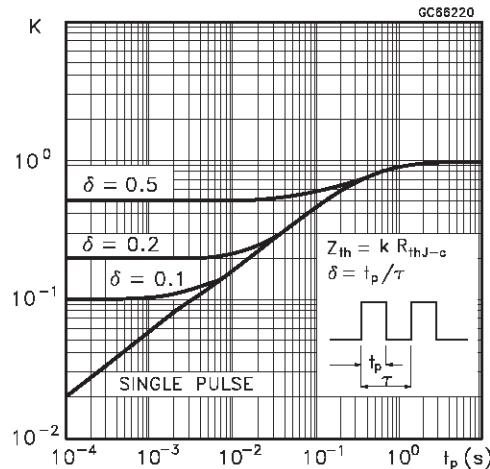
\* Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

Safe Operating Area For TO-218

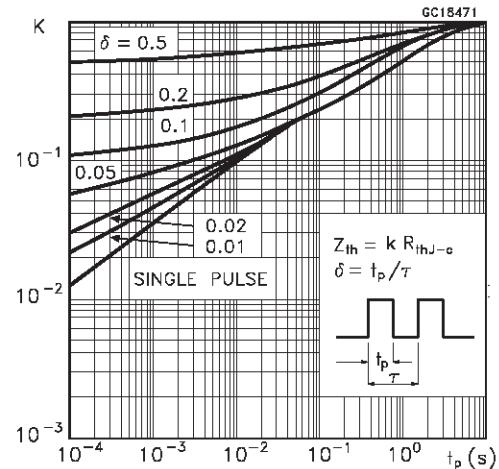
Safe Operating Area For ISOWATT218



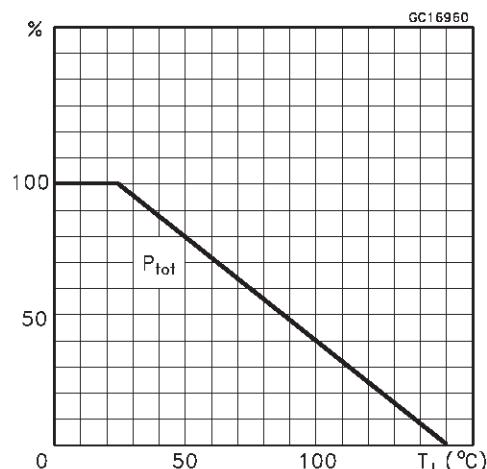
Thermal Impedance for TO-218



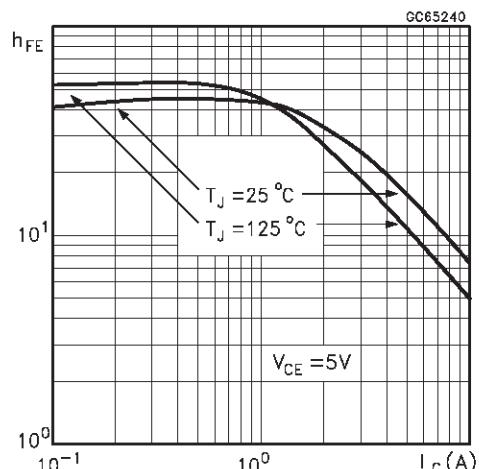
Thermal Impedance for ISOWATT218



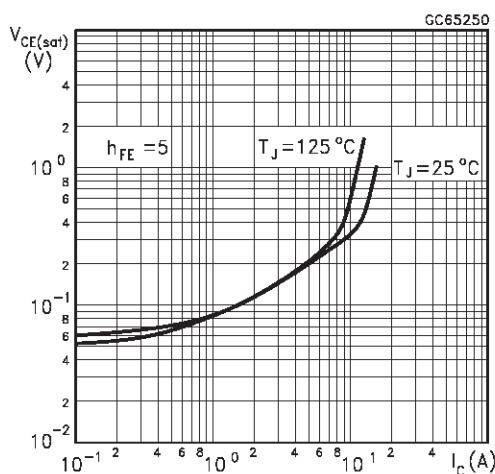
Derating Curve



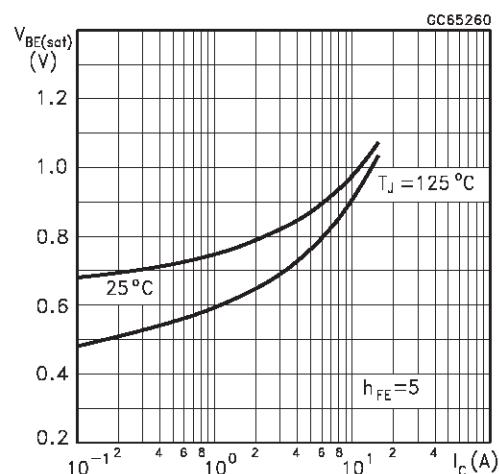
DC Current Gain



Collector Emitter Saturation Voltage

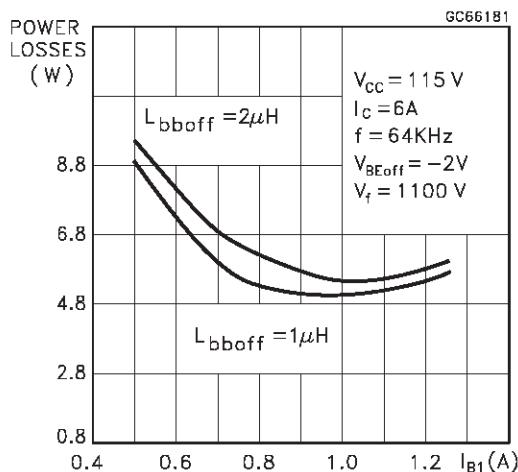


Base Emitter Saturation Voltage

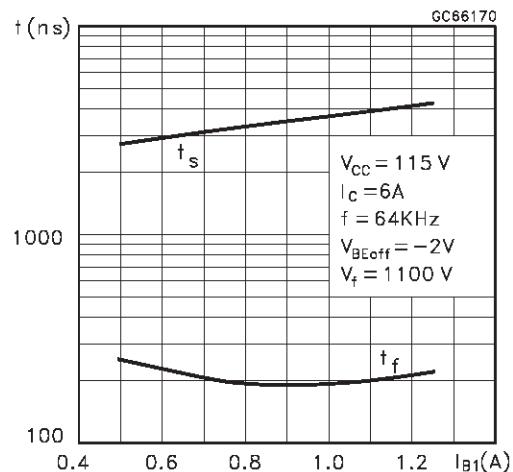


## BUH1015/BUH1015HI

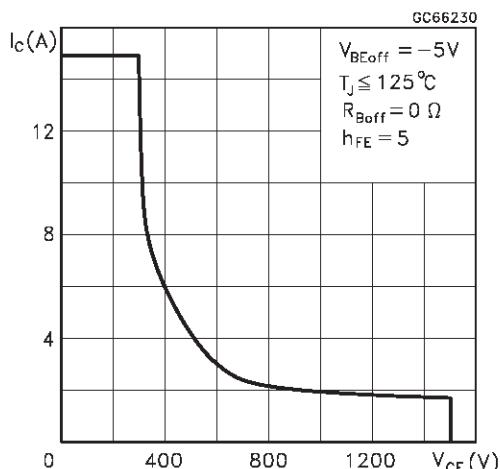
### Power Losses at 64 KHz



### Switching Time Inductive Load at 64KHz (see figure 2)



### Reverse Biased SOA



### BASE DRIVE INFORMATION

In order to saturate the power switch and reduce conduction losses, adequate direct base current  $I_{B1}$  has to be provided for the lowest gain  $h_{FE}$  at  $T_j = 100\text{ }^\circ\text{C}$  (line scan phase). On the other hand, negative base current  $I_{B2}$  must be provided to turn off the transistor (retrace phase). Most of the dissipation, especially in the deflection application, occurs at switch-off so it is essential to determine the value of  $I_{B2}$  which minimizes power losses, fall time  $t_f$  and, consequently,  $T_j$ . A new set of curves have been defined to give total power losses,  $t_s$  and  $t_f$  as a function of  $I_{B1}$  at 64 KHz scanning frequencies for choosing the

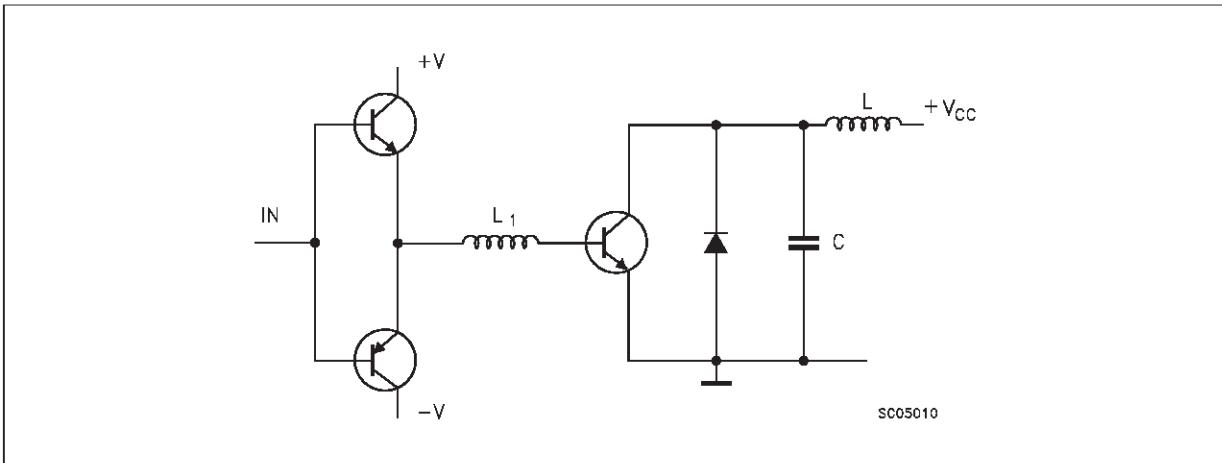
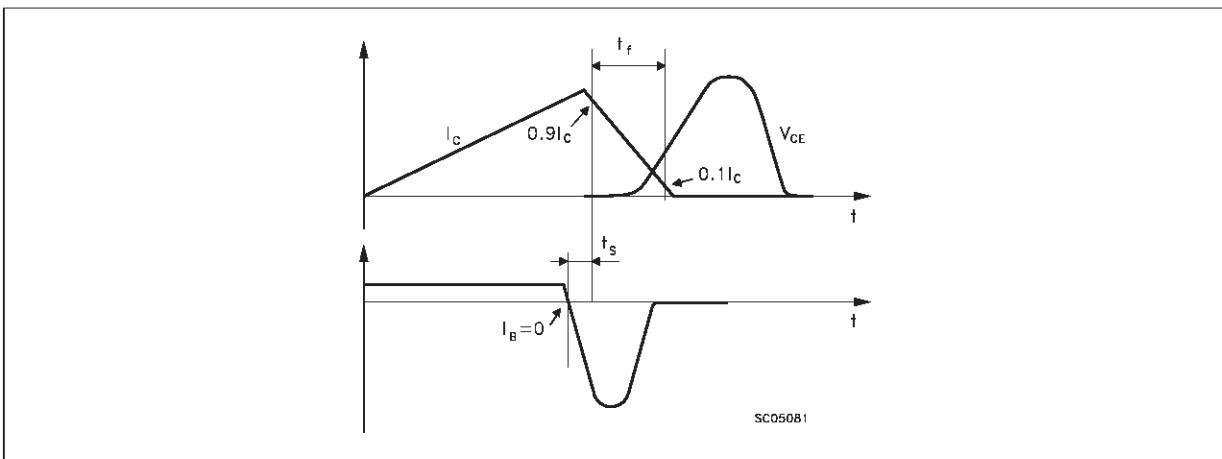
optimum drive. The test circuit is illustrated in figure 1.

The values of  $L$  and  $C$  are calculated from the following equations:

$$\frac{1}{2} L (I_c)^2 = \frac{1}{2} C (V_{CE\text{fly}})^2$$

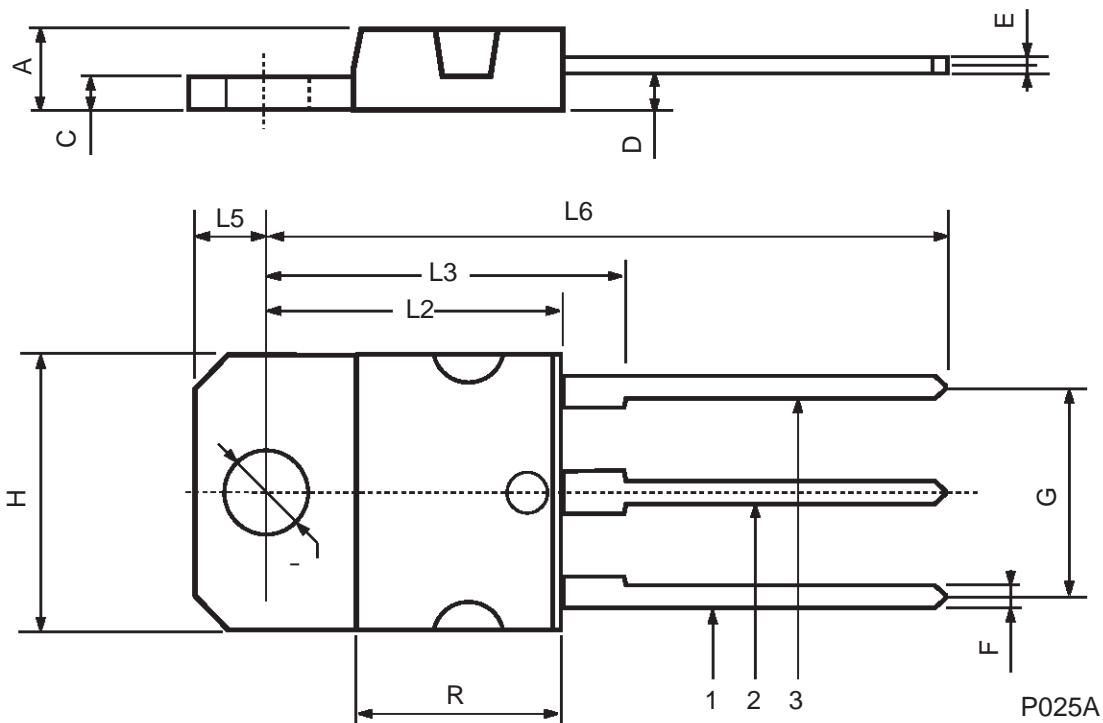
$$\omega = 2 \pi f = \frac{1}{\sqrt{LC}}$$

Where  $I_c$  = operating collector current,  $V_{CE\text{fly}}$  = flyback voltage,  $f$  = frequency of oscillation during retrace.

**Figure 1:** Inductive Load Switching Test Circuits.**Figure 2:** Switching Waveforms in a Deflection Circuit

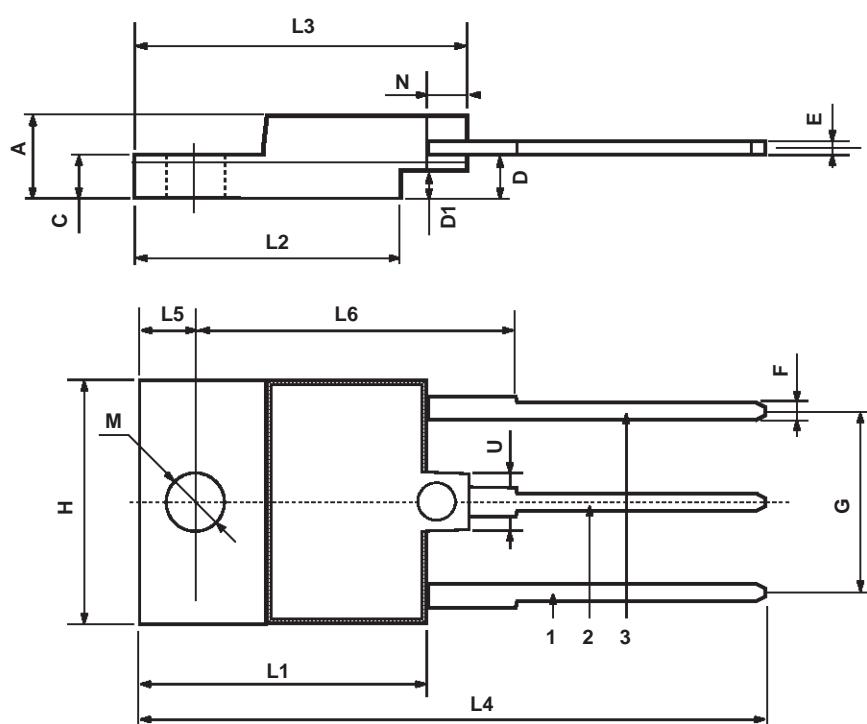
## TO-218 (SOT-93) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		4.9	0.185		0.193
C	1.17		1.37	0.046		0.054
D		2.5			0.098	
E	0.5		0.78	0.019		0.030
F	1.1		1.3	0.043		0.051
G	10.8		11.1	0.425		0.437
H	14.7		15.2	0.578		0.598
L2	–		16.2	–		0.637
L3		18			0.708	
L5	3.95		4.15	0.155		0.163
L6		31			1.220	
R	–		12.2	–		0.480
Ø	4		4.1	0.157		0.161



## ISOWATT218 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	5.35		5.65	0.210		0.222
C	3.3		3.8	0.130		0.149
D	2.9		3.1	0.114		0.122
D1	1.88		2.08	0.074		0.081
E	0.75		1	0.029		0.039
F	1.05		1.25	0.041		0.049
G	10.8		11.2	0.425		0.441
H	15.8		16.2	0.622		0.637
L1	20.8		21.2	0.818		0.834
L2	19.1		19.9	0.752		0.783
L3	22.8		23.6	0.897		0.929
L4	40.5		42.5	1.594		1.673
L5	4.85		5.25	0.190		0.206
L6	20.25		20.75	0.797		0.817
M	3.5		3.7	0.137		0.145
N	2.1		2.3	0.082		0.090
U		4.6			0.181	



P025C

Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectronics.

© 1998 SGS-THOMSON Microelectronics - Printed in Italy - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - France - Germany - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands -  
Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A