



# BUH1015 BUH1015HI

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- STMicroelectronics PREFERRED SALESTYPES
- HIGH VOLTAGE CAPABILITY
- VERY HIGH SWITCHING SPEED

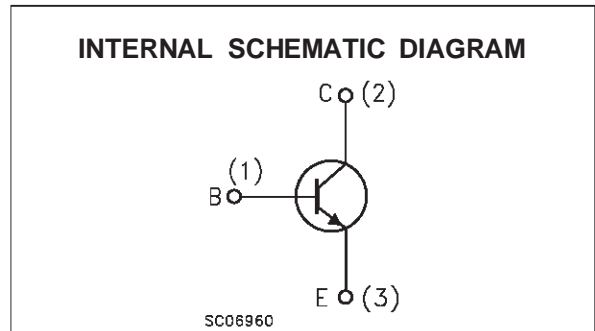
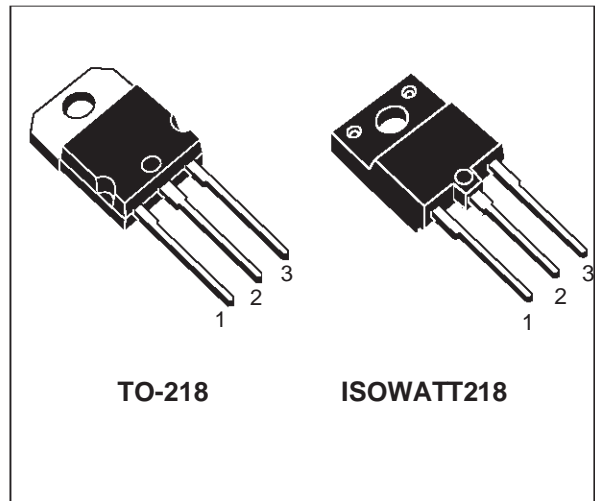
### APPLICATIONS:

- HORIZONTAL DEFLECTION FOR COLOUR TV AND MONITORS

### DESCRIPTION

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

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



### 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 ( $t_p < 5$ ms)	18	A	
$I_B$	Base Current	8	A	
$I_{BM}$	Base Peak Current ( $t_p < 5$ ms)	11	A	
$P_{tot}$	Total Dissipation at $T_c = 25$ °C	160	70	W
$T_{stg}$	Storage Temperature	-65 to 150	°C	
$T_j$	Max. Operating Junction Temperature	150	°C	

# BUH1015/BUH1015HI

## THERMAL DATA

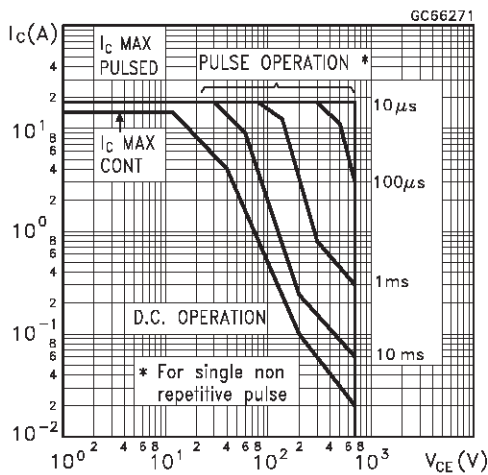
			TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.78	1.8	$^{\circ}\text{C}/\text{W}$

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

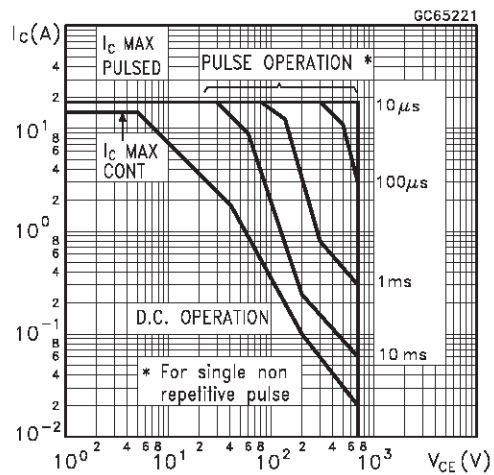
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 1500\text{ V}$ $V_{CE} = 1500\text{ V}$ $T_j = 125^{\circ}\text{C}$			0.2 2	$\text{mA}$ $\text{mA}$
$I_{EBO}$	Emitter Cut-off Current ( $I_C = 0$ )	$V_{EB} = 5\text{ V}$			100	$\mu\text{A}$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

\* Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

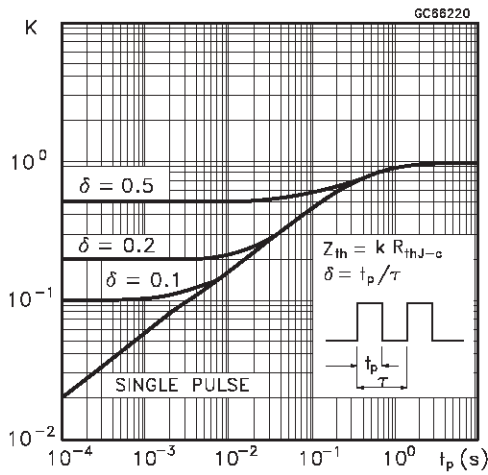
Safe Operating Area For TO-218



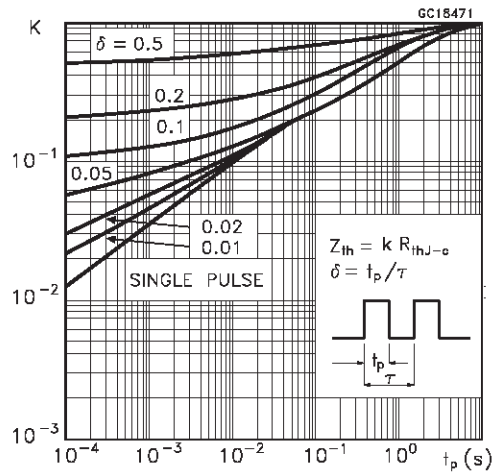
Safe Operating Area For ISOWATT218



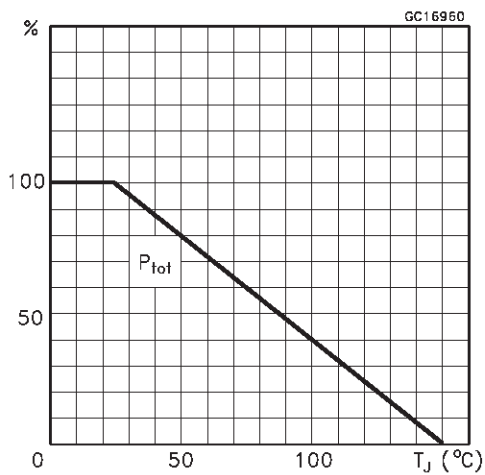
Thermal Impedance for TO-218



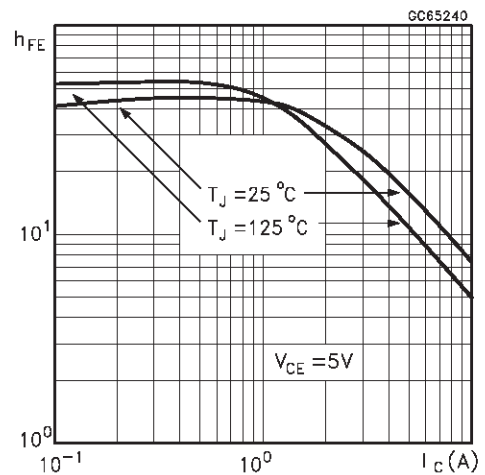
Thermal Impedance for ISOWATT218



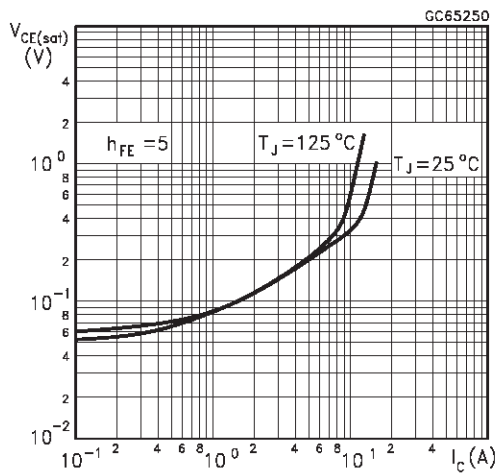
Derating Curve



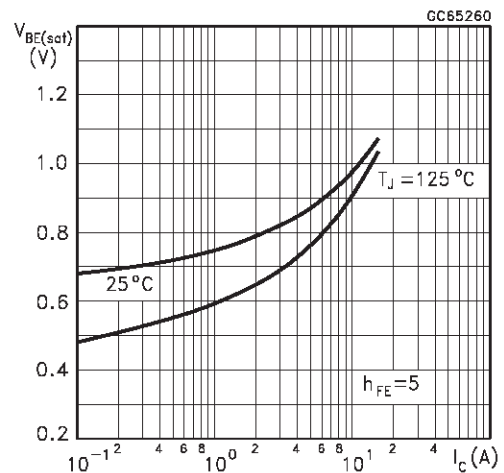
DC Current Gain



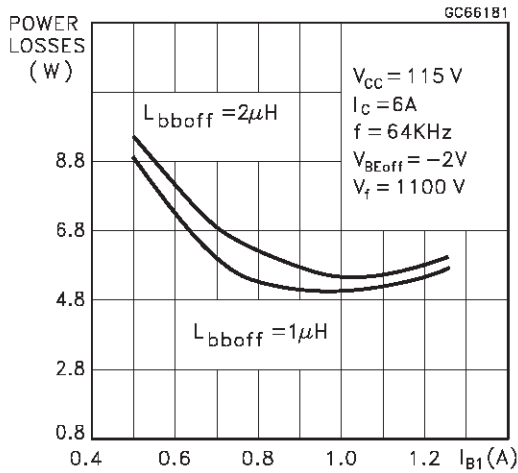
Collector Emitter Saturation Voltage



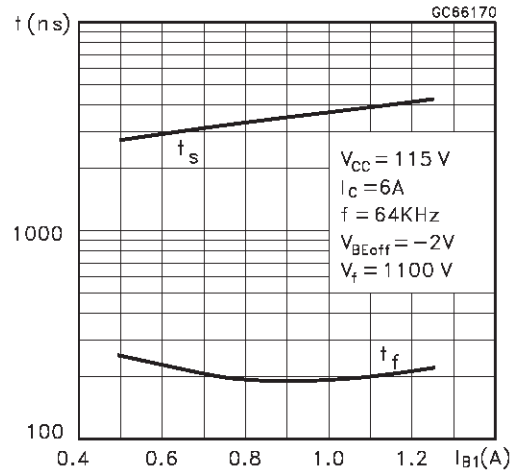
Base Emitter Saturation Voltage



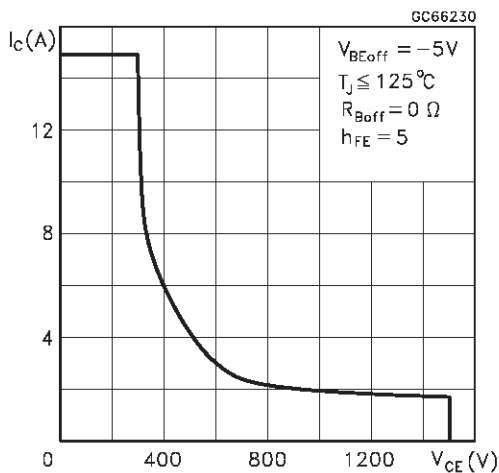
Power Losses at 64 KHz



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  $T_j = 100^\circ\text{C}$  (line scan phase). On the other hand, negative base current  $I_{B2}$  must be provided the transistor to turn off (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.

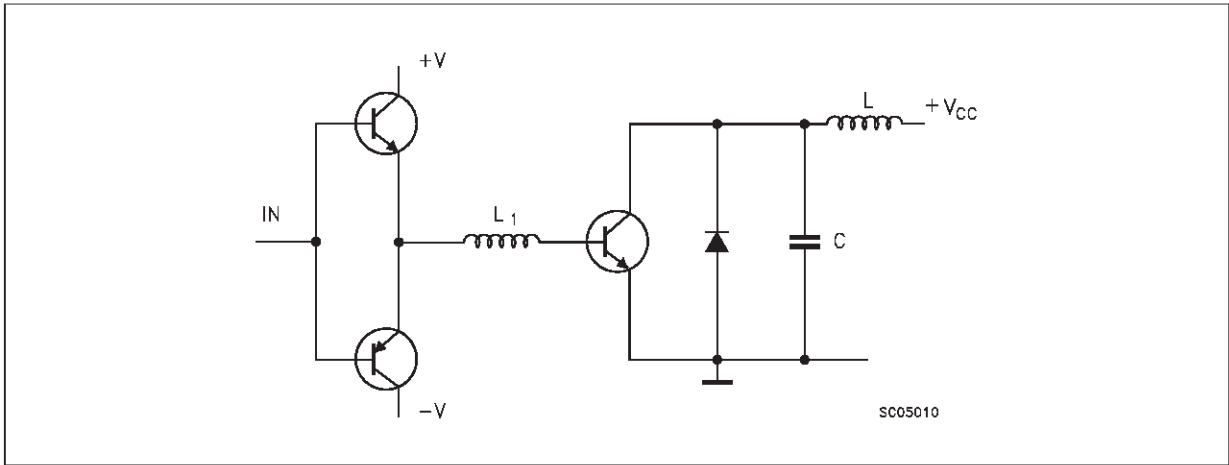
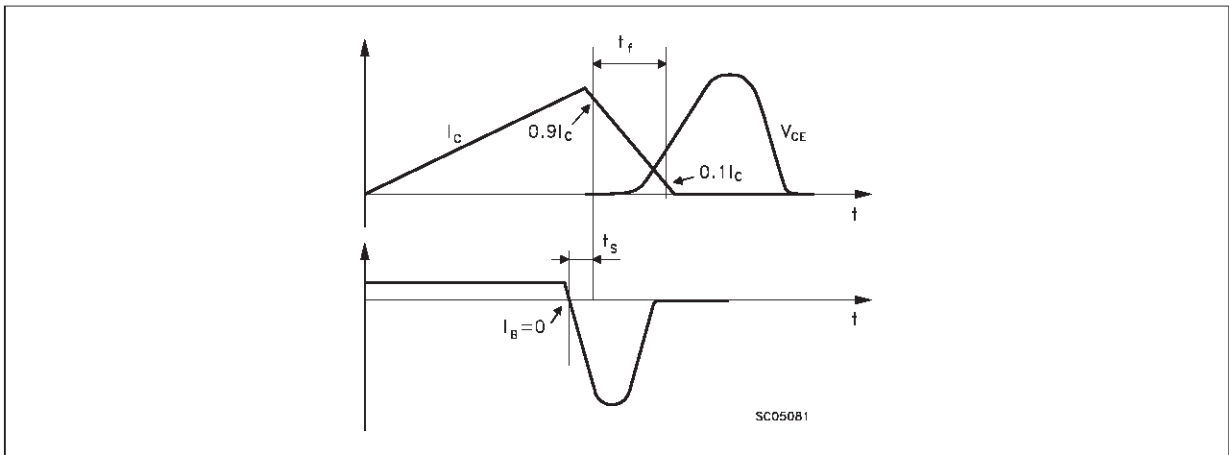
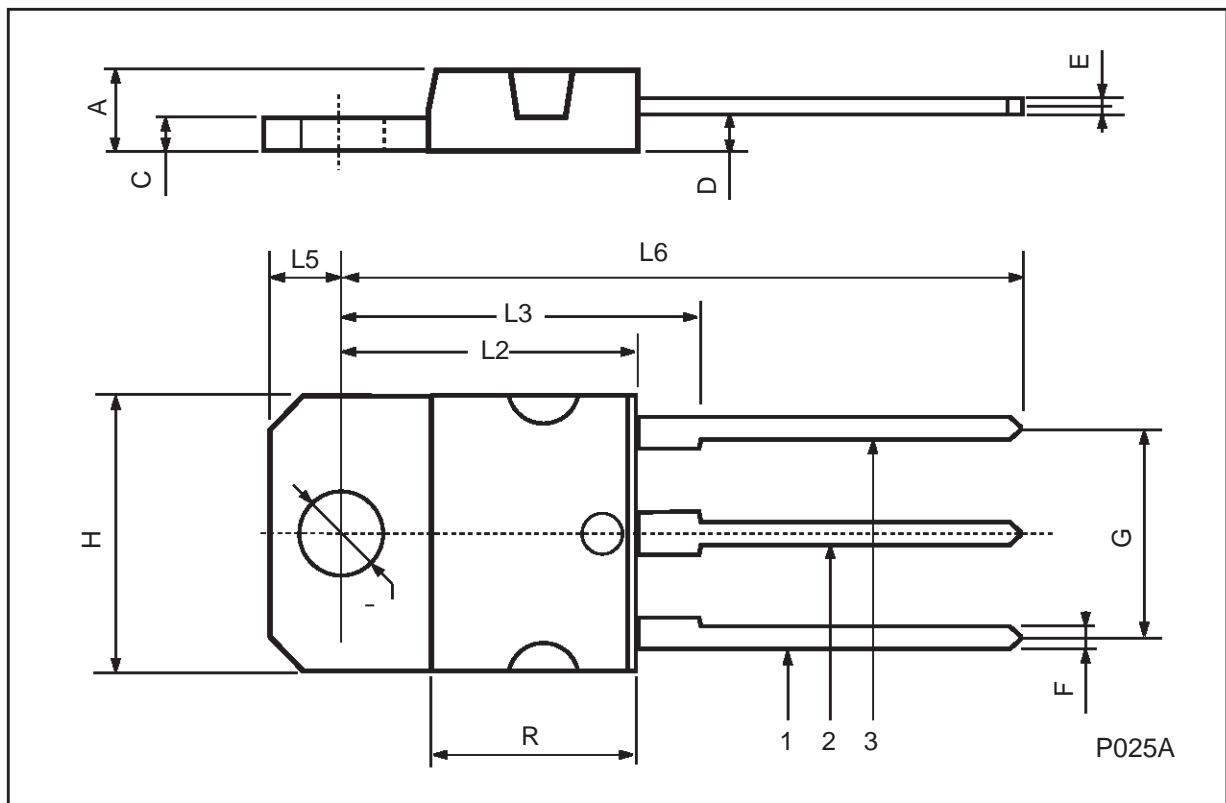


Figure 2: Switching Waveforms in a Deflection Circuit



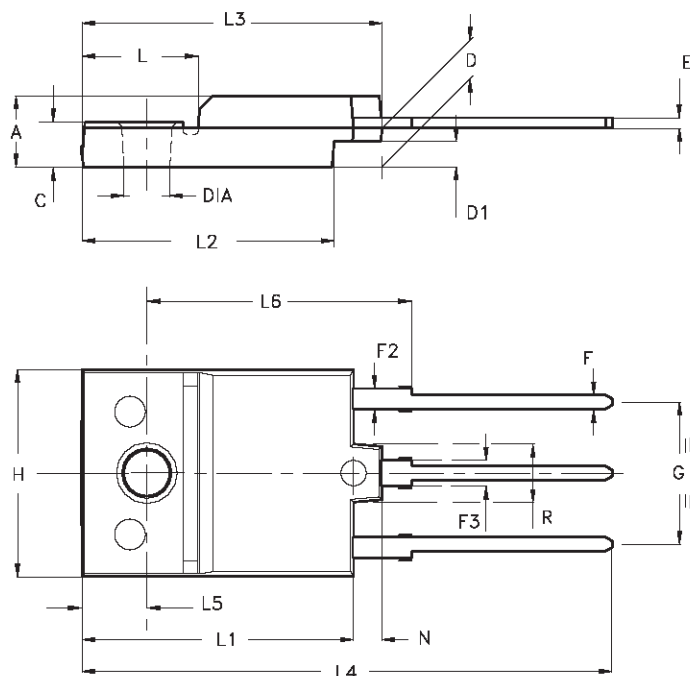
**TO-218 (SOT-93) MECHANICAL DATA**

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	0.211		0.222
C	3.30		3.80	0.130		0.150
D	2.90		3.10	0.114		0.122
D1	1.88		2.08	0.074		0.082
E	0.75		0.95	0.030		0.037
F	1.05		1.25	0.041		0.049
F2	1.50		1.70	0.059		0.067
F3	1.90		2.10	0.075		0.083
G	10.80		11.20	0.425		0.441
H	15.80		16.20	0.622		0.638
L		9			0.354	
L1	20.80		21.20	0.819		0.835
L2	19.10		19.90	0.752		0.783
L3	22.80		23.60	0.898		0.929
L4	40.50		42.50	1.594		1.673
L5	4.85		5.25	0.191		0.207
L6	20.25		20.75	0.797		0.817
N	2.1		2.3	0.083		0.091
R		4.6			0.181	
DIA	3.5		3.7	0.138		0.146



- Weight : 4.9 g (typ.)
- Maximum Torque (applied to mounting flange) Recommended: 0.8 Nm; Maximum: 1 Nm
- The side of the dissipator must be flat within 80  $\mu$ m

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