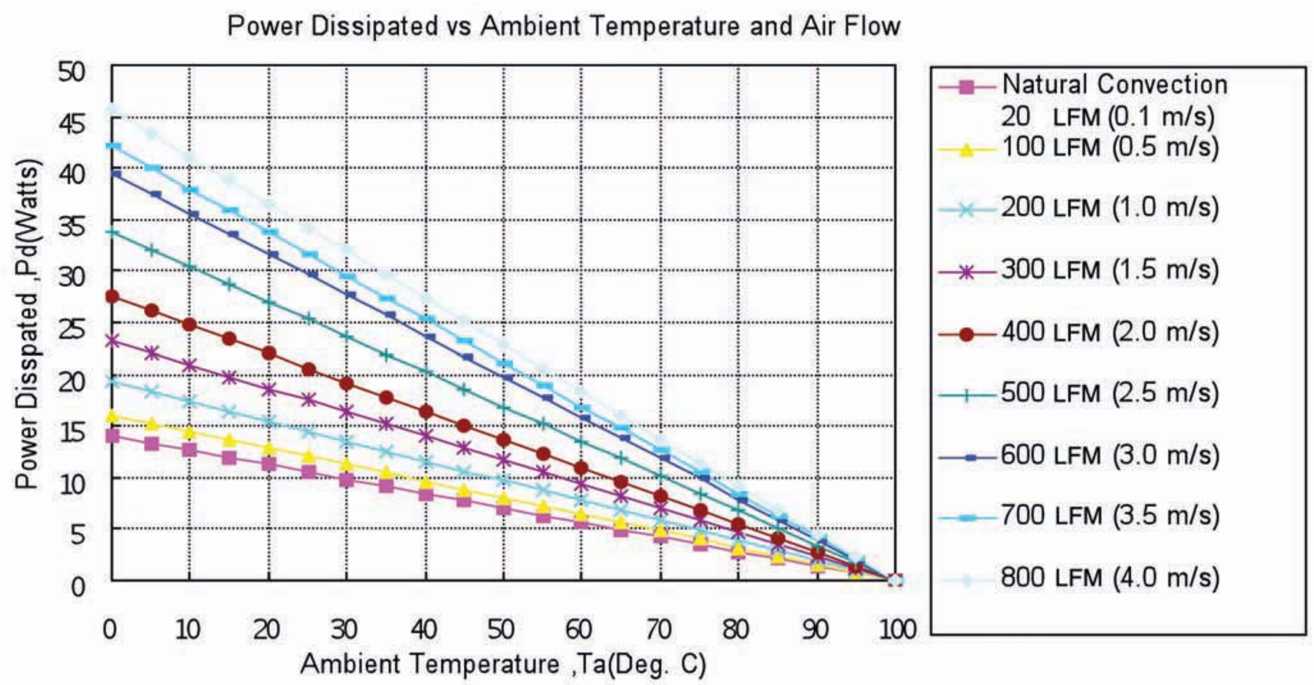
ICH50-150 Derating Curves

THE XPERTS IN POWER

Derating Curve

The following curve is the de-rating curve of ICH50-150 series without a heat sink.



Example

What is the minimum airflow necessary for a ICH7524S12 operating at nominal line, an output current of 6.25 A, and a maximum ambient temperature of 40 °C?

Solution:

Determine Power dissipation (P_d):

$P_d=P_i-P_o=P_o(1-\eta)/\eta$

$P_d=12 \times 6.25 \times (1-0.84) / 0.84 = 14.29$ W

Determine airflow:

Given: P_d = 14.29 W and T_a = 40 °C

Check above Power de-rating curve:

minimum airflow= 400 LFM (2.0 m/s)

Verification: Maximum temperature rise $\Delta T = Pd \times R_{ca}=14.29\times3.64=52$°C

Maximum case temperature $T_c=T_a+\Delta T=92$ °C <100°C

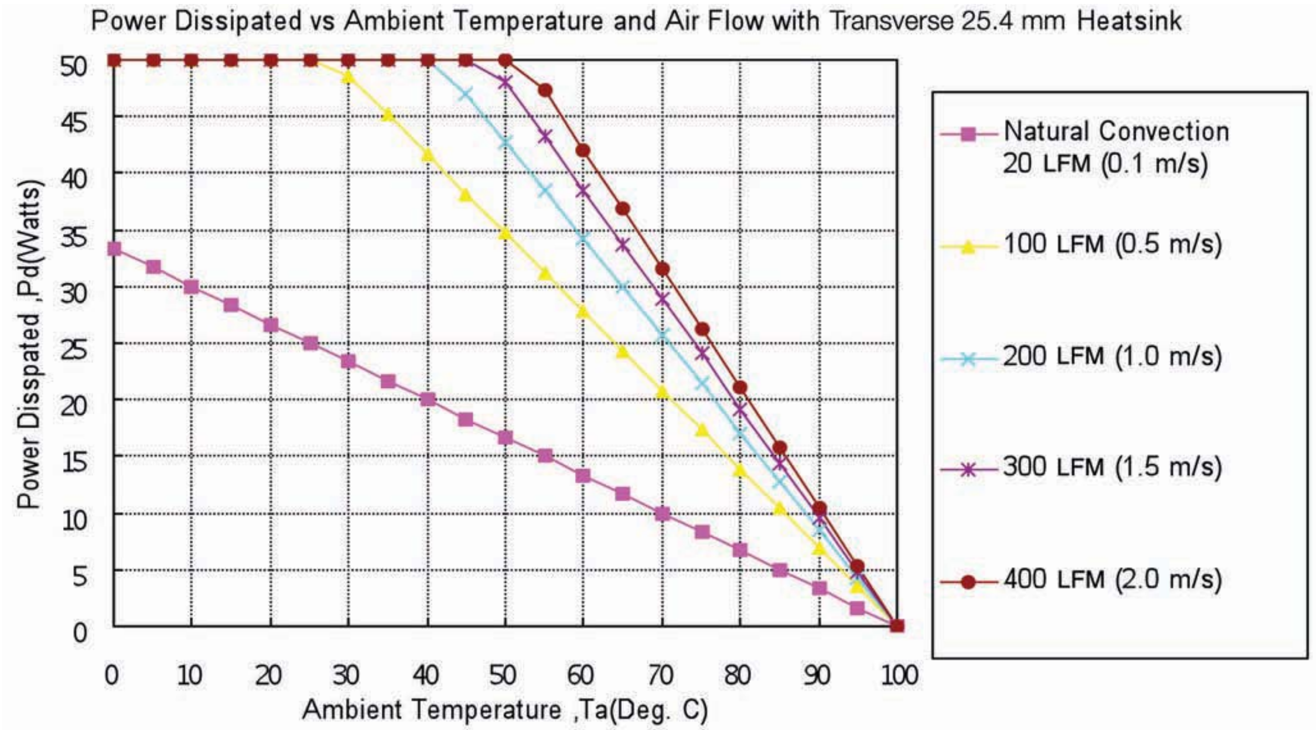
Where: Rca is thermal resistance from case to ambient.

T_a is ambient temperature and T_c is the case temperature.

Thermal Resistance vs Air Flow

Air Flow Rate	Typical R_{ca}
Natural Convection 20 LFM (0.1 ms)	7.12 °C/W
100 LFM (0.5 ms)	6.21 °C/W
200 LFM (1.0 ms)	5.17 °C/W
300 LFM (1.5 ms)	4.29 °C/W
400 LFM (2.0 ms)	3.64 °C/W
500 LFM (2.5 ms)	2.96 °C/W
600 LFM (3.0 ms)	2.53 °C/W
700 LFM (3.5 ms)	2.37 °C/W
800 LFM (4.0 ms)	2.19 °C/W

Derating Curve...cont.



Example

What is the minimum airflow necessary for a ICH15048S05 operating at nominal line, an output current of 30A, and a maximum ambient temperature of 40°C?

Thermal Resistance vs Air Flow

Air Flow Rate	Typical R_{ca}
Natural Convection 20 LFM (0.1 ms)	3.0 °C/W
100 LFM (0.5 ms)	1.44 °C/W
200 LFM (1.0 ms)	1.17 °C/W
300 LFM (1.5 ms)	1.04 °C/W
400 LFM (2.0 ms)	0.95 °C/W

Solution:

Determine Power dissipation (Pd):

$P_d=P_i-P_o=P_o(1-\eta)/\eta$

$P_d= 5 \times 3\ 0\times (1-0.84) / 0.84 = 28.57$ W

Determine airflow:

Given: P_d = 28.57 W and T_a = 40 °C

Check above Power de-rating curve:

minimum airflow = 100 LFM (0.5 m/s)

Verification: The maximum temperature rise $\Delta T = P_d \times R_{ca} = 28.57 \times 1.44 = 41.14$ °C

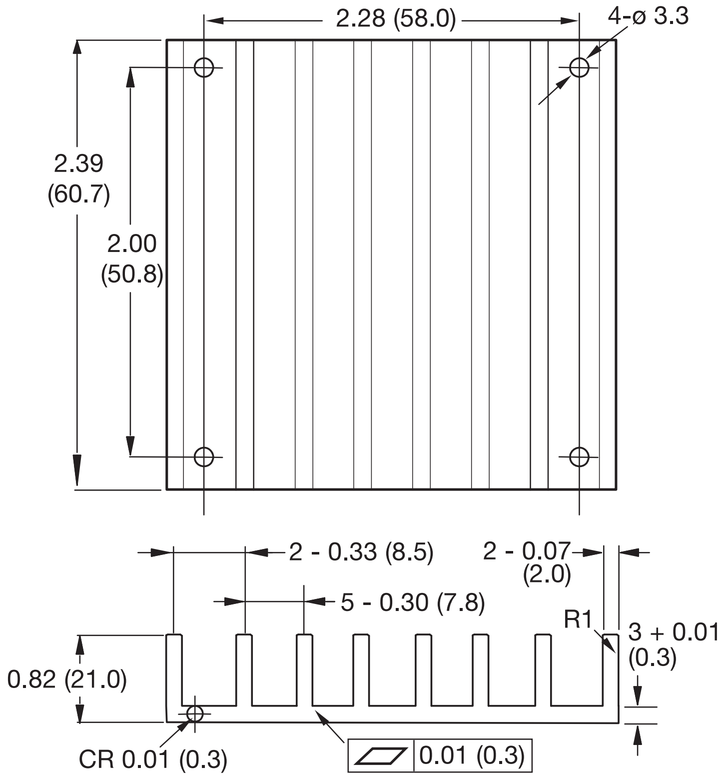
The maximum case temperature $T_c = T_a + \Delta T = 81.14$ °C <100 °C

Where: R_{ca} is thermal resistance from case to ambient.

T_a is ambient temperature and T_c is the case temperature.

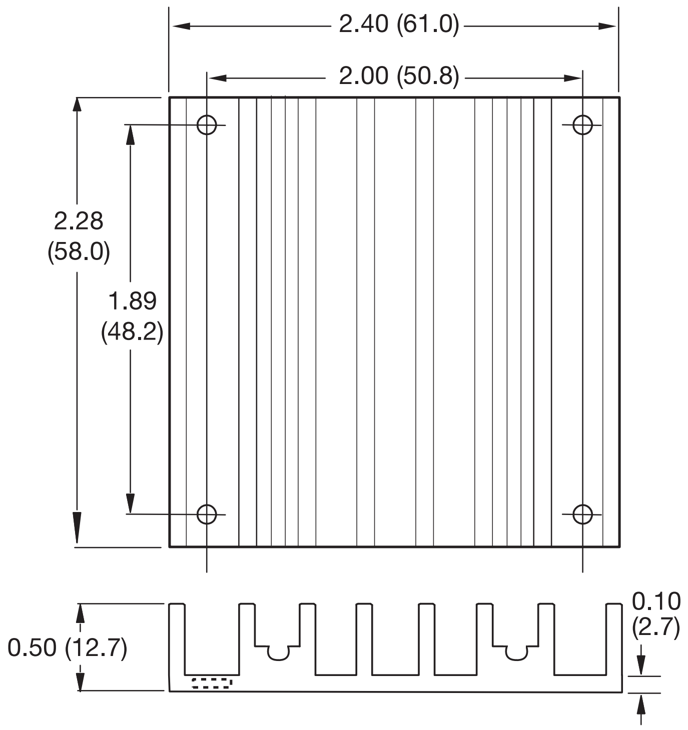
Half Brick Heat Sinks

Longitudinal Heat Sink



Rca:
3.90 °C/W (typ.), natural convection
1.74 °C/W (typ.), at 100 LFM
1.33 °C/W (typ.), at 200 LFM
1.12 °C/W (typ.), at 300 LFM
0.97 °C/W (typ.), at 400 LFM

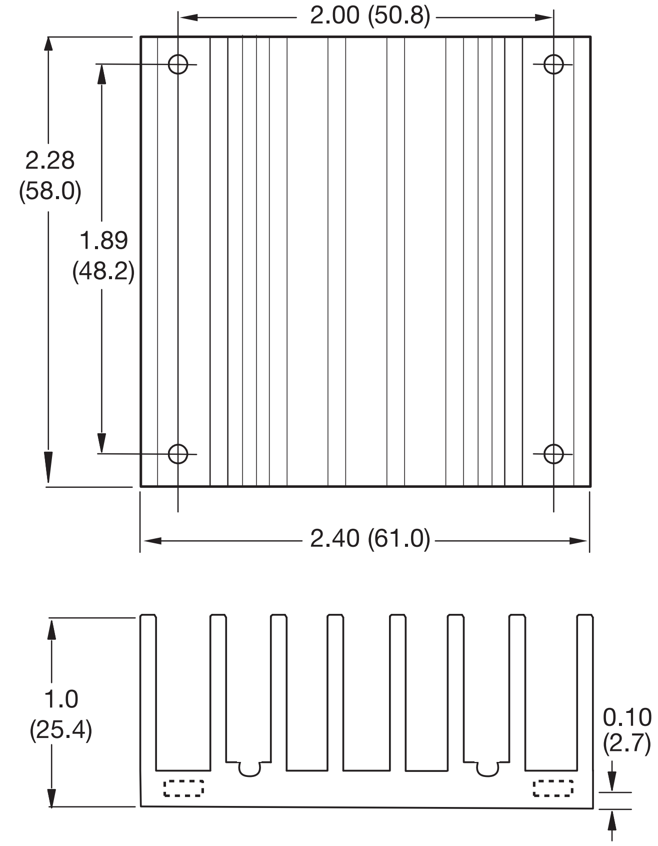
Transverse Heat Sink



Rca:
4.70 °C/W (typ.), natural convection
2.89 °C/W (typ.), at 100 LFM
2.30 °C/W (typ.), at 200 LFM
1.88 °C/W (typ.), at 300 LFM
1.59 °C/W (typ.), at 400 LFM

Half Brick Heat Sinks...cont.

Transverse Heat Sink



Rca:
3.00 °C/W (typ.), natural convection
1.44 °C/W (typ.), at 100 LFM
1.17 °C/W (typ.), at 200 LFM
1.04 °C/W (typ.), at 300 LFM
0.95 °C/W (typ.), at 400 LFM