Thermal Consideration of AMC7140

When power consumption is over about 687mW for TO-252 package, at T_A=70˚C, additional heat sink is required to control the junction temperature below 125˚C.

The junction temperature is: $T_J = P_D (\theta_{JT} + \theta_{CS} + \theta_{SA}) + T_A$

P_D: Dissipated power.

θ_{JT}: Thermal resistance from the junction to the mounting tab of the package.

For TO-252 package, θ_{JT} = 7.0 °C /W.

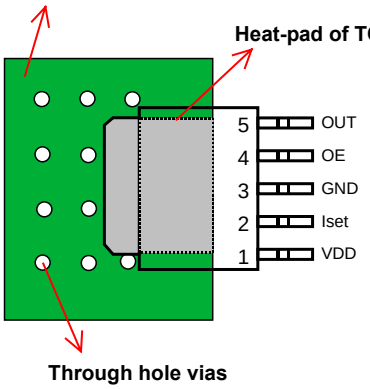
θ_{CS}: Thermal resistance through the interface between the IC and the surface on which it is mounted. (Typically, θ_{CS} < 1.0˚C /W)

θ_{SA}: Thermal resistance from the mounting surface to ambient (thermal resistance of the heat sink).

If PC Board copper is going to be used as a heat sink, below table can be used to determine the appropriate size of copper foil required. For multi-layered PCB, these layers can also be used as a heat sink. They can be connected with several through hole vias.

PCB θ_{SA} (°C /W)	59	45	38	33	27	24	21
PCB heat sink size (mm^2)	500	1000	1500	2000	3000	4000	5000

Recommended figure of PCB area used as a heat sink.



When I_{OUT} =700mA and V_{DROP} = 2V, P_D = 0.7 x 2 = 1.4(W)

Then, the needed θ_{SA} is: $\theta_{SA} = (T_J - T_A) / P_D - \theta_{JT} - \theta_{CS}$ = (125 − 70) / 1.4 − 7 − 1 = 31.3

A PCB area of 2000mm^2 is needed for heat sink.

If I_{OUT} =350mA and V_{DROP} = 0.6V, P_D = 0.35 x 0.6 = 0.21(W)

Then, the needed θ_{SA} is: $\theta_{SA} = (T_J - T_A) / P_D - \theta_{JT} - \theta_{CS}$ = (125 − 70) / 0.21 − 7 − 1 = 254

A PCB area of the same size as heat-pad of chip is enough for heat sink.