

Total Cost of Ownership of a Bypass System

This document describes the total cost of ownership of a solar bypass solution throughout its lifetime.

1. Why is bypass needed?

A solar module is made of a string of solar cells in series:

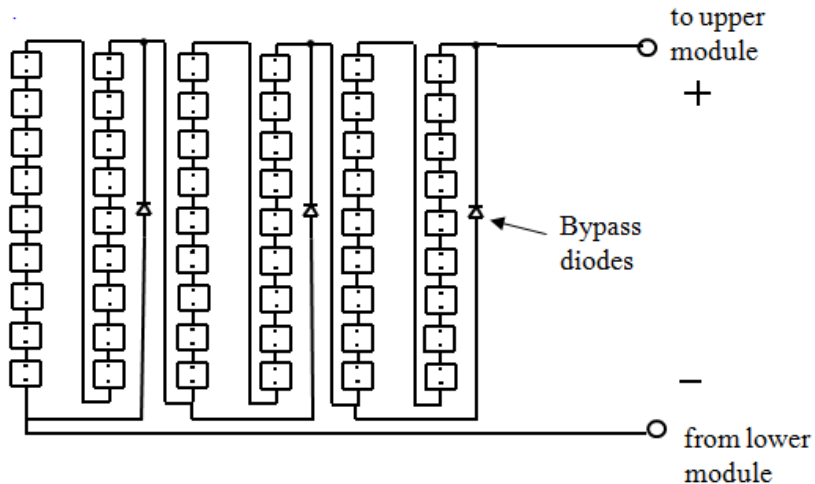


Figure 1: Solar Module

Bypass Diodes are added in parallel to every 12-24 cells in a typical module to do the following:

1. Limit the overall string/system power loss due to a localized shading event or a damaged cell.
2. Prevent hot-spot damage on shaded cells as they operate in avalanche mode.
3. Provide a first line of defense against intra-module DC series arcing in the event of a cell or column interconnect losing integrity. DC arcing is a potential fire hazard.

2. Where does the real cost of bypass devices come from?

Solar systems are required to operate for 25 years.

The solar industry working assumption is that after five years of operation, an average of 4% of the bypass diodes will fail. When a bypass diode fails in the field it can reduce energy harvesting efficiency in the best case and create a real hazard in the worst. This means that if a bypass diode fails, the diode, the junction box, or even the whole module needs to be replaced, which includes the cost of material and the cost of the removal and assembly by a certified technician. The total cost is typically 10 times more than the cost of the actual junction box.

The utilization of Microsemi's Active Bypass Device, with expected failure rates an order of magnitude lower than that of Schottky Diodes, guarantees very infrequent replacement of junction boxes. Over the lifetime of the solar module, this reduces the total cost of ownership 6x, despite the fact that Microsemi's Active Bypass Devices typically cost more than traditional Schottky diodes.



Figure 2 shows the difference between the total costs of ownership of a standard bypass diode and Microsemi's Active Bypass Device.

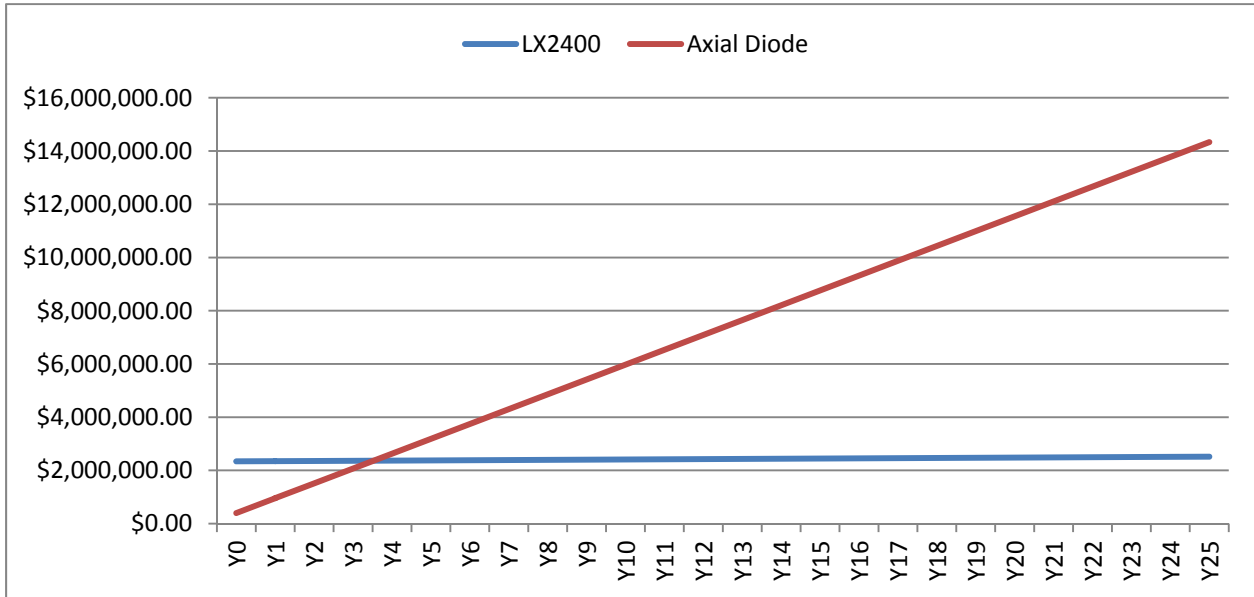


Figure 2: Total Cost of Ownership Comparison

More details on Microsemi's solar solutions, including a TCOS calculation tool, can be found at <http://www.microsemi.com/soc/products/solutions/solar/default.aspx>.



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