



Power MOSFETs Packaging Reliability

Description:

- In recent years improvements in silicon technology have significantly reduced MOSFET $R_{DS(on)}$ and the amount of heat generated by power semiconductors to the point where packaging has become the limit to higher performance devices.
- Operating Power MOSFET devices at frequencies over 1 Mhz will cause the standard wirebonded SO-8 package, with high fixed Die Free Package Resistance (DFPR), to become the bottleneck for performance.
- New package types such as CopperStrap™, PowerPak™, and DirectFET™ can potentially reduce the DFPR from 1.5 mOhm in the standard SO-8 package to only 0.1 mOhm in the same foot-print and reduce the thermal resistance to 3° C/W, compared to 18° C/W for the SO-8 package.
- Choosing the right package for a Space Application can be a challenge due to single die versus multiple die, thermal and stray impedance issues.
- An evaluation of a top candidate package will be conducted and compared to a standard SO-8 package for reliability in space applications.

Benefits:

Often the die size in a standard SO-8 package is big in order to compensate for its large package resistance and higher junction temperature. Some readily available packages can either reduce the parts count or reduce power loss to the extent that system level design is less expensive and more reliable than many SO-8 implementations due to the reduction in junction temperature.

Products:

Report summarizing technology risk for NASA Projects.

Schedule/Costs: Total ROM Cost (non-CS) = \$150K

	2005						2006						
	O	N	D	J	F	M	A	M	J	J	A	S	O
Survey		█	█										
Down-select			█	█	█								
Order/Receive					█	█	█						
Electrical /Enviro Test								█	█	█	█	█	█
Publish/Present data													▲

Risks:

Cost	█	
Schedule	█	
Technical	█	If rel testing is not completed, knowledge would not be available.
Programmatic	█	Projects need more performance from MOSFETs but need new approved packages.

Red, Yellow, or Green

Non-NASA Organizations/Procurements:

Packaged parts and electrical/environmental testing -- \$50K

Product Insertion Plan:

- Data Summary/Report – Upload to IMD Website

Lead Center/PI: JPL/Gerke

Co-Is:

Center Funding Split: JPL -- \$150K