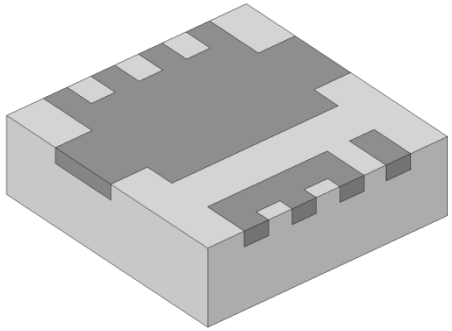
Introducing SiC Schottky Diode In Compact QFN Package

CREE

New “QFN” Package - C3D1P7060Q

- **Key Electrical Parameters**
  - Forward Rated Current: 1.7A @ T_C = 150 ˚C
  - Reverse Blocking Voltage: 600V
  - Forward Voltage: 1.7V @ 100˚C
  - Total Charge Q_C : 5.6 nC



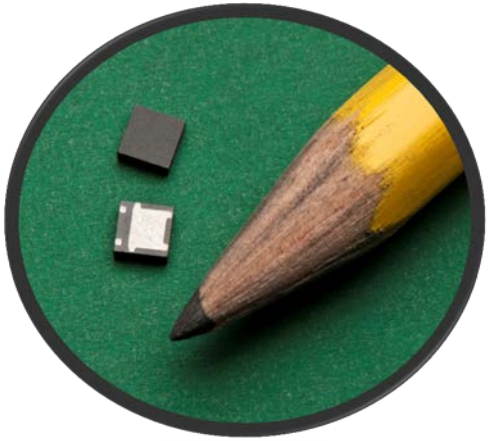
- **Package**
  - Smallest SiC package in the market
  - 3.3 x 3.3 x 1mm QFN Surface Mount

- **Benefits**
  - Higher efficiency
  - Lower thermals for diode, surrounding components
  - Smaller footprint

Why Cree Schottky Diodes?

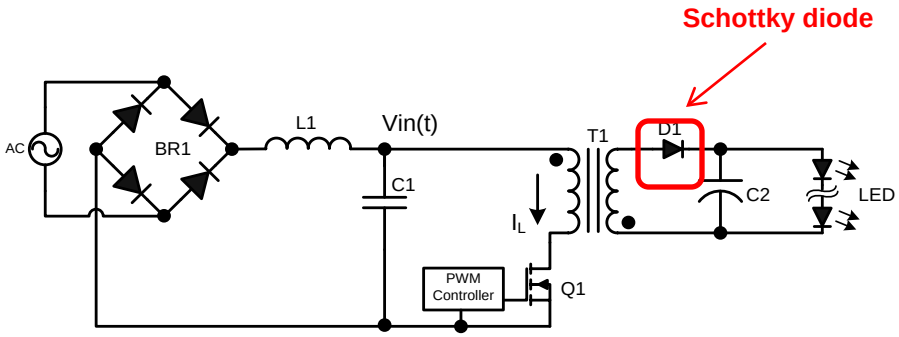
Cree C3D1P7060Q in Light Bulb applications

- Cree's new C3D1P7060Q well suited for new Non-Isolated lighting applications
- Industry's smallest SiC package well suited for space constrained application such as Lighting
- Improved Switching behavior reduces thermals and stress on MOSFET

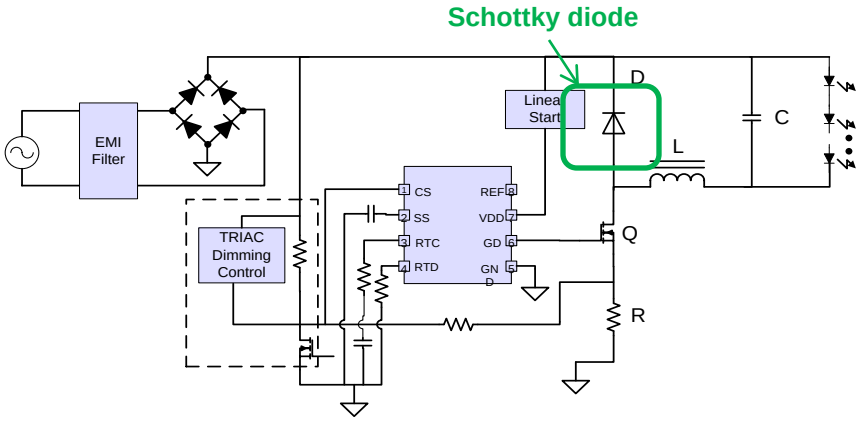


Isolated Vs Non-Isolated LED Lighting

Isolated Single Stage Flyback



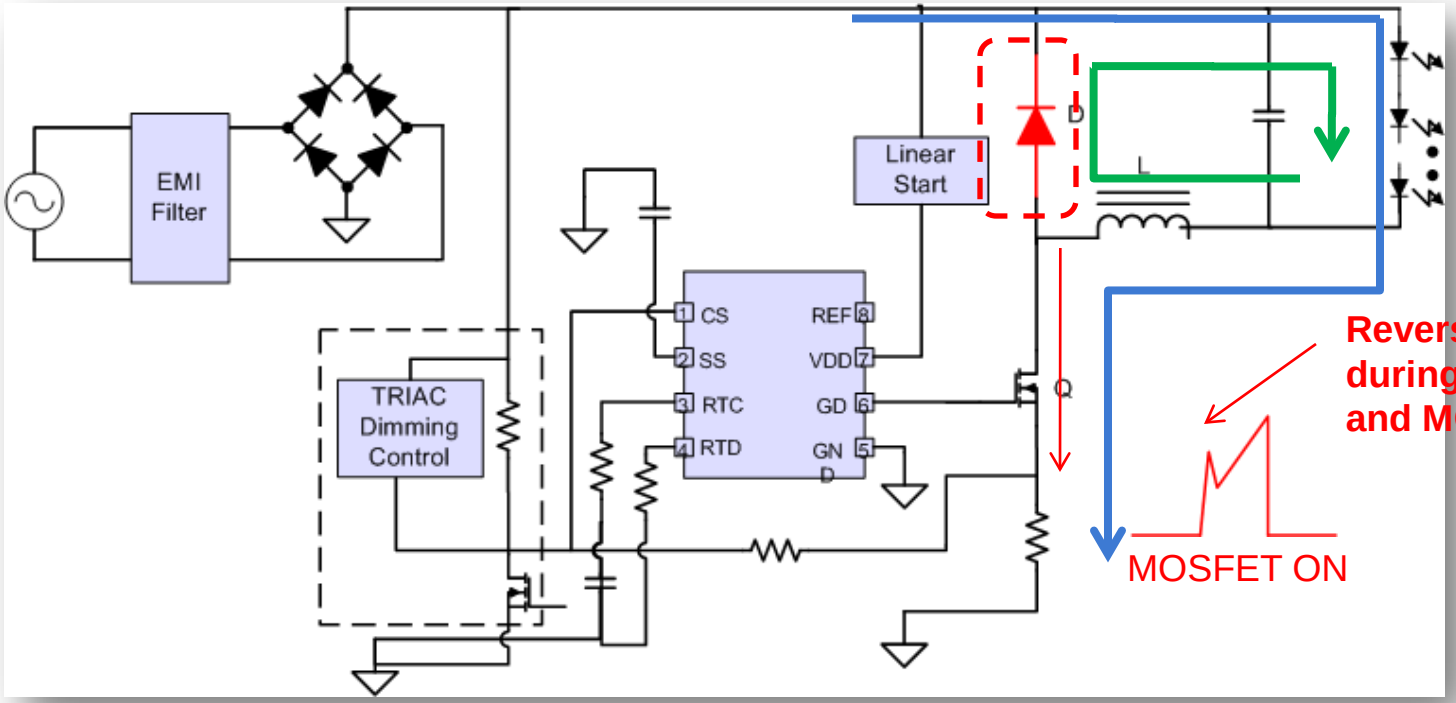
Non-Isolated Low-Side Buck



- Transformer for isolation
- Single Stage Flyback
- Typical Eff. 80%
- Diode blocking DC voltage requirements <200V

- Inductor with no isolation
- Low Side Buck
- Typical Eff. 85%
- Diode blocking DC voltage requirements increase to 500V – 600V

Why use a SiC Schottky Diode?



- **Simplified Circuit operation**

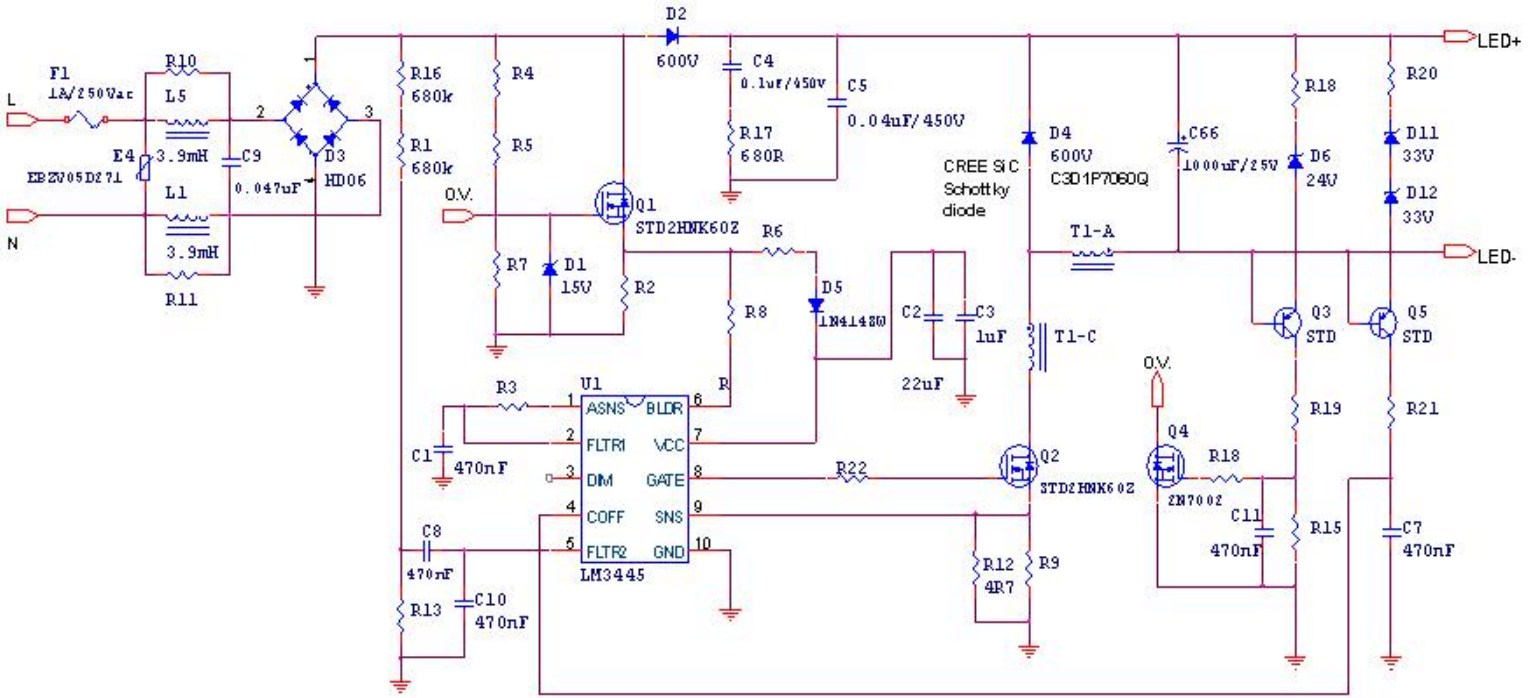
MOSFET Q is turned on, current ramps up through inductor and LED string

MOSFET Q is turned off and the freewheeling diode D conducts the current the current through the inductor and LED string

Any reverse recover current from diode will flow into the MOSFET.

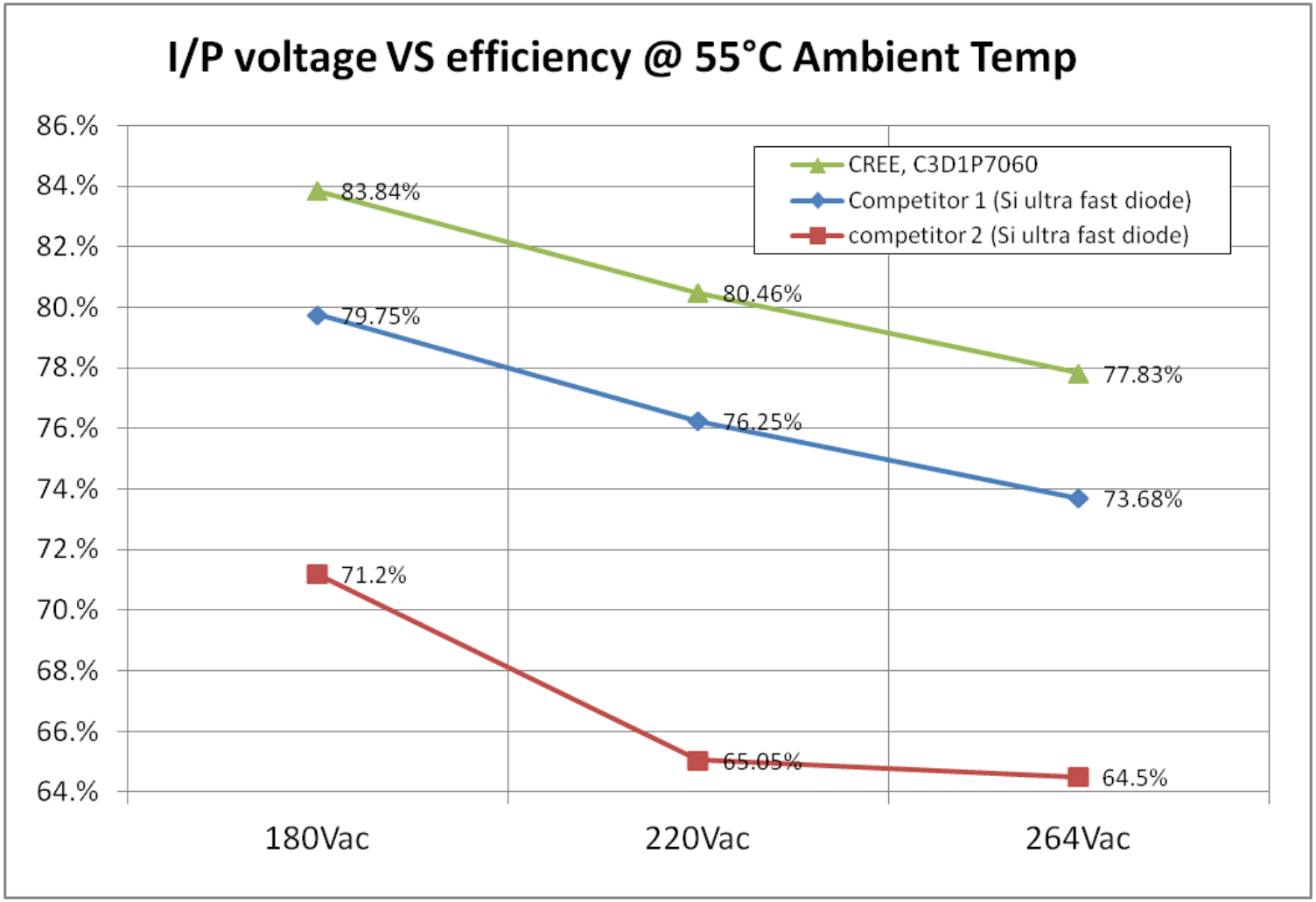
7W Cree Reference Design - Schematic

- **Driver Spec**
  - Input: 240Vac
  - Output: 25Vdc, 270mA (7W) – 40W Incandescent Replacement
  - Switching Freq: 125kHz
  - Driver IC: TI/National LM3445



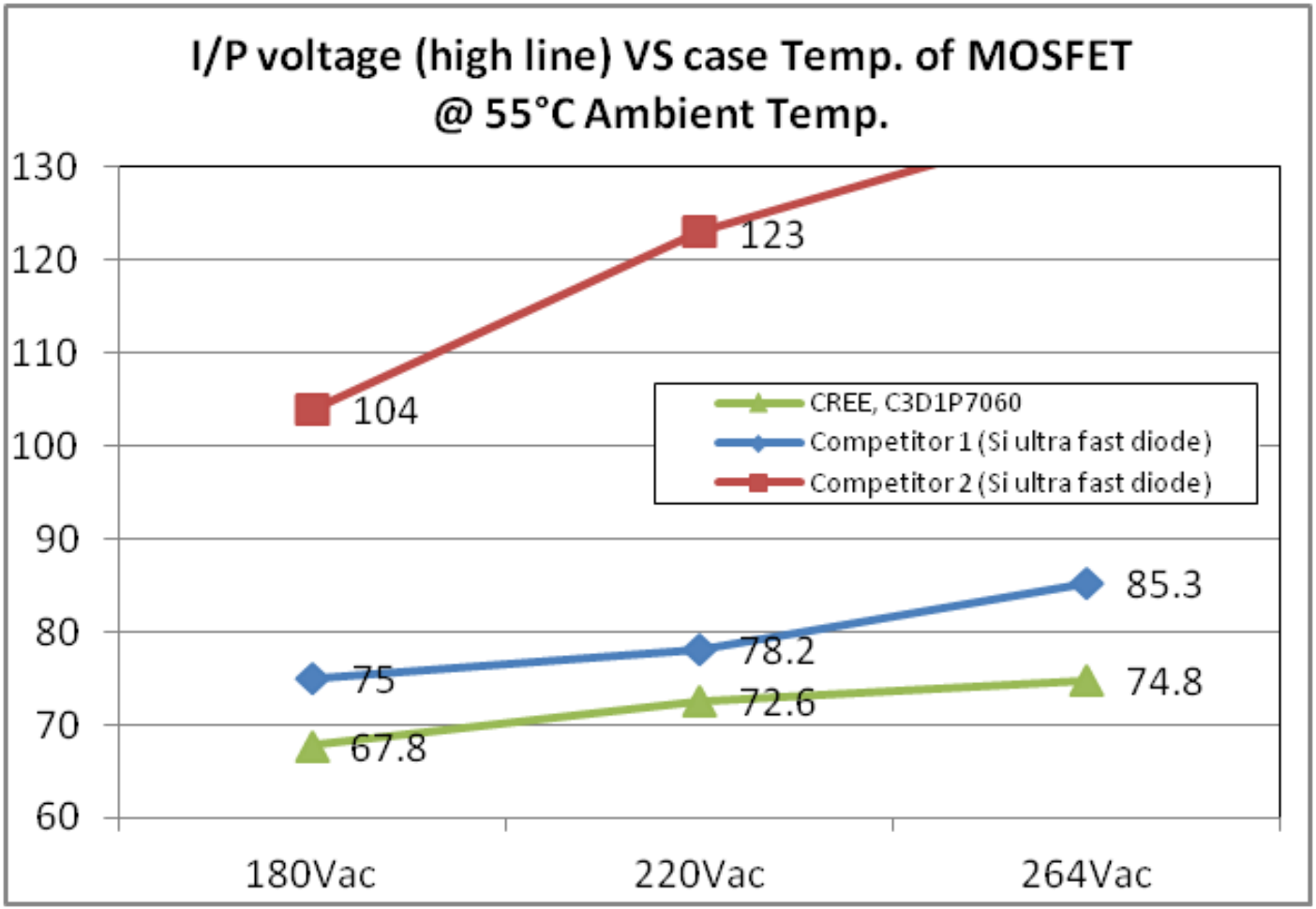
7W Cree Reference Design - Test Data

Efficiency Comparison - ~4% efficiency improvement



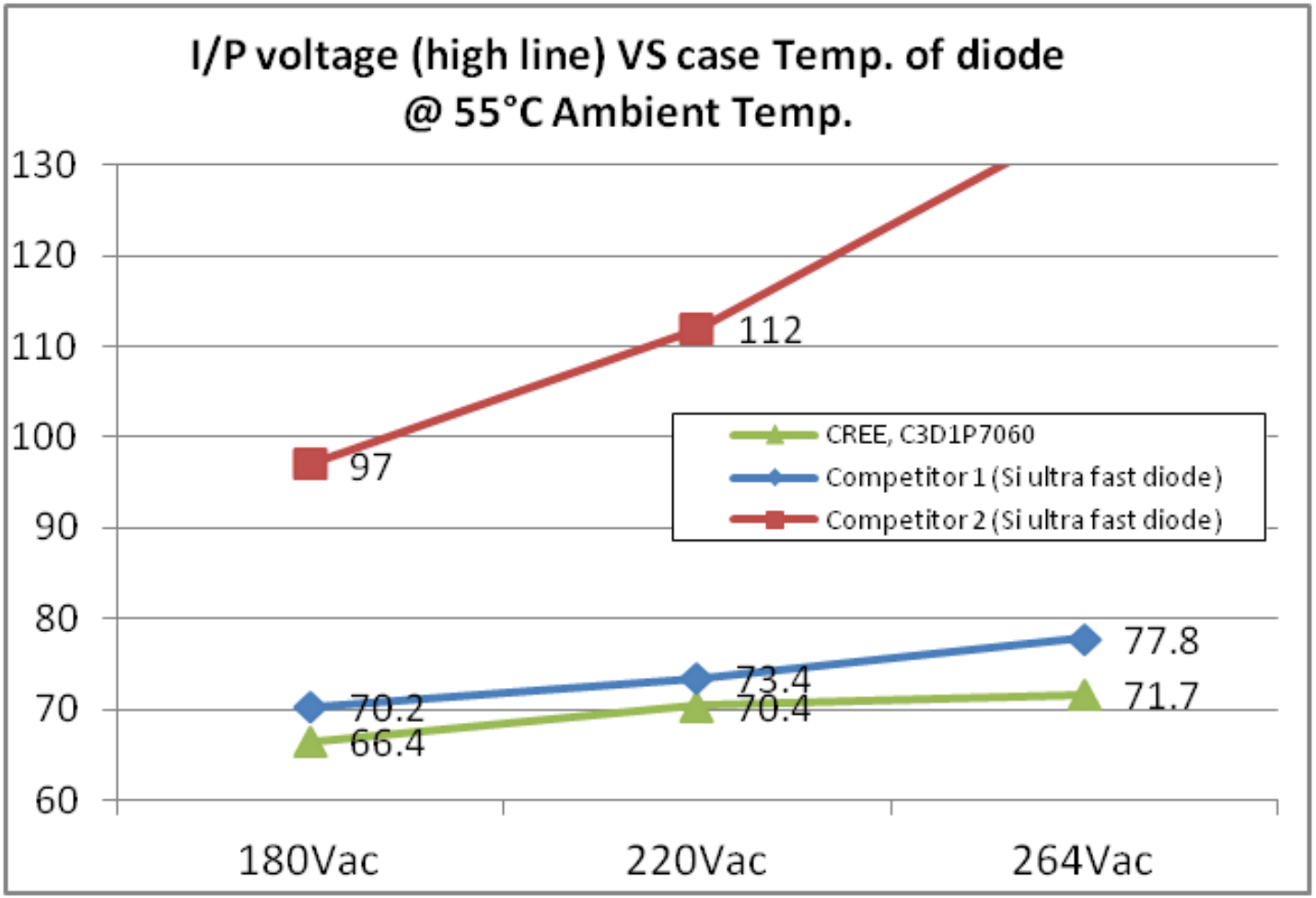
7W Cree Reference Design – Test data

MOSFET Temperature Comparison



7W Cree Reference Design

Diode Temperature Comparison



Conclusion

- **C3D1P7060Q Schottky diode increases system efficiency and enables higher Lm/W.**

- **System benefits**
  1. Space savings/higher density
     - Small 3.3 x 3.3 mm footprint
  2. Efficiency Improves 2-5%
  3. Improved Thermals
  4. Improved System Reliability.
     - Thermal reduction can prolong life of caps
     - Less stress on MOSFET