

Primarion® PX3520 Integrated Power Stage

Advanced Information Product Brief



Applications

- Core power regulation for Intel® and AMD® processors
- Small form factor point-of-load applications

Features

- Highest power density solution available when combined with the Primarion® PX3535 or PX3538 Digital Multiphase Controllers
- Integrated p-channel high-side FET
- Integrated high and low side drivers
- 30A per power stage capability
- Discrete low-side FET for best efficiency
- Process and temperature independent lossless integrated current sense for accurate loadlines and over-current protection
- Integrated high-side short detection protects processor from over-voltage due to any shorted high-side FET in the system
- High-side short detect can be used with optional external SCR crowbar circuit to further protect the processor from shorted high-side FETs
- On-die temperature sense works in conjunction with the Primarion Digital Multiphase Controllers to provide accurate programmable thermal shutdown protection
- Low-side driver supply (VDRIVE) may be separately biased from 5V to 12V to optimize efficiency
- 35-ball small form factor CSP package (3.210 mm x 4.860 mm) provides ultra low thermal resistance
- RoHS compliant packaging – “green” and Pb-free

Parameter	Nom	Unit
HS PFET ON resistance	13	mΩ
HS PFET switch time	5	ns
HS PFET gate charge (at 12V Vgs)	44	nC
LS Driver Output Impedance	0.8	Ω

Description

The Primarion® PX3520 is a high performance power stage for the highest power density server and workstation buck regulation solutions. The PX3520 combined with the Primarion® PX3535 or PX3538 Digital Multiphase Controllers offers a complete high current, small form factor solution with superior accuracy, transient response, and protection features.

The PX3520 integrates a low RDSon high-side P-Channel MOSFET together with both high-side and low-side MOSFET drivers. The integration of the high-side power FET with high- and low-side drivers minimizes switching losses while providing industry leading power density. At an upper limit duty cycle of 20%, PX3520 can support a maximum average output current of 30A per phase in an area less than 16 mm², smaller than most discrete power MOSFETs. The PX3520 low-side driver supply (VDRIVE) may be biased separately from the VCC supply from 5V to 12V to optimize system efficiency.

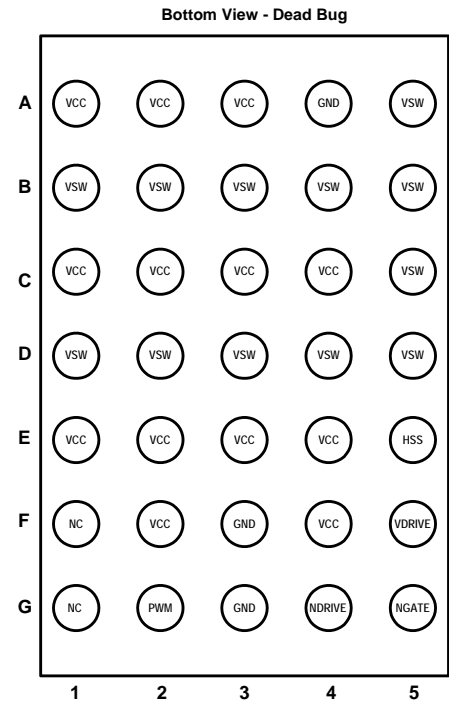
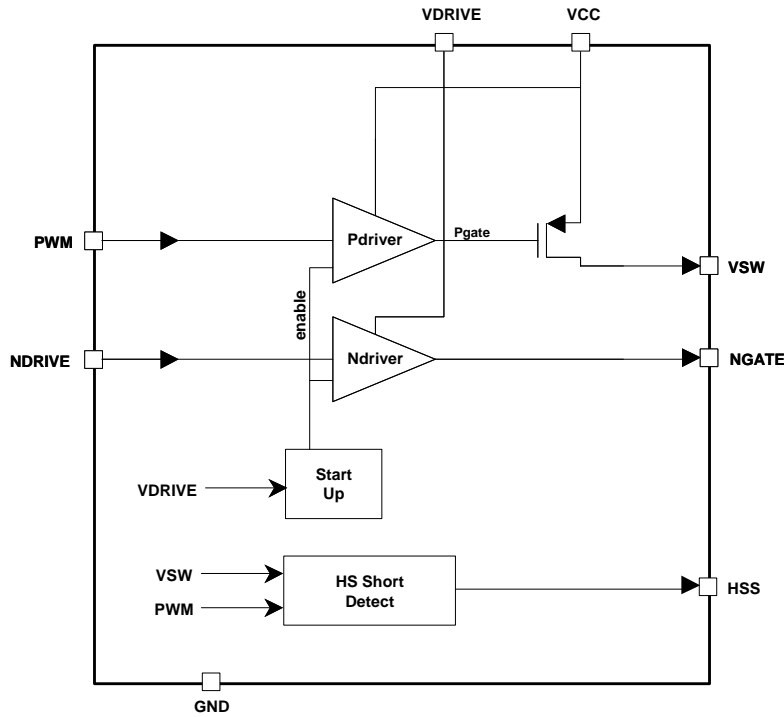
The PX3520 has a patent pending lossless current sensor which accurately senses the current in the high-side FET independent of VID, inductor value, supply, temperature, and switching frequencies. This integrated current sense method provides the accuracy of precision resistor based sensing with no efficiency loss.

The PX3520 has an integrated high-side FET short detector which reacts rapidly on startup to protect the processor before the controller is powered up. The output high-side short pins from each phase can drive a single external crowbar circuitry for rapid protection from a high-side short on any phase of a multiphase solution. The high-side short pin also acts as an input, detecting alert signals from every PX3520 power stage in the system and protecting each power stage internally.

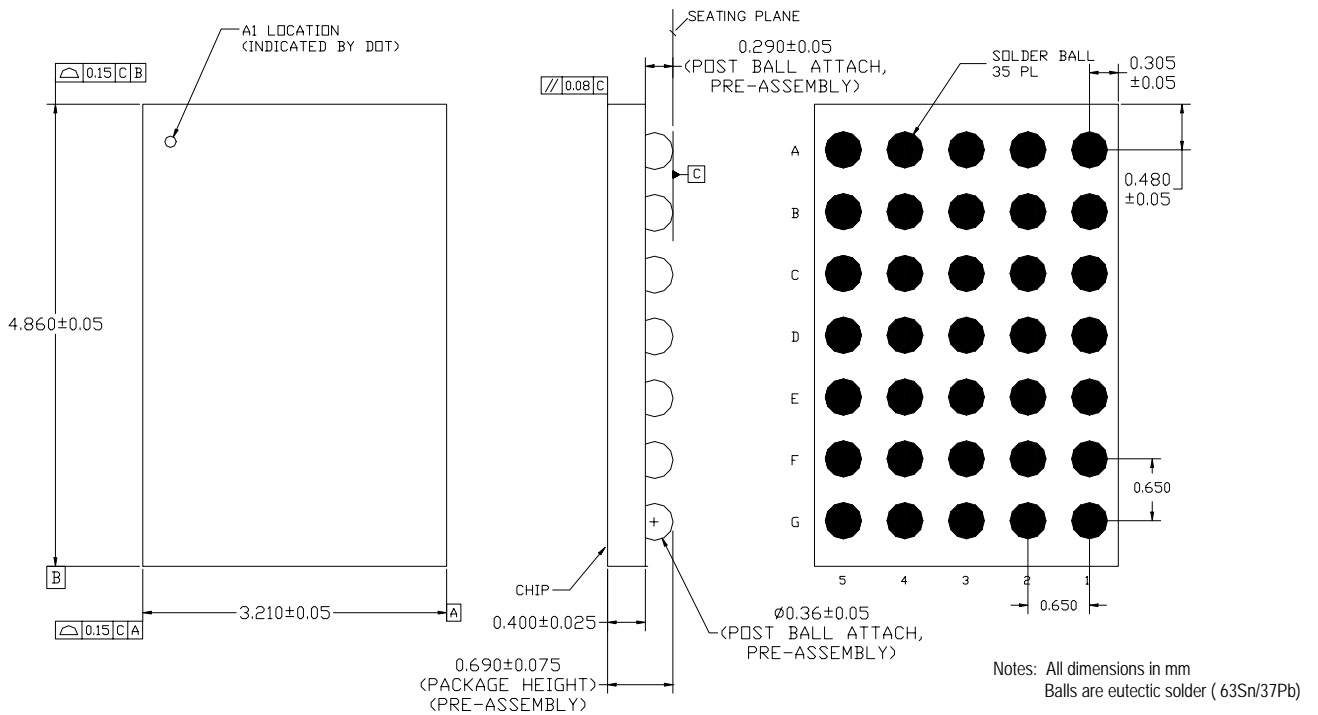
The PX3520 also has an integrated junction temperature sensor which provides an on-die measurement of the high-side FET temperature. When used with the Primarion controllers, this feature provides accurate, programmable over-temperature protection.

The PX3520 uses CSP packaging to provide the lowest thermal resistance and smallest footprint. A relaxed 0.65 mm ball pitch allows for easy assembly.

Block Diagram and Pinout



Physical Characteristics (35-ball CSP)



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2780 SkyPark Drive, Suite 100, Torrance, CA 90505 1-310-602-5550 Fax 1-310-602-5559 www.primarion.com