DDR3 Power Solutions

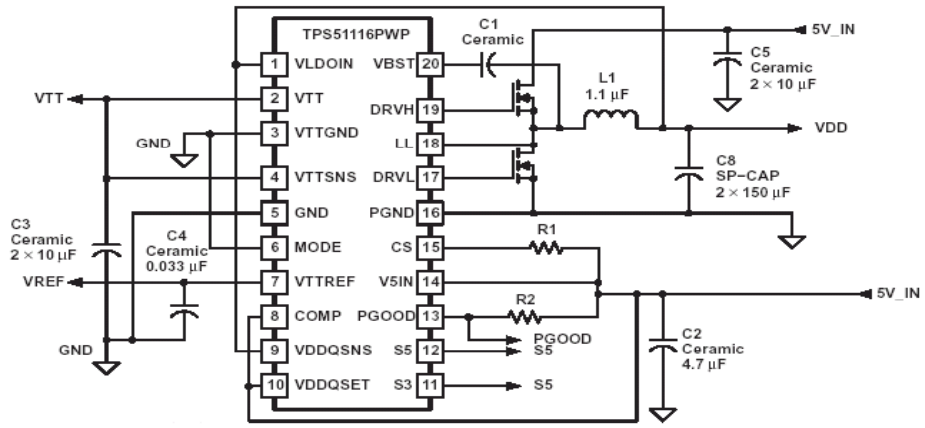
TPS51116 – 3V-28Vin controller + 3A LDO for DDRI/II/III

ONE OF THE WORLD'S MOST POPULAR DDR POWER SOLUTIONS

Features	Benefits
• Adaptive On-Time Current Mode control	• Fastest Transient Response, lowest output ripple
• D-CAP™ Mode for Integrated Loop Compensation	• No loop compensation makes easier to use
• Selectable Current Mode Option	• Supports all output cap. types including ceramic
• Integrated sleep state control for S3/S4/S5 States	• Supports High-Z in S3 and Discharge in S4/S5
• Current Sensing from both RDSon or Resistor	• High efficiency or high current sense accuracy
• Configurable for 2.5V (DDR), 1.8V (DDR II), 1.5V (DDR3), 1.35V (LPDDR3), or Adj.	• Flexibility to support all DDR systems
• LDO Input Available	• Reduces total power dissipation
• Capable to Sink and Source 3A Peak	• Can power high-current DDR termination
• Requires only ***20uF Ceramic Output Capacitor***	• Low BOM cost, small PCB area
• Buffered Low Noise 10mA VTTREF Output	• Meets JEDEC DDR Power requirements
• Accuracy +/-20mV for both VTT and VTTREF	• Meets JEDEC DDR Power requirements
• OVP, UVP, Thermal Shutdown, Power Good	• Full suite of system protection

Applications:

- DDR I / DDRII / DDR III Memory Termination
- SSTL-2, SSTL-3, HSTL Termination
- EVM available



Schedule of New DDR Power Products

Part Number	Application	Package	Eng. Sample Date	RTM Date
TPS51216/59216	DCAP/DCAP2 DDR3 or LPDDR3 controller with VTT LDO (1x 10uF) for 1.5V or other rail	20-pin 3x3 mm QFN 0.4mm pitch (RUK)	9/2010	Now
TPS51206	VTTLDO: 1A TDC/2A Imax/3A OCL	10-pin 2x2 mm SON 0.5mm pitch (DSQ)	10/2010	04/2011

TPS51216 - New DDR2/3/3L Solution

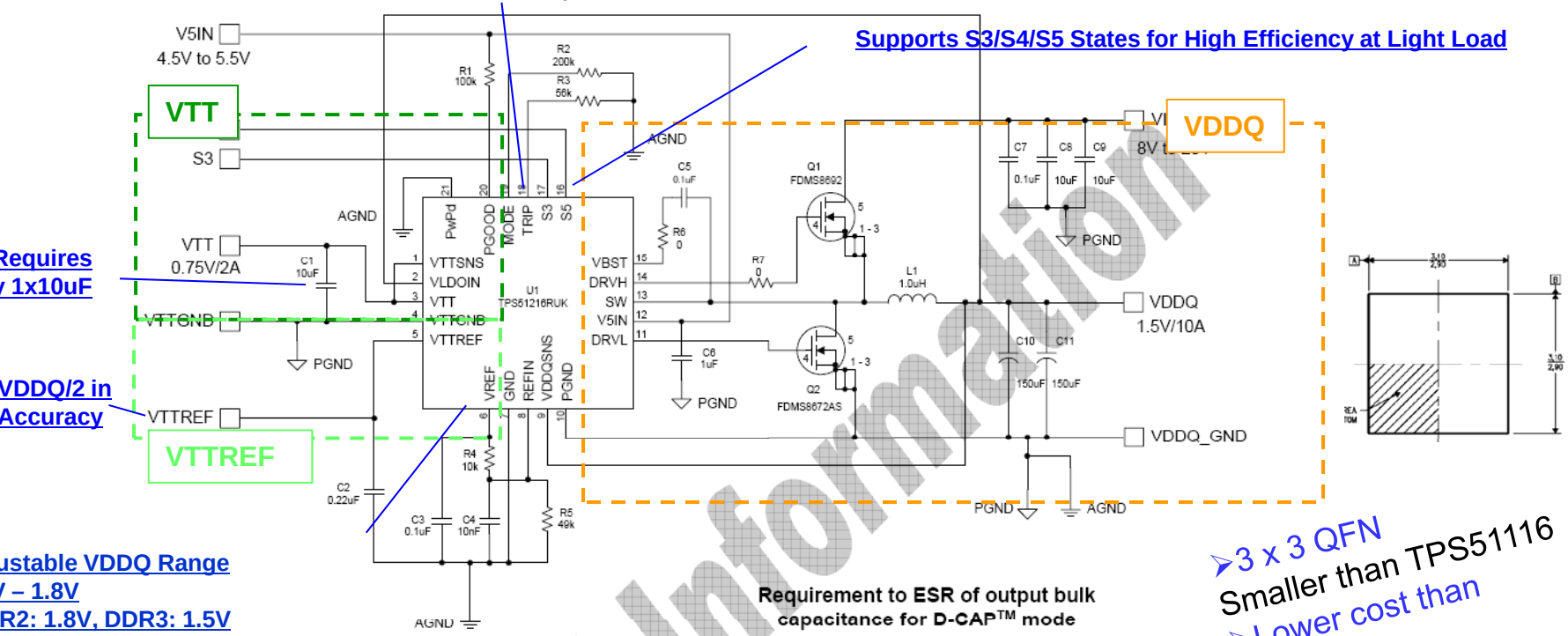
Features

- **Synchronous Buck Controller (VDDQ)**
  - ✓ VIN:3V-28V, VDDQ:0.7V-1.8V
  - ✓ 0.8% VREF Accuracy
  - ✓ Selectable D-CAP™ 300kHz, 400kHz Fsw Architectures
  - ✓ No External Compensation Required
  - ✓ OVP/UVP/OCL/UVLO Protections

- **±2A LDO (VTT), Buffered Reference (VTTREF)**
  - ✓ 2A Peak Sink/Source Current (VTT)
  - ✓ 10mA Buffered Low Noise Reference (VTTREF)
  - ✓ LDO Input for Higher Efficiency
  - ✓ 0.8% VTTREF, and 20mV VTT Accuracy
  - ✓ Require Only 1x10uF Capacitor for VTT
  - ✓ S3/S4/S5 Power State support

Adjustable OCL

Supports S3/S4/S5 States for High Efficiency at Light Load



Requires Only 1x10uF

Track VDDQ/2 in 10mV Accuracy

Adjustable VDDQ Range
0.7V – 1.8V
(DDR2: 1.8V, DDR3: 1.5V
LVDDR3:1.35V)

Requirement to ESR of output bulk capacitance for D-CAP™ mode

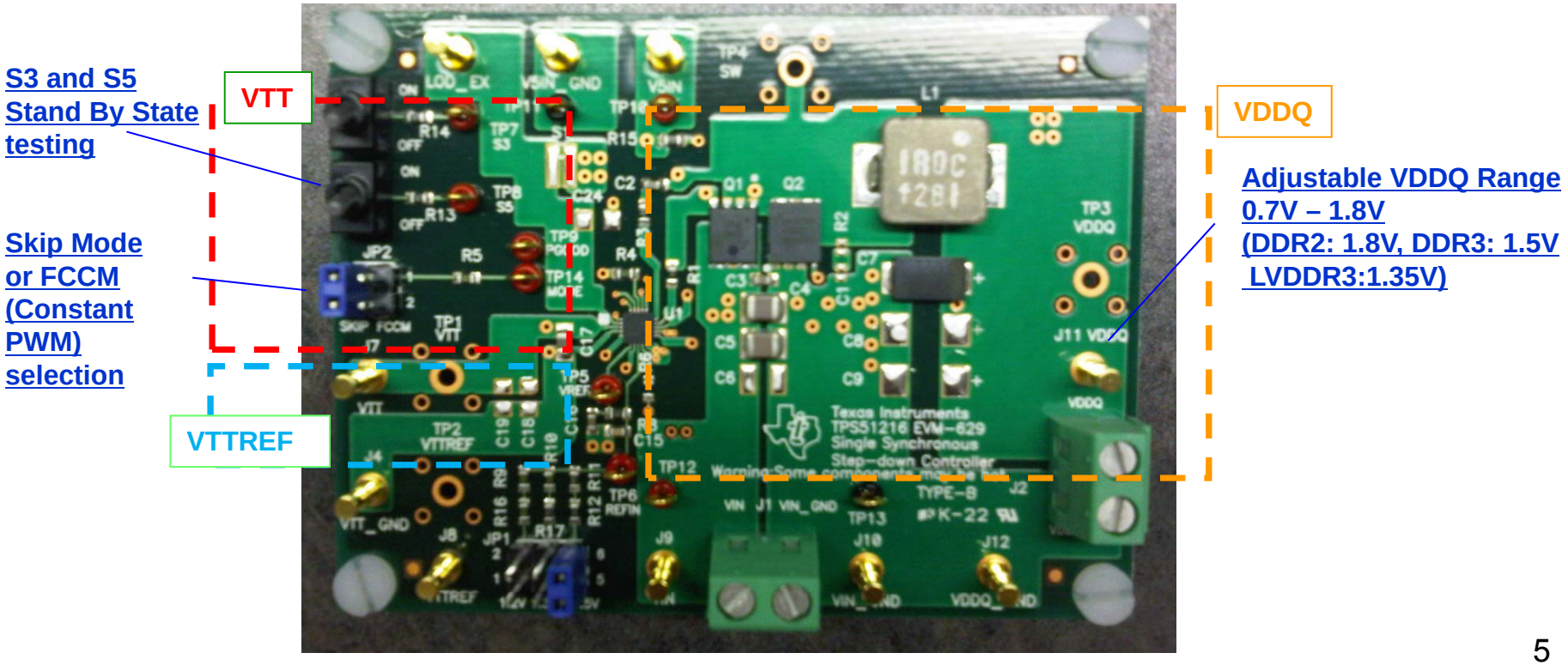
whichever is greater between $ESR \geq \frac{20mV \times f_{SW} \times L}{Vout}$ or $ESR \geq \frac{3}{2\pi \times f_{SW} \times Cout}$

- 3 x 3 QFN
  Smaller than TPS51116
- Lower cost than TPS51116

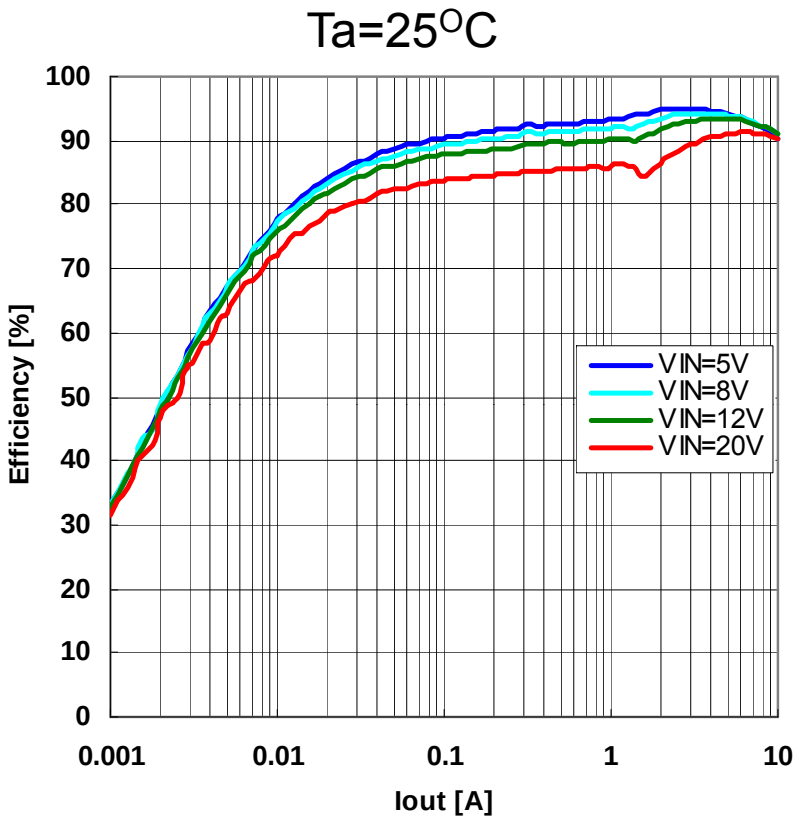
TPS51216 EVM - New DDR2/3/3L Solution

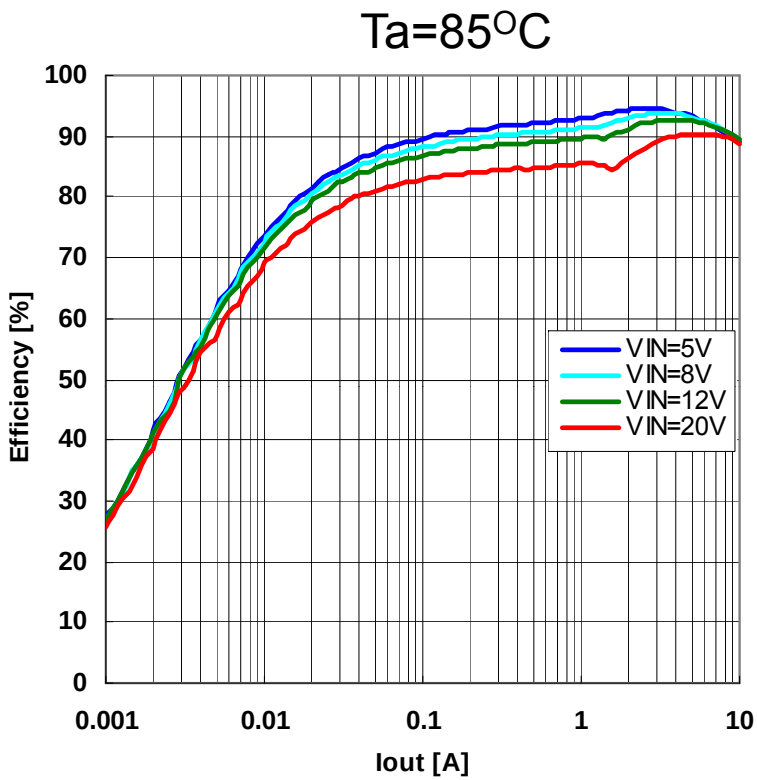
Features

- Complete DDR/DDR2/DDR3/LVDDR3 evaluation platform
- VIN, VOUT connections and all DDR-relevant test points



Efficiency Performance at $1.5V_{OUT}$

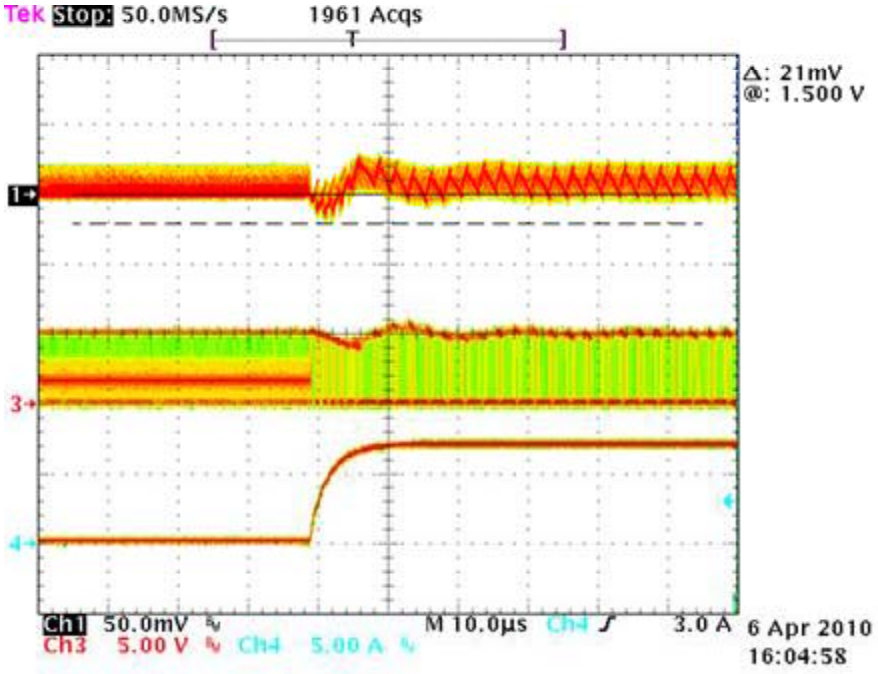




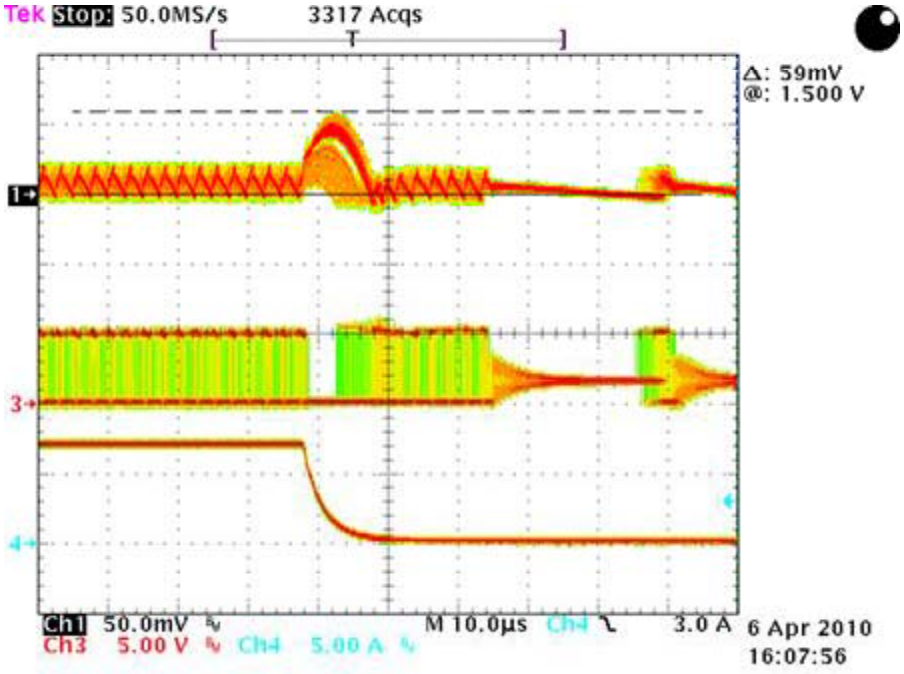
Lx	1.0uH	1.0uH, 2.3mΩ,18.5A	MPC1055L1R0C
C7	150uF	150uF, 15mΩ, 6.3V	EEFCX0J151R
C8	150uF	150uF, 15mΩ, 6.3V	EEFCX0J151R
Q1		30V, 28A, 9.0mΩ	FDMS8692
Q2		30V, 28A, 5.0mΩ	FDMS8672AS

Load Transient Performance

0.1A→ 7A



7A→ 0.1A



TPS51116 / TPS51216 Comparison

	TPS51116	TPS51216
Package	4x4mm- 24 pin, 0.5mm pitch	**3x3 mm- 20pin**, 0.4mm pitch
Switching Frequency	D-cap, 400kHz	**D-cap: 300kHz/400kHz**
VTTLDO	2 x 10uF decoupling	**1 x 10uF** decoupling
Voltage Feedback	Resistor divider of output voltage	**Voltage reference divider; less jitter, voltage dynamic change support**
Gate Drive	R_{DRVH} DRVH resistance — Source, I_{DRVH} = -100 mA: 3 6; Sink, I_{DRVH} = 100 mA: 0.9 3; R_{DRVL} DRVL resistance — Source, I_{DRVL} = -100 mA: 3 6; Sink, I_{DRVL} = 100 mA: 0.9 3; Ω	1.7 3.0 0.6 1.5 0.9 2.0 0.5 1.2 Ω
Zero Cross Detection	+-6mV max comparator offset	**Auto zero comparator**

Smallest VTT LDO: TPS51206 (Sijimi)

Features

VTT / VTTREF

- 1A TDC, 2A peak sink/source VTT LDO
- 10mA buffered VTTREF LDO
- Supports high-Z in S3, soft-off discharge in S4/S5
- 1x10uF VTT output capacitance
- Supports 5V and 3.3V Vdd
- 2.0x2.0mm SON Package
- Pin Integrity with TPS51100

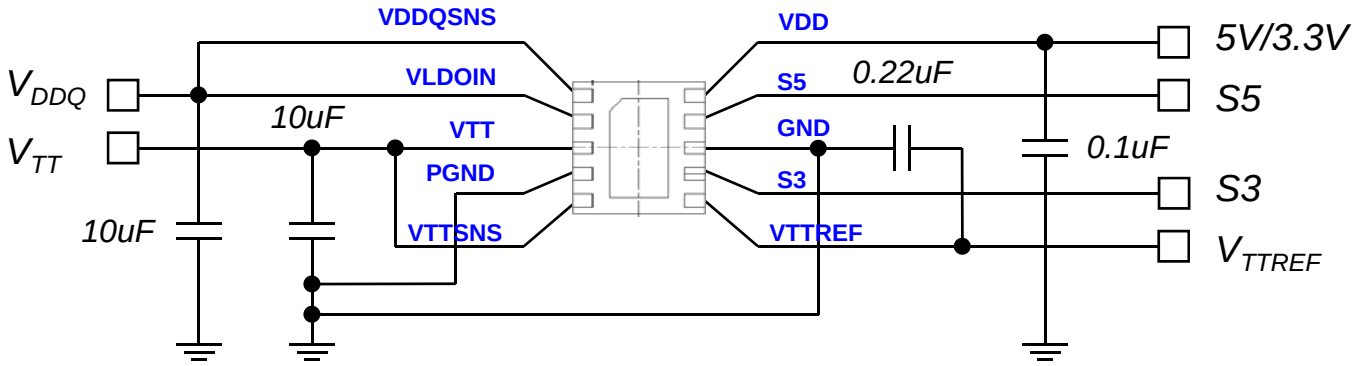
Benefits

VTT / VTTREF

- Compact solution size
- Support DDR2, DDR3, LPDDR3
- 50% reduction of VTT Cap footprint & cost
- Flexible for many platforms
- 73% reduction of IC footprint vs. TPS51100

SON10 (DSQ)

2.0x2.0mm²x H:0.8mm

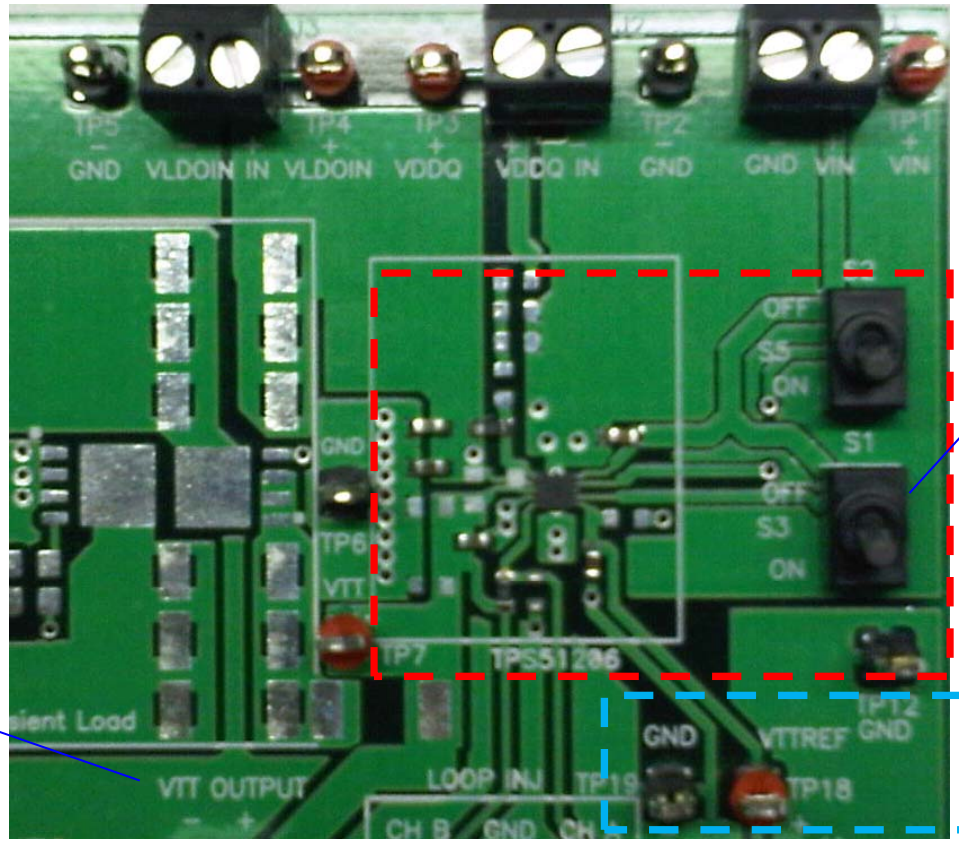


STATE	S3	S5	VTTREF	VTT
S0	H	H	ON	ON
S3	L	H	ON	OFF (high-Z)
S4/S5	L	L	OFF (discharge)	OFF (discharge)

TPS51206 EVM - New DDR2/3/3L +/-2A VTT Solution

Features

- Complete DDR2/DDR3/LVDDR3 VTT (termination) evaluation platform
- VIN, VLDOIN, VDDQ IN, VOUT connections and all DDR VTT-relevant test points



VTT

S1, S2, S3, S5 state test switches

VTT Transient Load Testing

VTTREF