

**UR5517**

Preliminary

**LINEAR INTEGRATED CIRCUIT****3A DDR BUS TERMINATION  
REGULATOR**■ **DESCRIPTION**

The **UR5517** is a linear regulator which provides up to 3 Amp bi-directional sourcing and sinking capability for DDR1/2/3 SDRAM bus terminator applications. It only requires 20uF of ceramic output capacitance by a integrated operational amplifier which provides fast load transient response.

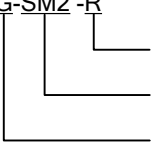
The **UR5517** also includes two control pins, S3 & S5. If S3 were set in low level, VTT will be turned off and left Hi-Z(sleep-state mode).If setting S5 were set in low level, both VTT and VTTREF will be turned off and discharged to ground(soft-off mode).

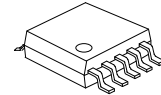
■ **FEATURES**

- \* Input Voltage Range::3~5.5V
- \* VLDOIN Voltage Range:1.2V~3.6V
- \* DDR1/2/3 Termination Voltage Applications
- \* Sourcing and Sinking Current up to 3A
- \*  $\pm 20\text{mV}$  Accuracy for VTT and VTTREF
- \* 10mA Buffered Reference(VTTREF)
- \* Supports High-Z in S3(STR) and Soft-off in S5(Shutdown)
- \* Integrated Divider Tracks 1/2 VDDQSNS for Both VTT&VTTREF
- \* Built-In Soft-Start
- \* Current Limiting Protection
- \* Thermal Shutdown Protection

■ **ORDERING INFORMATION**

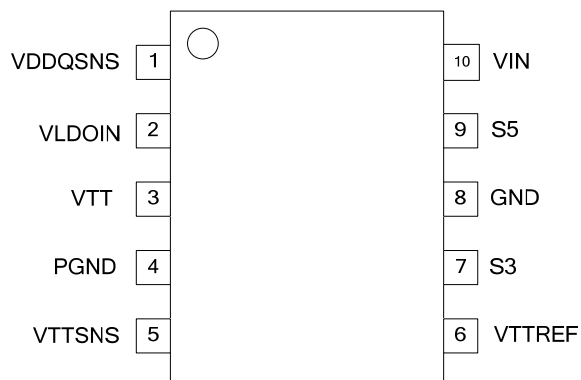
| Ordering Number | Package | Packing   |
|-----------------|---------|-----------|
| UR5517G-SM2-R   | MSOP-10 | Tape Reel |

|                                                                                     |                                                             |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------|
| UR5517G-SM2 -R                                                                      |                                                             |
|  | (1) R: Tape Reel<br>(2) SM2: MSOP-10<br>(3) G: Halogen Free |



MSOP-10

## ■ PIN CONFIGURATIONS

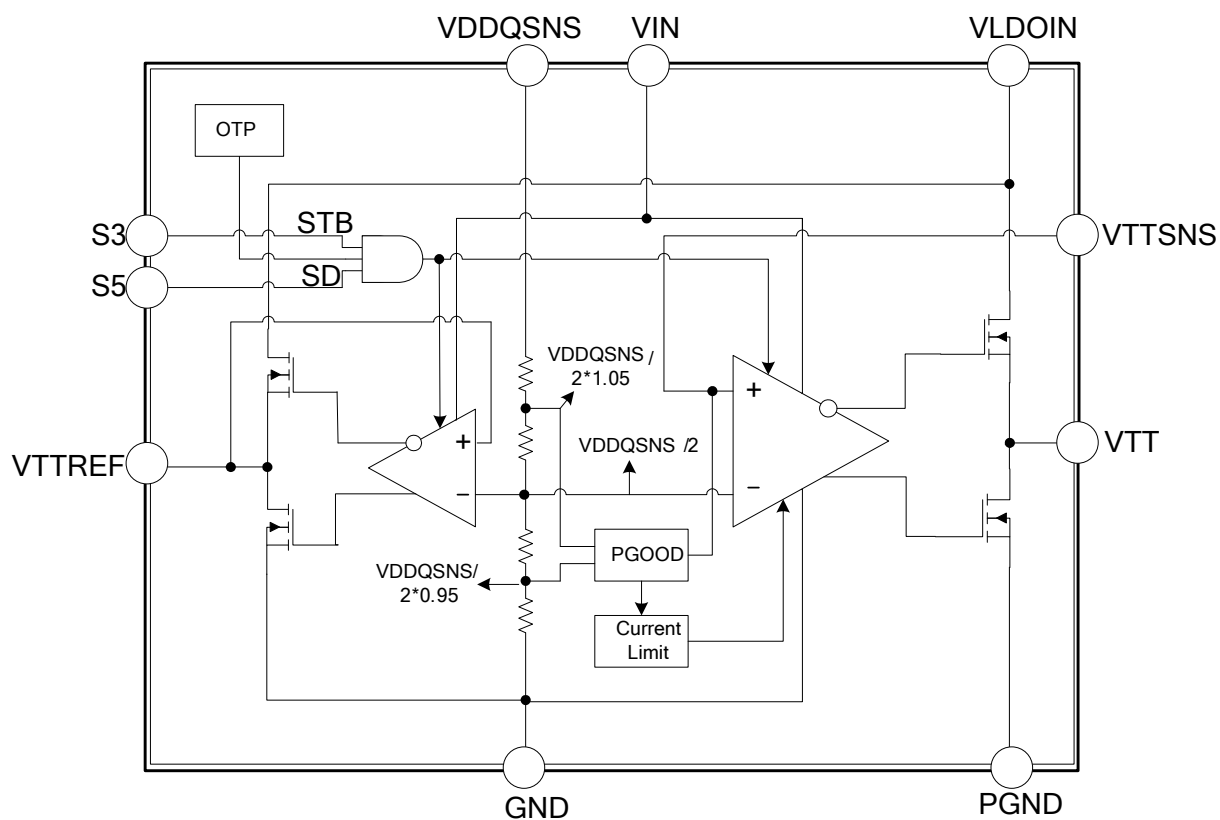


## ■ PIN DESCRIPTION(Note)

| PIN NAME | PIN TYPE | PIN DESCRIPTION                                                                          |
|----------|----------|------------------------------------------------------------------------------------------|
| VDDQSNS  | I        | VDDQ sense input                                                                         |
| VLDOIN   | I        | Power supply for the VTT & VTTREF output stage                                           |
| VTT      | O        | Output voltage for connection to termination resistors, equal to VDDQSNS/2               |
| PGND     | O        | Power ground output for the VTT output                                                   |
| VTTSENS  | I        | Voltage sense input for the VTT. Connect to plus terminal of the output capacitor        |
| VTTREF   | O        | Buffered output that is a reference output, equal to VDDQSNS/2                           |
| S3       | I        | Active low suspend to RAM mode control pin, VTT is turned off and left Hi-Z              |
| GND      | I        | Ground                                                                                   |
| S5       | I        | Active low shutdown control pin, both VTT&VTTREF are turned off and discharged to ground |
| VIN      | I        | Analog input pin                                                                         |

Note: Recommend connecting the Thermal Pad to the GND for the excellent power dissipation.

## ■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (unless otherwise specified)

| PARAMETER                                | SYMBOL           | RATINGS         | UNIT |
|------------------------------------------|------------------|-----------------|------|
| Supply Voltage(VIN,VLDOIN,VDDQSNS,S3,S5) |                  | -0.3~6          | V    |
| Power Ground Output for the VTT Output   | P <sub>GND</sub> | -0.3~0.3        | V    |
| Output Voltage(VTT,VTTREF)               | VTT,VTTREF       | -0.3~VLDOIN+0.3 | V    |
| Junction Temperature                     | T <sub>J</sub>   | 160             | °C   |
| Storage Temperature                      | T <sub>STG</sub> | -55 ~ +160      | °C   |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.  
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ RECOMMENDED OPERATING CONDITIONS (Note1, 2)

| PARAMETER                                        | SYMBOL              | MIN  | TYP | MAX | UNIT |
|--------------------------------------------------|---------------------|------|-----|-----|------|
| Input Voltage                                    | V <sub>IN</sub>     | 3    |     | 5.5 | V    |
| STR and Shutdown Voltage                         | S3,S5               | -0.1 |     | 5.5 | V    |
| VDDQ Sense Input                                 | V <sub>DDQSNS</sub> | 1.3  |     | 3.6 | V    |
| Power Supply for the VTT and VTTREF Output Stage | V <sub>LDOIN</sub>  | 1.2  |     | 3.6 | V    |
| Power Ground Output for the VTT Output           | P <sub>GND</sub>    | -0.1 |     | 0.1 | V    |
| Operating Temperature                            | T <sub>A</sub>      | -40  |     | 85  | °C   |

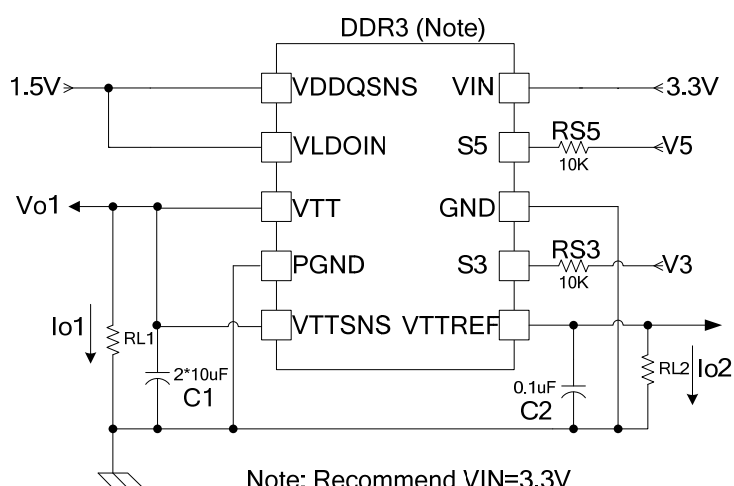
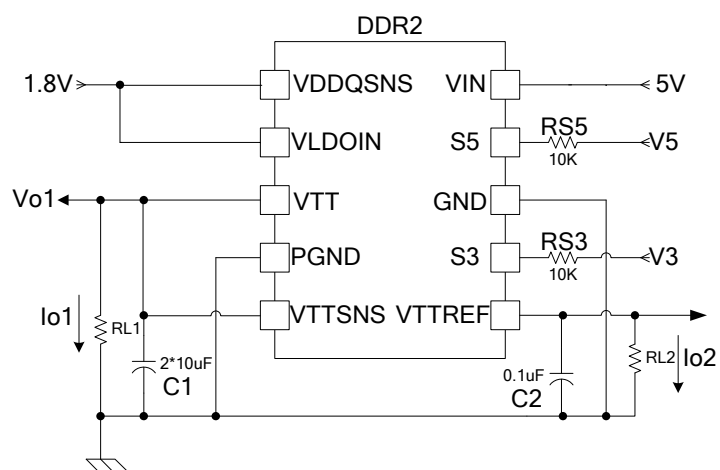
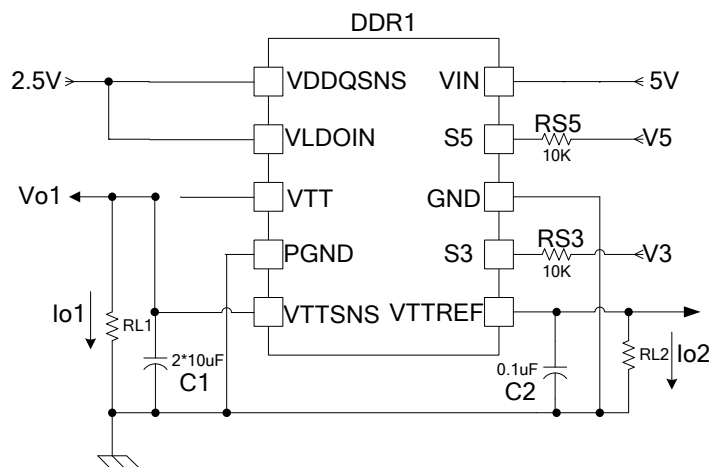
Note: 1. All voltage values are with respect to the network ground terminal unless otherwise noted.  
2. Please always keep VLDOIN,VTTSENS,VDDQSNS,S3,S5 lower than VIN on operation.

■ ELECTRICAL CHARACTERISTICS

(V<sub>IN</sub>=5V,VLDOIN=VDDQSNS=2.5V, T<sub>A</sub>=25°C. Unless otherwise specified)

| PARAMETER                              | SYMBOL                        | TEST CONDITIONS                | MIN | TYP  | MAX | UNIT |
|----------------------------------------|-------------------------------|--------------------------------|-----|------|-----|------|
| Current of VIN                         | I <sub>VIN</sub>              | S5=Hi,S3=Hi, no load(Normal)   | 0.5 | 0.8  | 2   | mA   |
|                                        | I <sub>VINSTB</sub>           | S5=Hi,S3=Lo, no load(Standby)  |     | 110  | 200 | uA   |
|                                        | I <sub>VINSDN</sub>           | S5=Lo,S3=Lo, no load(Shutdown) |     |      | 1   | uA   |
| Current of VLDOIN                      | I <sub>VLDOIN</sub>           | S5=Hi,S3=Hi, no load(Normal)   |     | 0.03 | 2   | mA   |
|                                        | I <sub>VLDOINSTB</sub>        | S5=Hi,S3=Lo, no load(Standby)  |     | 0.1  | 10  | uA   |
|                                        | I <sub>VLDOINSDN</sub>        | S5=Lo,S3=Lo, no load(Shutdown) |     | 0.1  | 1   | uA   |
| Input Impedance of VDDQSNS             | Z <sub>VDDQSNS</sub>          | S5=Hi,S3=Hi                    |     | 200  |     | kΩ   |
| Input Current of VTTSENS               | I <sub>VTTSENS</sub>          | S5=Hi,S3=Hi                    |     | 0.3  | 1   | uA   |
| Output Voltage of VTT                  | VTT                           | DDR1(VLDOIN=VDDQSNS=2.5V)      |     | 1.25 |     | V    |
|                                        |                               | DDR2(VLDOIN=VDDQSNS=1.8V)      |     | 0.9  |     |      |
|                                        |                               | DDR3(VLDOIN=VDDQSNS=1.5V)      |     | 0.75 |     |      |
| Load Regulation of VTT<br>(VTTREF-VTT) | V <sub>osVTT</sub>            | I <sub>VTT</sub> = 0           | -20 |      | 20  | mV   |
|                                        |                               | I <sub>VTT</sub>   <1.5A       | -30 |      | 30  |      |
|                                        |                               | I <sub>VTT</sub>   <3A         | -40 |      | 40  |      |
| Source Current Limit of VTT            | I <sub>VTTCLSRC</sub>         | VTT=VDDQSNS/2*0.95,PGOOD=HI    | 3   | 4    |     | A    |
|                                        |                               | VTT=0                          | 1.5 | 2    |     |      |
| Sink Current Limit of VTT              | I <sub>VTTCLSNK</sub>         | VTT=VDDQSNS/2*1.05,PGOOD=HI    | 3   | 4    |     | A    |
|                                        |                               | VTT=VDDQSNS                    | 1.5 | 2    |     |      |
| Leakage Current of VTT                 | I <sub>VTTLK</sub>            | S5=Hi,S3=Lo                    |     | 0.01 |     | uA   |
| Discharge Current of VTT               | I <sub>VTTDIS</sub>           | S5=Lo, VDDQSNS=0V,VTT=0.5V     | 10  | 20   |     | mA   |
| Output Voltage of VTTREF               | V <sub>TTRF</sub>             | DDR1(VLDOIN=VDDQSNS=2.5V)      |     | 1.25 |     | V    |
|                                        |                               | DDR2(VLDOIN=VDDQSNS=1.8V)      |     | 0.9  |     |      |
|                                        |                               | DDR3(VLDOIN=VDDQSNS=1.5V)      |     | 0.75 |     |      |
| Load Regulation of VTTREF              | ΔV <sub>TTRF</sub>            | I <sub>VTTREF</sub>   <10mA    | -20 |      | 20  | mV   |
| High Level Input Voltage               | V <sub>IH</sub>               | S3 & S5 pin                    | 1.6 |      |     | V    |
| Low Level Input Voltage                | V <sub>IL</sub>               | S3 & S5 pin                    |     |      | 1   |      |
| Logic Input Leakage Current            | I <sub>I<sub>LEAK</sub></sub> | S3 & S5 pin                    | -1  |      | 1   | uA   |
| Thermal Shutdown Temperature           | T <sub>SD</sub>               | VIN=3V~5.5V                    |     | 160  |     | °C   |
| Thermal Shutdown Hysteresis            | ΔT <sub>SD</sub>              | VIN=3V~5.5V                    |     | 20   |     |      |

■ TYPICAL APPLICATIONS CIRCUIT



Note: Recommend VIN=3.3V

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