

Application Note AN-1141

IRS20955S and IRS20957S Comparison

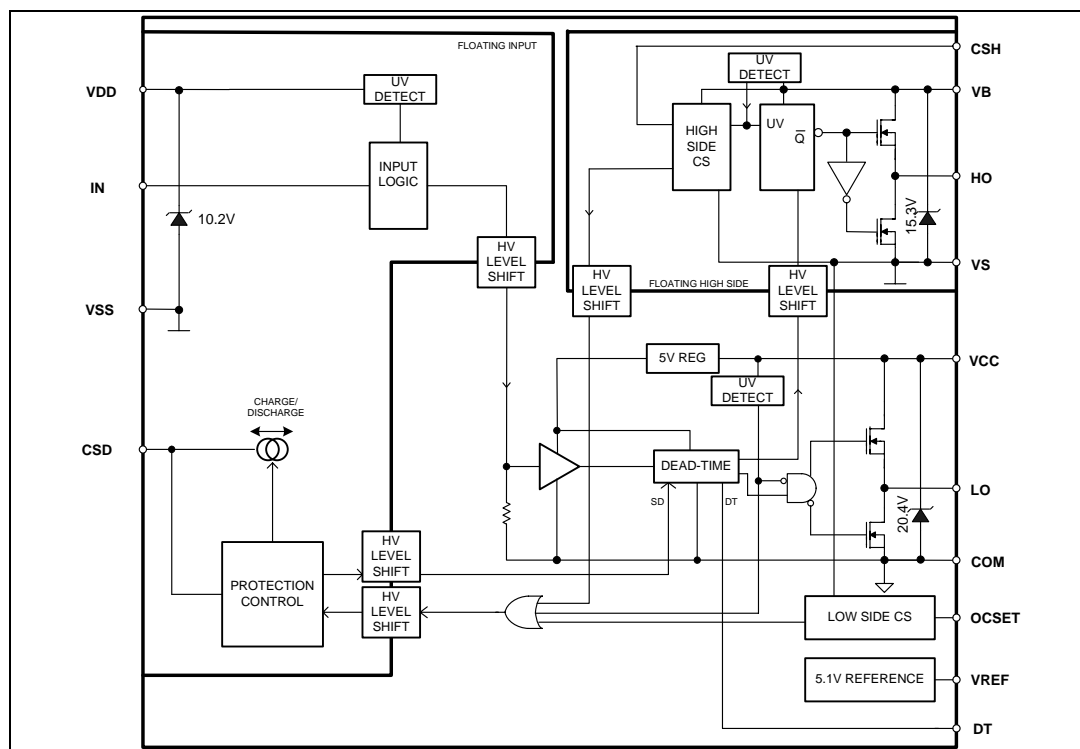
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Introduction

The IRS20957S is a high voltage, high speed MOSFET driver with a floating PWM input designed for Class D audio amplifier applications. The IRS20957S is an improved version of the IRS20955S. This application note describes the differences between the IRS20955S and IRS20957S.

Block Diagram



The IRS20955S and the IRS20957S share the same functional structure. In normal operating conditions, there are no functional changes between corresponding part numbers.

Electrical Characteristic Differences

All measurement conditions are the same for both the IRS20955S and IRS20957S.

Absolute Maximum Ratings

| Symbol | Definition | IRS20955S | | | IRS20957S | | | Units |
|--------|---------------------------------------|------------|-----|-------------|------------------------------|-----|-------------|-------|
| | | Min | Typ | Max | Min | Typ | Max | |
| V_B | High side floating supply voltage | -0.3 | - | 220 | -0.3 | - | 215 | V |
| V_S | High side floating supply voltage (†) | $V_B - 20$ | - | $V_B + 0.3$ | $V_B - 15$ | - | $V_B + 0.3$ | V |

† $V_{DD} - V_{SS}$, $V_{CC} - COM$ and $V_B - V_S$ contain internal shunt zener diodes. Please note that the voltage ratings of these can be limited by the clamping current.

Recommended Operating Conditions

| Symbol | Definition | IRS20955S | | | IRS20957S | | | Units |
|----------|--|--------------|-----|------------|------------|-----|------------------------------|-------|
| | | Min | Typ | Max | Min | Typ | Max | |
| V_B | High side floating supply absolute voltage | $V_S + 10$ | - | $V_S + 18$ | $V_S + 10$ | - | $V_S + 14$ | V |
| V_{CC} | Low side fixed supply voltage | 10 | - | 18 | 10 | - | 15 | V |
| I_{PW} | Input pulse width | 10 (Note) | - | - | - | - | - | ns |

Note: Output logic status may not respond correctly if input pulse width is smaller than the minimum pulse width.

Electrical Characteristics

| Symbol | Definition | IRS20955S | | | IRS20957S | | | Units |
|--------|---|-----------|-----|-----|-----------|-----|-----|-------|
| | | Min | Typ | Max | Min | Typ | Max | |
| Ton_1 | High and low side turn-on propagation delay, floating inputs | - | 105 | - | - | 95 | - | ns |
| Toff_1 | High and low side turn-off propagation delay, floating inputs | - | 90 | - | - | 80 | - | ns |
| Ton_2 | High and low side turn-on propagation delay, non-floating inputs | - | 105 | - | - | 95 | - | ns |
| Toff_2 | High and low side turn-off propagation delay, non-floating inputs | - | 90 | - | - | 80 | - | ns |
| DT4 | Deadtime: LO turn-off to HO turn-on (DTLO-HO) & HO turn-off to LO turn-on (DTHO-LO)VDT=VDT4 | 25 | 45 | 60 | 50 | 80 | 110 | ns |

Static Electrical Characteristics

| Symbol | Definition | IRS20955S | | | IRS20957S | | | Units |
|--------------------|-------------------------------------|-----------|------|------|-----------|------|------|-------|
| | | Min | Typ | Max | Min | Typ | Max | |
| V _{CLAMP} | High side zener diode clamp voltage | 19.6 | 20.4 | 21.6 | 14.7 | 15.3 | 16.2 | V |

Logic Status Differences

Narrow Pulse Behavior

In the IRS20955S, a narrow input pulse below 10 ns, such as spikes from switching stage, may flip the logic states of LO and HO opposite to the input. Next transition in input PWM fixes the inverted logic in the output. However, this wrong logic status is harmful in self-oscillating type topologies because it makes the system latch up and stop operation.

With natural PWM topologies, pulse width can be as narrow as 1ns that leads the wrong logic status with IRS20955S.

The IRS20957S ignores narrow input pulses. The logic states of HO and LO does not respond to the input of the IC if pulse width is less than 50ns, providing more noise immunity to systems using self-oscillating type topologies.

V_{CLAMPH} Differences

Pre-charging with VBS Zener Diode

During start up sequence, pre-charging bootstrap power supply through positive bus voltage might be necessary to start self oscillating PWM. It would be convenient to integrate 15V zener diode to clamp the high side power supply, V_{BS} , for applications with MOSFETs that have rated gate voltage of 20V.

Upgrading IRS20955 with IRS20957

| Current Design with IRS20955S | | Action Item for IRS20957S |
|-------------------------------|-----------|---|
| Deadtime | Vcc | |
| DT1-3 | >15V | Reduce Vcc to 15V or less. |
| | Up to 15V | Direct replacement. |
| DT4 | >15V | Reduce Vcc to 15V or less. |
| | Up to 15V | Direct replacement with wider deadtime. |

Summary

The IRS20957S is an improved version of the IRS20955S with shorter propagation delay. The longer deadtime window of IRS20957S enables use of MOSFET with larger gate charge. Applications using a natural PWM topology should use the IRS20957S. The IRS20957S has more immunity to incoming noise in IN pin. The IRS20955S is no longer recommended for new designs.