

IRS211(0,3), IR211(0,3) and 2ED2110S06M Comparison

About this document

Scope and purpose

The purpose of application note AN-1100 is to provide a detailed comparison of the IRS211(0,3) and IR211(0,3) high-voltage, high-speed MOSFET and IGBT drivers, focusing on their key electrical characteristics and performance differences. Additionally, this note includes an overview of the 2ED2110S06M, a next-generation gate driver that introduces significant enhancements such as an integrated bootstrap diode, greater voltage tolerance, faster propagation delays, and advanced noise immunity. This comparison aims to help designers select the most suitable driver for their specific high-voltage applications, from standard power control to demanding industrial systems.

Intended audience

The intended audiences for this document are design engineers, technicians, and developers of electronic systems.

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Introduction

1 Introduction

The IRS211(0,3) are new high-voltage IC (HVIC) products designed to replace the IR211(0,3). These are pin-to-pin compatible, enabling a straightforward transition with little to no change required in many designs. Both the IRS211(0,3) and IR211(0,3) are high-voltage, high-speed drivers for MOSFETs and IGBTs, featuring independent high-side and low-side referenced output channels. Built with proprietary HVIC and latch-immune CMOS technologies, these drivers deliver robust and ruggedized monolithic construction. They also support logic inputs compatible with standard CMOS or LSTTL outputs, down to 3.3 V, and include a high pulse current buffer stage for minimal driver cross-conduction. This design ensures matched propagation delays, simplifying their application in high-frequency circuits.

Complementing the IRS211(0,3) and IR211(0,3) is the advanced 2ED2110S06M gate driver, which provides a substantial upgrade with capabilities suited for more demanding applications. This 650V gate driver from Infineon, built on SOI (Silicon-On-Insulator) technology, features an integrated bootstrap diode that enables higher efficiency and simplified design. Additionally, it boasts superior noise immunity and latch-up protection, providing exceptional reliability even in challenging environments. The 2ED2110S06M's floating channel design supports driving N-channel MOSFETs and IGBTs in high-side configurations, operating effectively up to 500V or 600V, making it ideal for high-voltage applications such as motor drives, industrial power supplies, and advanced inverter systems.

Including the 2ED2110S06M driver with the IRS211(0,3) and IR211(0,3) allows design engineers to choose from a range of options based on application needs. While the IRS211(0,3) and IR211(0,3) offer reliable performance for general high-voltage switching, the 2ED2110S06M is suited for applications requiring higher voltage tolerance, faster switching speeds, and enhanced noise immunity, providing an advanced solution for power electronics where efficiency and robustness are critical.

Block Diagram

2 Block Diagram

The IRS211(0,3) and the IR211(0,3) share the same block diagram. There are no functional changes between corresponding part numbers.

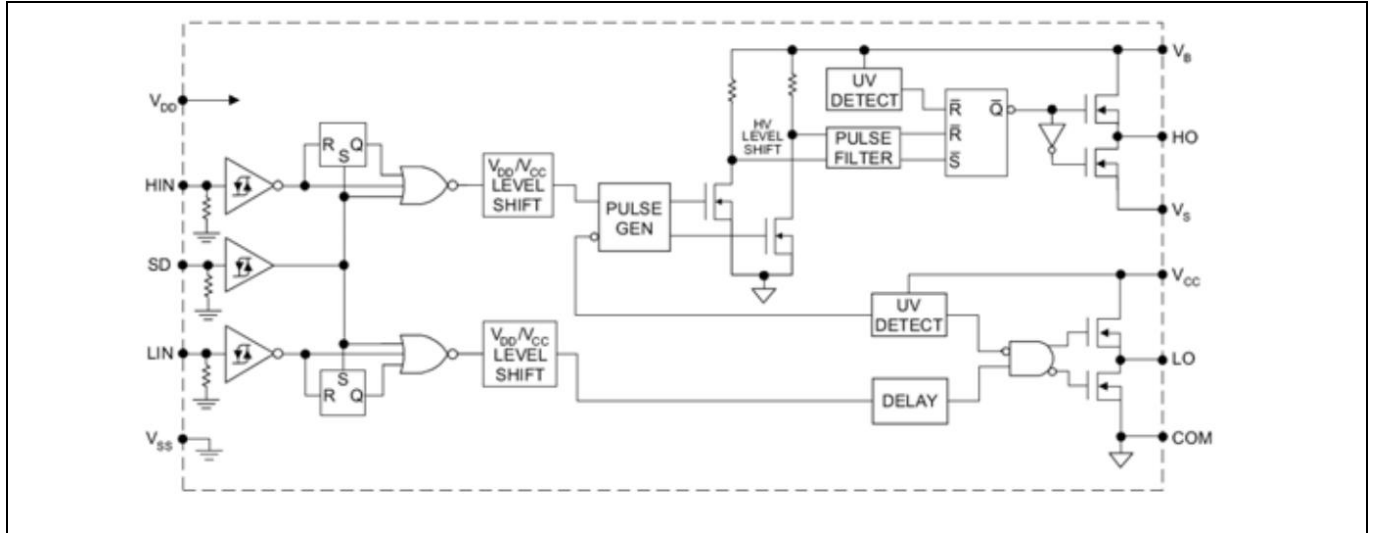


Figure 1 Block diagram of IRS211(0,3) and IR211(0,3)

The 2ED2110S06M features a negative VS transient immunity up to 100V below COM (due to the SOI technology), along with an integrated bootstrap diode. Below is the block diagram of the 2ED2110S06M.

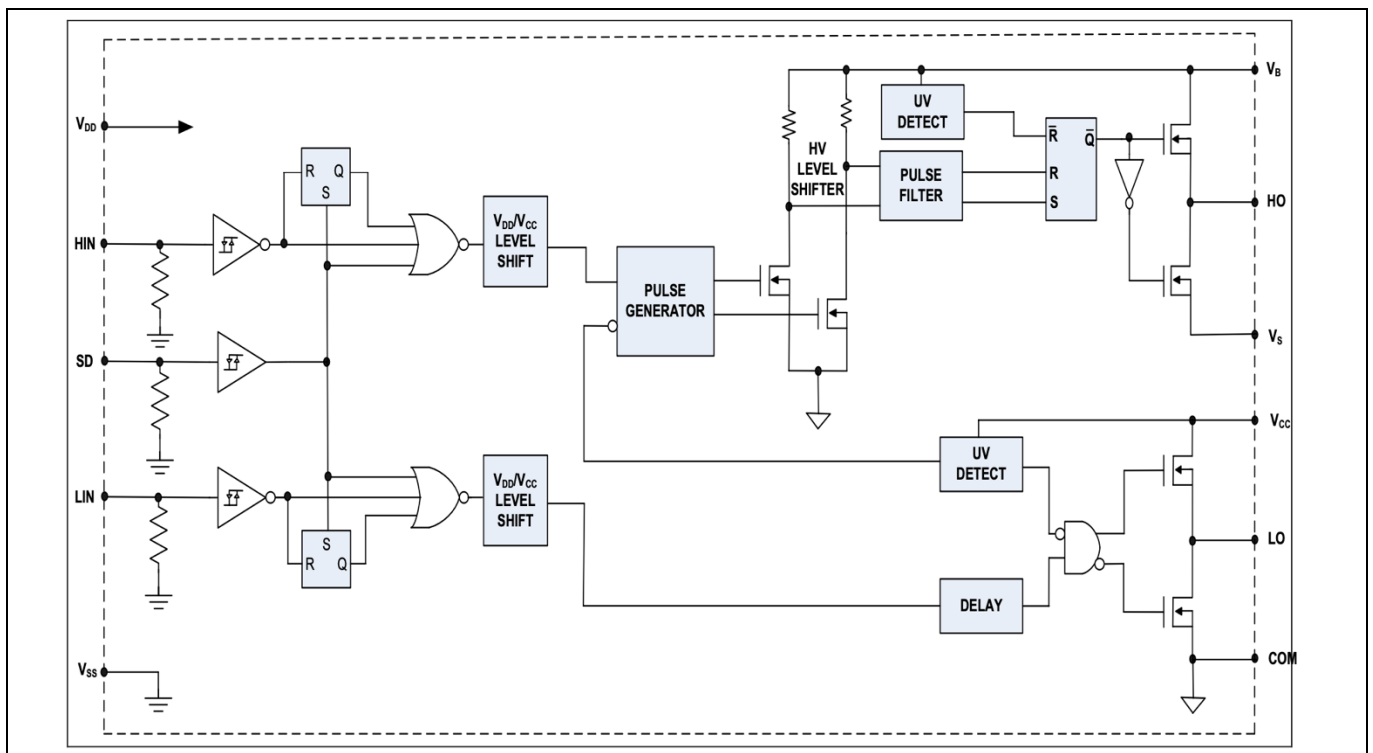


Figure 2 Block diagram of 2ED2110S06M

Electrical Characteristic Differences

3 Electrical Characteristic Differences

All measurement conditions remain unchanged unless noted. Parameters not mentioned in this document have not changed.

Table 1 Absolute Maximum Ratings

Parameter			IR2110/2113		IRS2110/2113		2ED2110S06M		Units
Symbol	Definition		min	max	min	max	min	max	
V_B	High side floating supply voltage	(IR2110/IRS2110)	-0.3	525	-0.3	520 (Note1)	$V_{CC} - 6$	675	V
		(IR2113/IRS2113)	-0.3	625	-0.3	620 (Note1)			
V_S	High side floating supply offset voltage		$V_B - 25$	$V_B + 0.3$	$V_B - 20$	$V_B + 0.3$	$V_{CC} - V_{BS} - 6$	650	
V_{CC}	Low side fixed supply voltage		-0.3	25	-0.3	20 (Note1)	-1	25	
V_{DD}	Logic supply voltage		-0.3	$V_{SS} + 25$	-0.3	$V_{SS} - 20$ (Note1)	$V_{SS} - 1$	$V_{SS} + 25$	
V_{SS}	Logic supply offset voltage		$V_{CC} - 25$	$V_{CC} + 0.3$	$V_{CC} - 20$	$V_{CC} + 0.3$	-7	7	
V_{HO}	Floating gate drive output voltage		$V_S - 0.3$	$V_B + 0.3$	$V_S + 0.3$	$V_B + 0.3$	$V_S - 0.5$	$V_B + 0.5$	
V_{LO}	Low side output voltage		-0.3	$V_{CC} + 0.3$	-0.3	$V_{CC} + 0.3$	-0.5	$V_{CC} + 0.5$	
V_{IN}	Logic input voltage		$V_{SS} - 0.3$	$V_{DD} + 0.3$	$V_{SS} - 0.3$	$V_{DD} + 0.3$	$V_{SS} - 5$	$V_{DD} + 0.5$	

Note1: In IRS211(0,3), all supplies are fully tested at 25 V and an internal 20 V clamp exists for each supply. The 20 V, internal clamp improves the IC survivability against supply transient spikes but at the same time reduces the absolute maximum rating to 20 V.

For applications that require recovery from an output short-circuit to negative bus, do not allow $V_{BS} \geq 25$ V for more than 1 μ s in such a short-circuit recovery event. To help ensure this parameter corresponds to the datasheet DC condition limit, consider:

1. decreasing the di/dt by increasing $R_{B,OFF}$,
2. decreasing the V_S to COM distance on the PCB,
3. reducing the short-circuit current level,
4. adding R_B in series with C_B ,
5. or increasing the size of C_B .

Electrical Characteristic Differences

Table 2 Recommended Operating Conditions

Parameter		IR2110/2113		IRS2110/2113		2ED2110S06M		Units
Symbol	Definition	min	max	min	max	min	max	
V_{SS}	Logic ground	-5	5	-5	5	-6	6	V
V_{IN}	Logic input voltage (HIN, LIN &SD)	V_{SS}	V_{DD}	V_{SS}	V_{DD}	$V_{SS} - 4$	V_{DD}	

Table 3 Dynamic Electrical Characteristics

Parameter		IR2110/2113		IRS2110/2113		2ED2110S06M		Units
Symbol	Definition	typ	max	typ	max	typ	max	
t_{on}	Turn-on propagation delay ($V_s = 0$ V)	120	150	130	160	90	110	ns
t_{off}	Turn-off propagation delay ($V_s = 500$ V / 600 V)	94	125	120	150	90	110	
t_{sd}	Shutdown propagation delay ($V_s = 500$ V / 600 V)	110	140	130	160	100	120	

There is a small difference in propagation delays between the IRS211(0,3) and the IR211(0,3). The 2ED2110S06M achieves faster propagation delays than the IRS211(0,3), with turn-on propagation delay reduced to 90 ns and shutdown delay to 100 ns, making it suitable for high-speed applications.

Table 4 Static Electrical Characteristics

Parameter		IR2110/2113			IRS2110/2113			2ED2110S06M			Units
Symbol	Definition	min	typ	max	min	typ	max	min	typ	max	
V_{OH}	High level output voltage, $V_{BIAS} - V_O$	-	-	1.2 ($I_o=0$ mA)	-	-	1.4 ($I_o=0$ mA)	-	-	0.15	V
V_{OL}	Low level output voltage, V_o	-	-	0.1 ($I_o=0$ mA)	-	-	0.15 ($I_o=20$ mA)	-	-	0.15	
I_{QBS}	Quiescent V_{BS} supply current	-	125	230	-	125	230	-	150	230	μ A
I_{QCC}	Quiescent V_{CC} supply current	-	180	340	-	180	340	-	600	900	
I_{QDD}	Quiescent V_{DD} supply current	-	15	30	-	15	30	-	110	200	

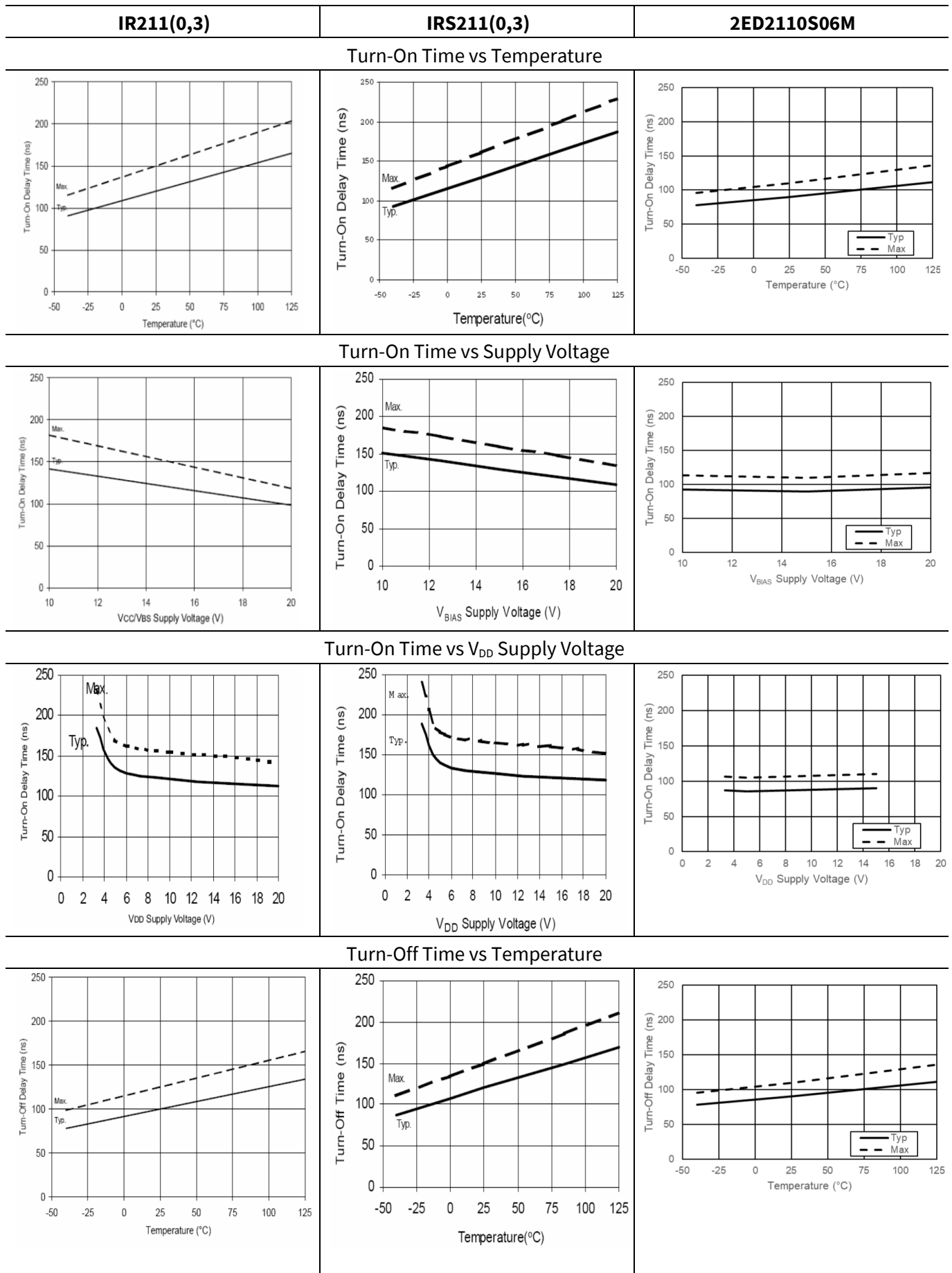
The V_{OL} is tested using a new standardized test condition of $I_o = 20$ mA.

Figures

4 Figures

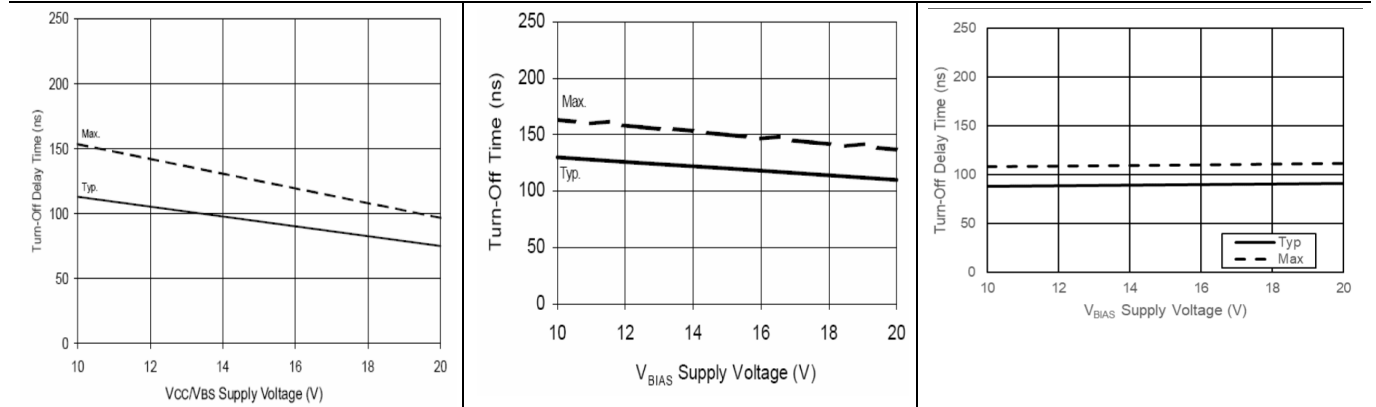
This section presents a comparative analysis of key figures from the IR211(0,3) (left column), IRS211(0,3) (center column), and 2ED2110S06M (right column) datasheets. Only the figures showing meaningful differences among the three drivers are included here, omitting those that are identical across all models for clarity and focus.

Figures

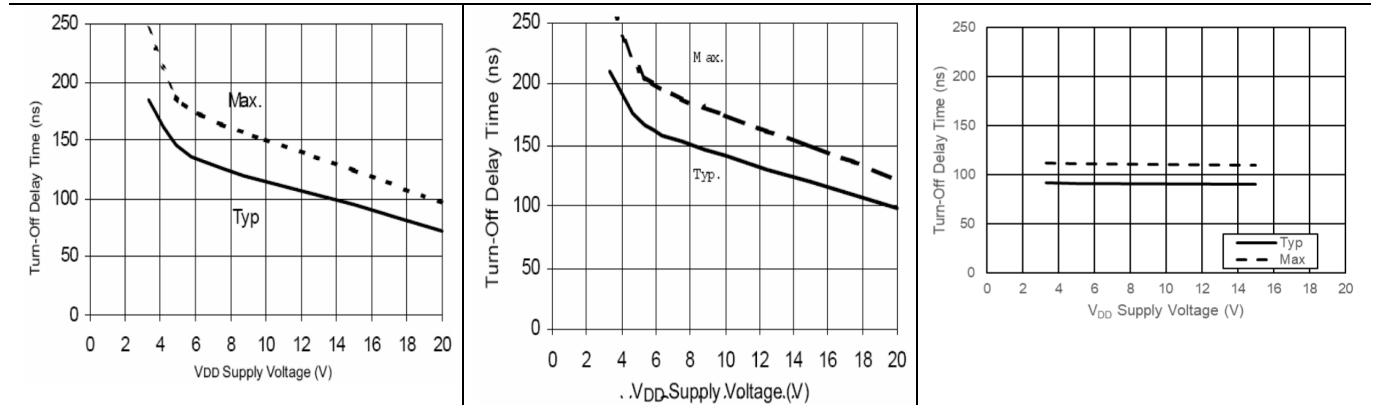


Figures

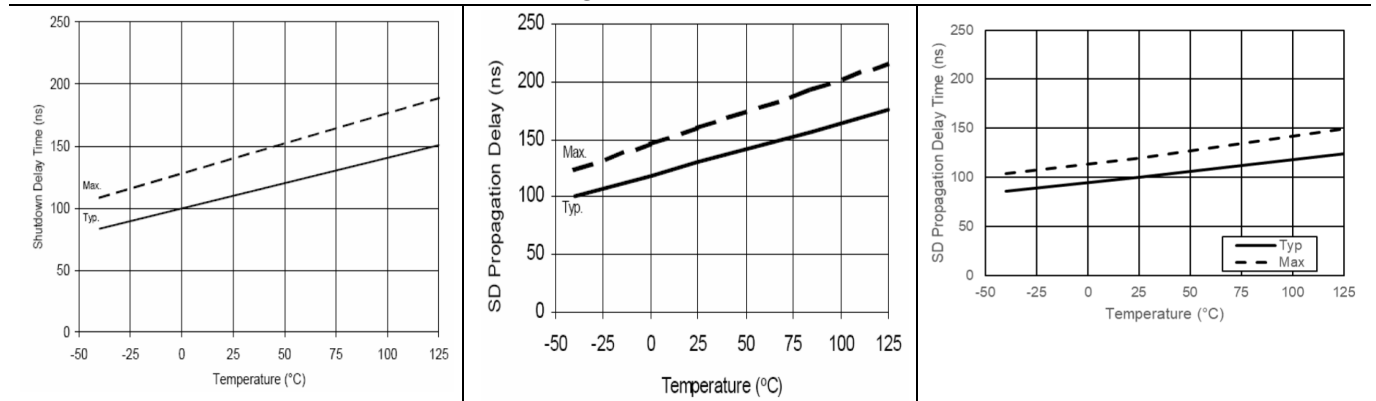
Turn-Off Time vs Supply Voltage



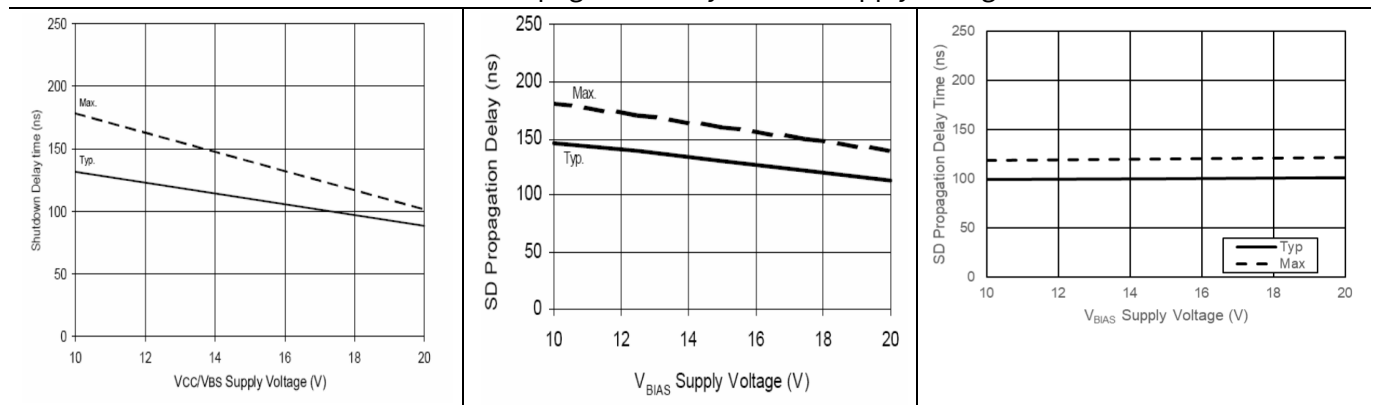
Turn-Off Time vs V_{DD} Supply Voltage



Shutdown Propagation Delay Time vs Temperature

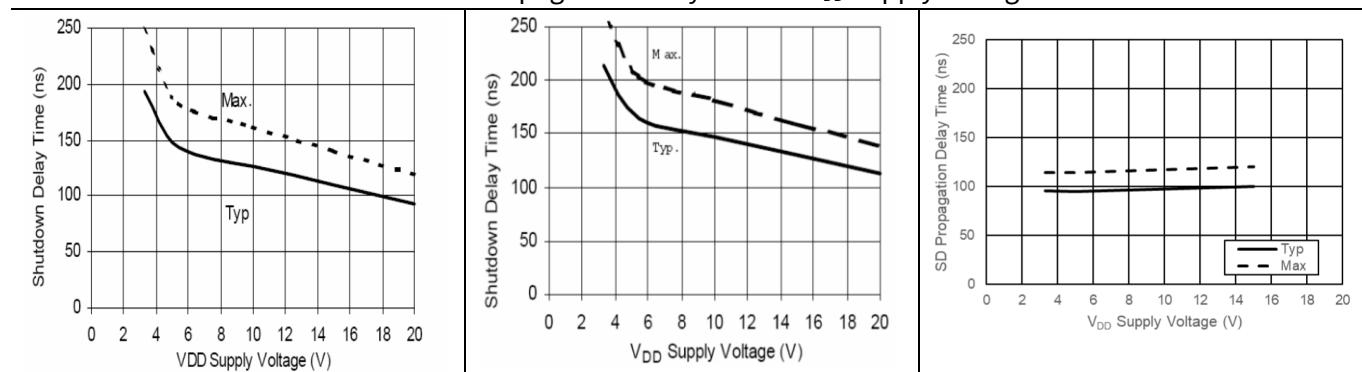


Shutdown Propagation Delay Time vs Supply Voltage

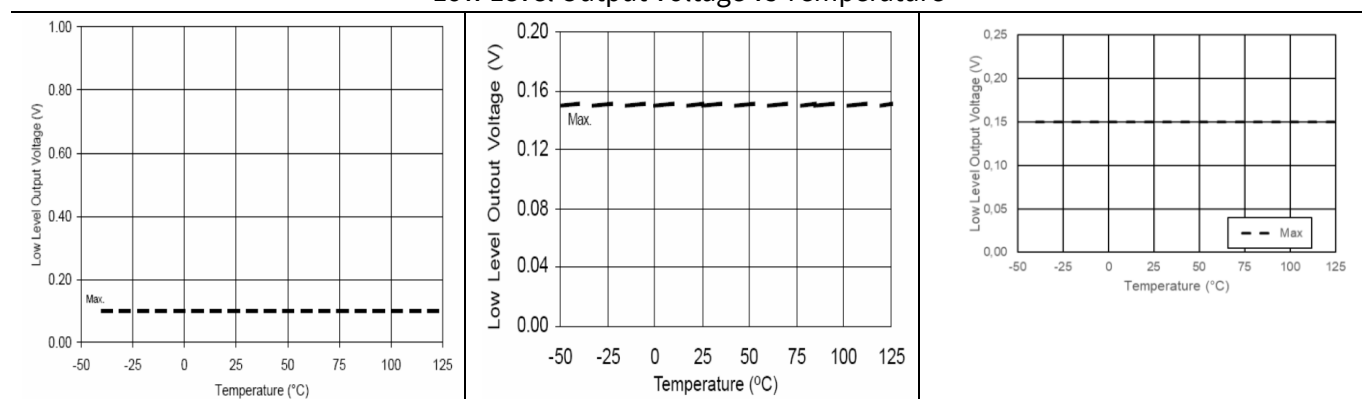


Figures

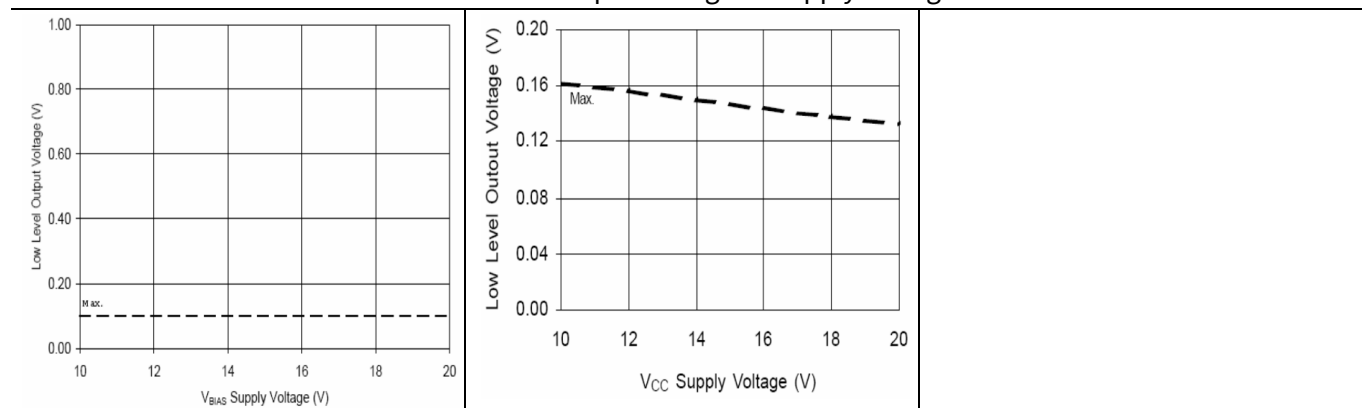
Shutdown Propagation Delay Time vs V_{DD} Supply Voltage



Low Level Output Voltage vs Temperature



Low Level Output Voltage vs Supply Voltage



Summary

5 Summary

The IRS211(0,3) and IR211(0,3) drivers share many similarities, primarily differing in minor electrical parameters. Both are high-voltage, high-speed MOSFET and IGBT drivers with robust, monolithic construction and matched propagation delays, which make them ideal for high-frequency applications where precise timing is critical. Their compatibility with standard CMOS or LSTTL inputs down to 3.3V makes them versatile for a wide range of digital circuits. These drivers are well-suited for general-purpose high-voltage applications where stable performance and reliable operation are required, such as industrial control systems, motor drives, and switch-mode power supplies.

In contrast, the 2ED2110S06M driver represents a significant advancement, incorporating modern design features that set it apart. This next-generation gate driver operates at higher voltages, supporting up to 650V, and includes an integrated bootstrap diode. This integration reduces component count, simplifying design and improving reliability in applications where space and robustness are essential. The 2ED2110S06M also utilizes Infineon's Thin-Film Silicon on Insulator (SOI) technology, which offers superior noise immunity and latch-up protection, making it exceptionally resilient in noisy environments. The faster propagation delays—reduced to 90 ns for turn-on and 100 ns for shutdown—make this driver ideal for high-speed switching applications, such as advanced motor drives, high-frequency inverters, and industrial power supplies.

For applications requiring straightforward, dependable performance at high voltages, the IRS211(0,3) and IR211(0,3) drivers remain excellent options. However, for demanding applications that benefit from high voltage tolerance, advanced noise immunity, and a reduced component footprint, the 2ED2110S06M offers clear advantages. Its capabilities are tailored to meet the needs of modern industrial and motor drive systems, where high efficiency, faster response, and robust design are paramount. Together, these three drivers offer a range of solutions for diverse power management and control applications.

References

References

- [1] <https://www.infineon.com/cms/en/product/power/gate-driver-ics/?redirId=115120>
- [2] https://www.infineon.com/dgdl/Infineon-2ED2110S06M-DataSheet-v02_05-EN.pdf?fileId=5546d4627645f877017650fe3cc54931
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- [4] https://www.infineon.com/dgdl/Infineon-IR2110-DataSheet-v01_00-EN.pdf?fileId=5546d462533600a4015355c80333167e

Revision history**Revision history**

Document revision	Date	Description of changes
Revision 1.00		Initial Version
Revision 1.01	2024-12-11	Document Template Change

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