DN1155

Use of DGD2103 & DGD2104 in IR2103 & IR2104 Applications

Introduction

The DGD2103 and DGD2104 are high-side/low-side gate driver ICs capable of driving 600V MOSFET / IGBTs and have been designed to be a pin to pin, functionally compatible, drop in replacements to the IRS2103 and IRS2104 respectively. However, for applications using the older IR2103 or IR2104 there may need to be a small change of BOM to best match the gate drivers' response.

Differences between the DGD2103/DGD2104 and the IR2103/IR2104

From the application perspective, the most significant differences in the specifications are rise/fall and output current capability as shown in Table 1 below.

Symbol	Definition	DGD2103/DGD2104			IR2103/IR2104			
		Min	Typ	Max	Min	Typ	Max	Units
IO+	Output high short circuit pulse current	130	290		130	210		mA
IO-	Output low short circuit pulse current	270	600		270	360		mA
tr	Turn-on rise time		70	170		100	170	ns
tf	Turn-off fall time		35	90		50	90	ns

Table 1: Specification differences

A faster gate driver IC will turn-on and turn-off the MOSFET/IGBT quicker. In some applications, this will translate to a more efficient system because of less switching losses. But in some driver circuits, the faster dV/dt and dI/dt could cause more overshoot, and potentially greater $-V_S$ undershoot, possibly causing a circuit to not function properly.

Hence, to use the DGD2103/DGD2104 in an IR2103/IR2104 application, and if the intention is to have the similar gate drive as the IR2103/IR2104, then the gate resistor would need to be increased to slow down the drive signal.

Matching the Rise/Fall time

A typical gate driver half-bridge circuit can be seen in Figure 1. Often for the HO and LO gate drives, external resistors (R_{GH} and R_{GL}) are used. To increase rise/fall time, R_{GH} and R_{GL} are increased.

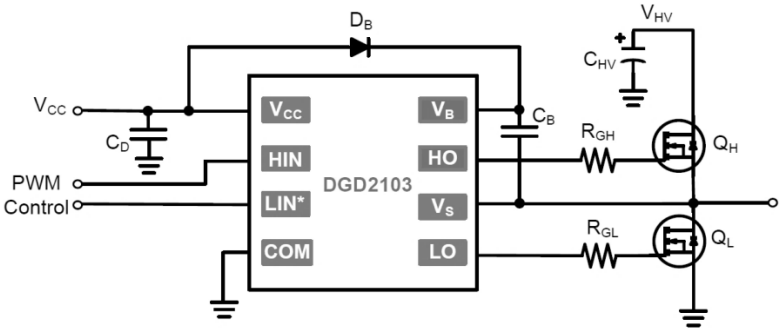

Figure 1: Typical DGD2103 Half-Bridge Circuit

To best match the DGD2103/DGD2104 in an IR2103/IR2104 application, match the rise/fall time of the DGD2103/DGD2104 with that of the IR2103/IR2104 in that application. To show an example, using the circuit similar to Figure 1 except instead of the MOSFETs as load to the gate drive signal, a load capacitor (C_L = 1000pF) was used.

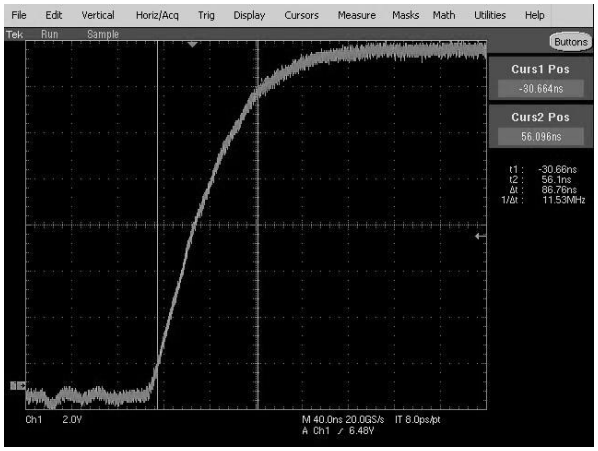

Figure 2: IR2103 with R_{GL} = 3Ω, tr = 86ns

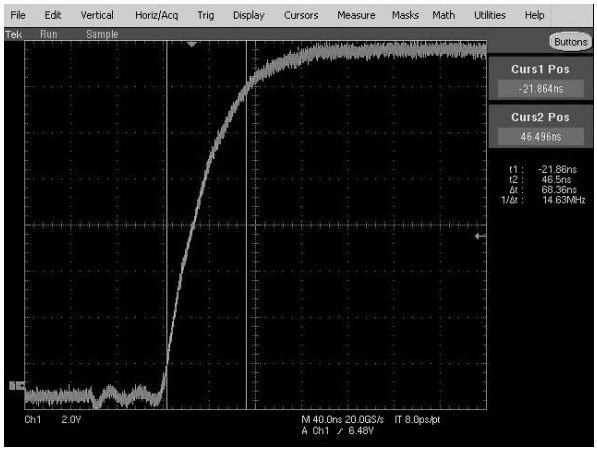

Figure 3: DGD2103 with R_{GL} = 3Ω, tr = 68ns

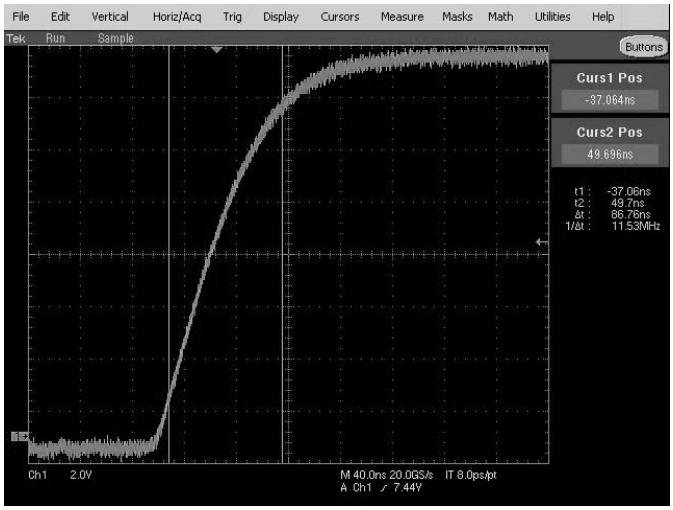

Figure 4: DGD2103 with R_{GL}= 100Ω, tr = 86ns

Hence, by making the gate resistors, R_{GH} and R_{GL}, larger you will have similar rise and fall times and will decrease the chances of any unwanted effects due to the higher dV/dt and dI/dt. Note that in other driver circuits the value may be greater or less than 100Ω depending on initial gate resistor value and MOSFET gate capacitance.

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