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Sep 27, 2007

APPLICATION NOTE 4104

Understanding and Configuring the 1-Wire Timing of the DS2480B

Abstract: The DS2480B is a 1-Wire® master (driver) with UART host interface. This driver is optimized for power delivery and supports overdrive speed in embedded applications. A special feature of the DS2480B is its flexible speed mode, which allows the designer to configure the 1-Wire timing at standard speed. This application note explains how to determine the optimum timing configuration settings and how to write the settings to the chip using Windows® software. The article also compares the driver strength of the DS2480B to a resistive pullup, as described in application note 3829. The first appendix explains how the optimum set of configuration parameters was determined. A second appendix describes an algorithm to estimate the number of slaves that the DS2480B can drive, depending on the electrical characteristics of the master and the capacitive load of the network cabling. The third appendix discusses network overload conditions.

Introduction

The DS2480B is a 1-Wire master (driver) with UART host interface. Optimized for power delivery and supporting overdrive speed in embedded applications, it relieves the host from the duty of generating time-critical 1-Wire waveforms. The DS2480B uses active circuitry to shorten the recovery time at the end of time slots. **Figure 1** shows a simplified schematic of the 1-Wire driver section.

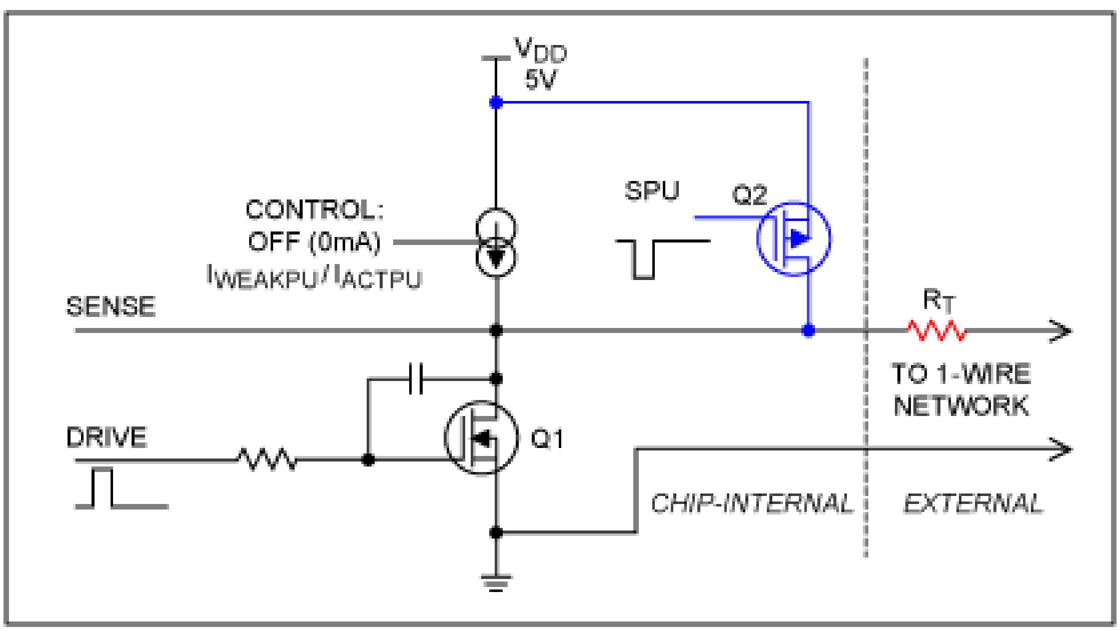

Figure 1. Simplified drawing of the DS2480B 1-Wire driver circuit.

When the 1-Wire line is idle, the DS2480B driver performs the pullup through a controlled current source. This current source can be switched off (during pulldown), provide weak pullup (I_{WEAKPU} after pulldown and when idle), or provide an active pullup (I_{ACTPU} during rising edges). The pulldown circuit (Q1) implements a slew rate that can be adjusted through software. Q2 represents the power delivery circuit used by 1-Wire slave functions that require high current, such as EEPROM programming or performing temperature conversion. The function of Q2 is not discussed in this application note.

To support configurations with significant cabling, an external line termination resistor, R_T (~100Ω), is needed to minimize transmission line effects such as reflections, undershoot, and overshoot. However, a consequence of adding R_T is that the active pullup can turn off prematurely before the 1-Wire line is fully recharged at the slave device(s). This can happen because the DS2480B senses voltage at its 1-Wire pin rather than the slave side of the 1-Wire network. The slave side will be lower than the 1-Wire pin by the voltage drop across R_T when the pin reaches an internal threshold (typically $I_{ACTPU} \times R_T = 15mA \times 100\Omega = 1.5V$). Crossing this threshold starts a timer that must expire before the active pullup is turned off. But since the timer starts early, it also ends early. Nevertheless, after the active pullup turns off (early), the 1-Wire line will continue to charge with the weak pullup current, I_{WEAKPU}, until it is fully recharged.

Critical Parameters

In very simple terms, a 1-Wire network can be compared to a lossy capacitor that is charged and discharged as communication occurs. Consequently, anything that affects the process of charging and discharging the network is a parameter that must be considered when determining the driver performance. The critical hardware-defined parameters that characterize the DS2480B driver are:

- 1-Wire Weak Pullup Current, I_{WEAKPU}
- 1-Wire Active Pullup Current, I_{ACTPU}
- Active Pullup on Threshold, V_{IAPO}
- Active Pullup Timer Threshold, V_{IAPTO}
- Active Pullup on Time, t_{APUOT} (2.0µs at standard speed, 0.5µs at overdrive)

With the exception of t_{APUOT}, all these parameters vary to some extent from manufacturing lot to lot and for different temperature operating conditions. Since I_{WEAKPU} and I_{ACTPU} depend on the same physical effects, they track each other. Simply stated, if I_{WEAKPU} is higher than typical, then I_{ACTPU} will be higher too. Therefore, the ratio between I_{WEAKPU} and I_{ACTPU} varies little. The threshold voltages, V_{IAPO} and V_{IAPTO}, can vary independently of each other and are not correlated to changes of the pullup currents. For the actual specification values, refer to the DS2480B data sheet. I_{WEAKPU} is measured at a residual voltage of 0.4V on the 1-Wire pin. The DC parameters ΔV_{STRPU} and ΔV_{PROG}, also found in the data sheet, do not apply to the active pullup that only occurs during a rising edge on the 1-Wire side. Rather, ΔV_{STRPU} and ΔV_{PROG} refer to a voltage drop between either V_{DD} and 1-Wire or V_{P-P} and 1-Wire during a strong pullup (SPU, power delivery) or EPROM programming pulse.

1-Wire Master Timing Configurability

The DS2480B offers flexible speed mode, which is a variant of standard speed. This special flexible speed mode allows fine-tuning of the timing for the 1-Wire time slots. The timing of a reset-/presence-detect sequence is fixed. Timing parameters that *can* be set by writing to control registers are:

- Write 1 Low Time (t_{LOW1})
- Data Sample Offset (t_{DSO})
- Write 0 Recovery Time (t_{REC0})
- Slew Rate of Falling Edges (DS2480B initiated)

Table 1 shows the available ranges and increments for these timing parameters in flexible speed mode only. The parameter codes and value codes are used in conjunction with the DS2480B's configuration commands. **Table 2** shows parameters that are fixed (invariable) at flexible speed and parameters for overdrive speed.

Table 1. Variable Parameters: Flexible Speed Only

Description	Symbol	Par. Code	Parameter Value Codes and Values								Units
			000	001	010	011	100	101	110	111	
Write 1 Low Time	t_{LOW1}	100	8	9	10	11	12	13	14	15	µs
Data Sample Offset, Write 0 Recovery Time	t_{DSO}, t_{REC0}	101	3	4	5	6	7	8	9	10	µs
Pulldown Slew Rate	—	001	15	2.2	1.65	1.37	1.1	0.83	0.7	0.55	V/µs

Table 2. Fixed Parameters: Flexible and Overdrive Speeds

Description	Symbol	Value (µs)	Speed
Write 1 High Time	t_{HIGH1}	49	Flexible
		8	Overdrive
Write 0 Low Time	t_{LOW0}	57	Flexible
		7	Overdrive
Active Pullup On-Time	t_{APUOT}	2	Flexible
		0.5	Overdrive
Write 1 Low Time	t_{LOW1}	1	Overdrive
Data Sample Offset	t_{DSO}	1	Overdrive
Write 0 Recovery Time	t_{REC0}	3	Overdrive

The same register value controls both the Data Sample Offset and Write 0 Recovery Time parameters. This is permissible since both parameters are driven by the same effect, the recharge speed of the 1-Wire network. There is no need to sample the 1-Wire before logic 1 could have been reached (t_{DSO} function). Conversely, a waiting time that is adequate to fully recharge the 1-Wire line during a Read time slot serves well as recovery time for a Write 0 time slot (t_{RECO} function).

As illustrated in **Figure 2**, the Write 1 and Read Data time slots are constructed from three segments: t_{LOW1}, t_{DSO}, and t_{HIGH1}. The duration of t_{LOW1} can be set from 8µs to 15µs. With a t_{DSO} range from 3µs to 10µs and a fixed t_{HIGH1} of 49µs, the duration of a Write 1 or Read Data time slot can be anywhere from 60µs to 74µs. The sampling to read from the 1-Wire (in case of a Read time slot) takes place at t_{LOW1} + t_{DSO} after the beginning of the time slot, i.e., anywhere from 11µs to 25µs from the beginning of the falling edge.

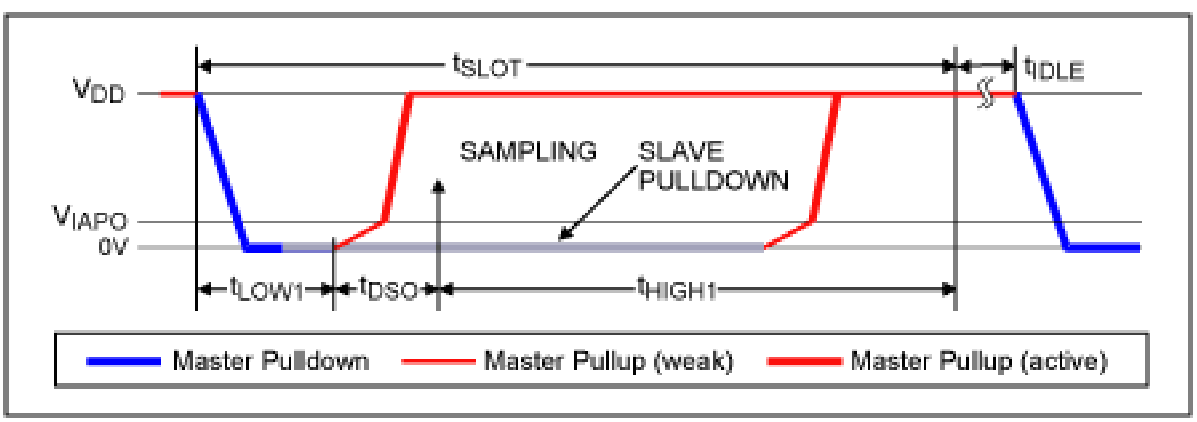

Figure 2. Write 1 and Read Data time slots.

A Write 0 time slot (**Figure 3**) consists of the two segments, t_{LOW0} and t_{RECO}. With a fixed t_{LOW0} of 57µs and a t_{RECO} range from 3µs to 10µs, a Write 0 time slot can last from 60µs to 67µs. Depending on the data that the DS2480B receives from the host's UART, there can be significant idle time between time slots.

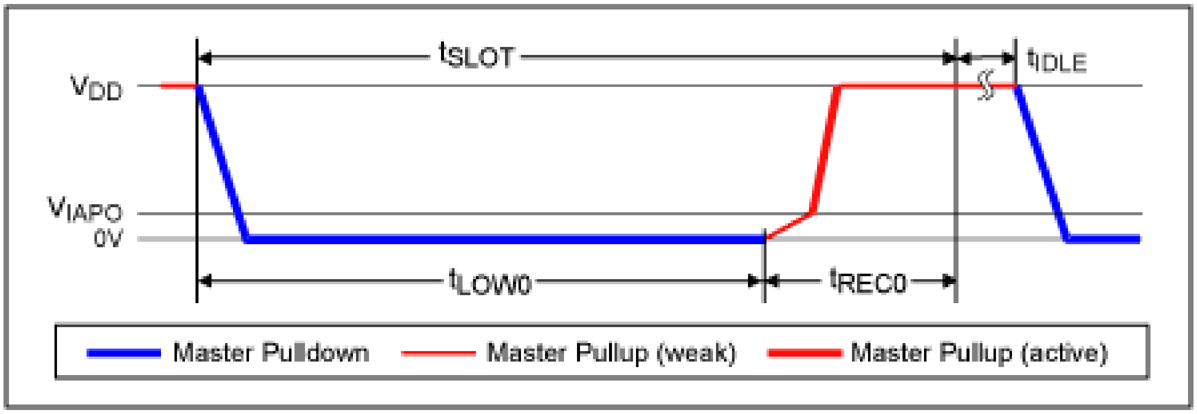

Figure 3. Write 0 time slot.

The instant at which a 1-Wire slave recognizes a time slot depends on three factors: the slew rate of the falling edge of the master pulldown; the slave's electrical characteristics; and the physical distance between master and slave. In flexible speed mode the slew rate can be adjusted from a fast 15V/µs down to a slow 0.55V/µs. A very slow slew rate can, however, conflict with a short t_{LOW1} setting. Extensive tests have shown that a slew-rate setting of 1.37V/µs is a good starting point, and works in almost all applications with and without line termination. The fastest setting (15V/µs) should be avoided unless the line is properly terminated. Without termination, there is significant likelihood of ringing, particularly if the DS2480B drives a long cable.

How to Change the Settings

As shown in the **Appendix A**, "Choosing Configuration Parameter Values," the optimal configuration is a time slot duration of 66µs with t_{LOW1} = 8µs and t_{DSO} = 9µs.

An executable Windows utility program, `tmline.exe`, to change the settings can be downloaded (ZIP). This file must first be extracted from the ZIP folder and moved to the Windows desktop. To run the program, double-click its icon or right click the icon and select "open." The program opens a DOS-like window and performs several tasks: introduces itself; identifies the revision of the underlying driver software; and displays the default settings for Pulldown Slew Rate, Write 1 Low Time, and Data Sample Offset/Write 0 Recovery Time. If 1-Wire application software is already running at the time where the `tmline` program is started, the displayed settings are the current settings.

```
Current (STANDARD) 1-Wire line settings:
 PDSR  = 1.37 V/us
 W1LT  = 8 us
 DSOW0 = 6 us
```

The first parameter for which `tmline` requests user input is the Pulldown Slew Rate. The number to be entered is the parameter value code, found in Table A. Numeric values from 0 to 7 select the new value; entering an 8 exits the program without changing the settings. All other inputs are ignored.

```
Select the PDSR (pulldown slew rate):
 0) 15 V/us
 1) 2.20 V/us
 2) 1.65 V/us
 3) 1.37 V/us
 4) 1.10 V/us
 5) 0.83 V/us
 6) 0.70 V/us
 7) 0.55 V/us
 8) EXIT
```

```
Enter number: 3
```

(Example user input: 3)

After a valid number is entered, the next parameter to be specified is Write 1 Low Time.

```
Select the W1LT (write-1 low time):
 0) 8 us
 1) 9 us
 2) 10 us
 3) 11 us
 4) 12 us
 5) 13 us
 6) 14 us
 7) 15 us
 8) EXIT

Enter number: 0
```

(Example user input: 0)

After a new Write 1 Low Time is entered, the last parameter for user input is Data Sample Offset/Write 0 Recovery Time.

```
Select the DSO/WOR (data sample offset/write 0 recovery):
 0) 3 us
 1) 4 us
 2) 5 us
 3) 6 us
 4) 7 us
 5) 8 us
 6) 9 us
 7) 10 us
 8) EXIT

Enter number: 6
```

(Example user input: 6)

After a valid number is entered, `tmline` writes the new set of parameters to the DS2480B in the port adapter. It then loops back to display the new settings as the current ones and asks for a new pulldown slew rate. To exit the program, enter "8." The new setting remains valid as long as the 1-Wire application software is running.

Recovery Time for Multiple Slave 1-Wire Networks

Standard Speed Mode

For a single-slave network in standard speed mode, the 1-Wire slave data sheets typically specify a minimum recovery time of 5µs in conjunction with a 2.2kΩ pullup resistor and a minimum pullup voltage of 2.8V. Maxim's application note 3829, "Determining the Recovery Time for Multiple-Slave 1-Wire Networks," explains how to determine the recovery time for multiple slaves, four temperatures, and two voltages. Since the DS2480B is a 5V device, the 4.5V section of application note 3829 is relevant. For temperatures of -5°C and warmer, the recovery time at standard speed is specified as 2 × N + 1µs (N = number of slaves). Accordingly for one slave, one needs 3µs, for two slaves 5µs, for three slaves 7µs, and for four slaves 9µs.

Therefore, using the calculations for worst-case conditions (1.5mA I_{WEAKPU}, 9mA I_{ACTPU}) from the Appendix B and the configuration of "four slaves with 9µs" as references, the DS2480B can handle at least 31 slaves. Consequently, at standard speed *the DS2480B driver is at least **eight times as strong** as the 2.2kΩ passive pullup.*

Overdrive Speed Mode

For a single-slave network in overdrive speed mode, the 1-Wire slave data sheets typically specify a minimum recovery time of 2µs in conjunction with a 2.2kΩ pullup resistor and a minimum pullup voltage of 2.8V. According to application note 3829 cited above, for -5°C temperatures and warmer, the recovery time at overdrive speed is specified as 1.37 × N + 0.5µs (N = number of slaves). Accordingly, for one slave one needs 1.87µs, for two slaves 3.24µs, for three slaves 4.61µs, and for four slaves 5.98µs.

Therefore, by using the condition "two slaves with 3.24µs" as a reference and scaled to 1.8 slaves at 3µs, and then by performing the same calculation for a worst-case condition at overdrive speed, the DS2480B can handle at least nine slaves. Consequently, at overdrive speed *the DS2480B driver is at least **five times as strong** as the 2.2kΩ passive pullup.*

What Happens If the Number of Slaves Exceeds the Recommendations?

The answer to the above question is straightforward: the network will probably continue functioning. This is true because:

- V_{IAPTO} is usually higher than the worst case assumed for the calculation.
- The slaves tolerate incomplete recharge as long as the voltage rises high enough to be recognized as the end of the time slot.
- V_{IH1} of the DS2480B is probably lower than the minimum specification in the data sheet.

Nonetheless, the robustness of the communication will suffer, resulting in retries that appear as a slower response or in reduced throughput.

Summary

The reliability of a 1-Wire network depends equally on master (driver) and slaves. For operation at standard speed, the DS2480B 1-Wire driver's optimal setup is flexible speed with t_{LOW1} = 8µs, t_{DSO} = t_{RECO} = 9µs. The slew-rate setting of 1.37V/µs is a good start. This setup accommodates 1-Wire slaves in the speed range of 15µs to 54µs. A single slave with a time base slower than 54µs can make the system nonfunctional. Changing the pulldown slew rate to 1.65V/µs or 2.2V/µs increases the chance for a "borderline" slave to function in the network. To accommodate 1-Wire slaves as slow as 60µs, the duration of t_{HIGH1} and t_{LOW0} must be increased by 6µs to 55µs and 63µs, respectively. This latter capability, however, is not yet available with the current revision of the DS2480B.

As an example, consider the free OneWireViewer which uses the 1-Wire drivers for Windows. The OneWireViewer software uses the configuration t_{LOW1} = 8µs, t_{DSO} = 6µs, and a slew rate of 1.37V/µs as default for standard speed. As explained above, it might be necessary to increase t_{DSO} to 9µs. OneWireViewer revisions 4.01 and newer changed the default t_{DSO} to 9µs, thus matching the recommendation in this application note. The defaults for t_{LOW1} and the slew rate remain at 8µs and 1.37V/µs, respectively.

The DS2480B is a strong 1-Wire driver. At standard speed the DS2480B can drive at least eight times and at overdrive speed five times as many slaves as a circuit that relies on a 2.2kΩ pullup resistor.

Appendix A

Choosing Configuration Parameter Values

Comprised of the three segments, t_{LOW1}, t_{DSO}, and t_{HIGH1}, the Write 1 and Read Data time slots can have 64 variations, as shown in **Table 3**. The longer t_{DSO} is (alias t_{RECO} for Write 0 times slots), the more time is available for network recharge (recovery). A combination of maximum settings for t_{LOW1} and t_{DSO}, however, positions the sampling point up to 25µs into the time slots. The sampling point is where the DS2480B reads from the 1-Wire line.

Table 3. Time Slot Duration As Function of t_{LOW1} and t_{DSO}

t_{LOW1} (µs)	t_{DSO} (µs)							
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**
8	60	61	62	63	64	65	**66**	67
9	61	62	63	64	65	**66**	67	68
10	62	63	64	65	**66**	67	68	69
11	63	64	65	**66**	67	68	69	70
12	64	65	**66**	67	68	69	70	71
13	65	**66**	67	68	69	70	71	72
14	**66**	67	68	69	70	71	72	73
15	67	68	69	70	71	72	73	74

The internal time base of 1-Wire slaves can vary from 15µs to 60µs. Therefore, a slave device that responds with a 0 can stop pulling the line low as soon as 15µs after it recognizes the beginning of the time slot. With a slew-rate setting of 1.37V/µs (nominal value), the slave might recognize the time slot and start its timer at ~2.2V or ~2µs into t_{LOW1}. To ensure that one still can read a 0 from such a fast slave, the sampling point must not be later than 2 + 15 = 17µs from the beginning of the time slot. *All time slots that are no longer than 66µs meet this condition.* Another slave might recognize the time slot and start its timer at ~0.8V or ~3µs into t_{LOW1} and stop pulling the line low 60µs later. In this case the 1-Wire line can start recharging 63µs after the beginning of a time slot. To allow for a minimum recovery time of 3µs, *the time slot duration needs to be minimally 66µs.* A faster slew rate moves the points where slaves turn on their timers closer together. This can slightly improve the recovery time, but also add ringing if there is no line termination at the driver.

What happens if the Write 1 and Read Data time slot is different from 66µs? A shorter duration is acceptable for fast 1-Wire slaves. However, for every µs less, the slowest slave that can be accommodated must be 1µs faster. In the extreme case of a 60µs time slot, the slowest slave that would still function in the network must not be slower than 54µs. A time-slot duration longer than 66µs is acceptable for slow 1-Wire slaves. However, for every additional µs, the fastest slave must be 1µs slower to remain readable in the network. In the extreme case of a 74µs time slot, the fastest slave that would still function must not be faster than 23µs. There is a small chance that some randomly chosen 1-Wire slaves do not meet this last condition. Therefore, time-slot choices of less than 64µs or more than 68µs are less reliable. Most 1-Wire slaves have a speed close to the center of the 15µs to 60µs range, and devices slower than 54µs are rare.

Since the value chosen for t_{DSO} also applies to t_{RECO} for recharge in Write 0 time slots, the highest possible value for t_{RECO} is desirable. *This high value identifies the pair t_{LOW1} = 8µs and t_{DSO} = 9µs as the optimal configuration* (highlighted in Table 3). Reviewing the Write 0 time slot from a slave's perspective, the slave might start its timer ~3µs into t_{LOW0} and read (sample) 60µs later. Since t_{LOW0} ends 57µs after the beginning of the time slot, the slave's sampling occurs 6µs late, near the end of t_{RECO}. To guarantee that a slave does not miss the latest sampling point in a Write 0 time slot, its time base must *not be slower than 54µs.* This requirement also ensures that the shortest recovery time in a Read 0 case is the same as in the Write 0 time slot, i.e., 9µs.

Appendix B

How Many Slaves Can the DS2480B Drive?

There is no simple answer to this question. A 1-Wire slave does not behave like an ideal capacitor. However, to describe the behavior one can use a capacitor model with a low capacitance until a certain voltage and a high capacitance above this voltage. The high capacitance corresponds to the parasitic supply capacitor and applies when the slave's recharge begins.

To speed the recharge process, the DS2480B uses a 2-stage current source instead of a resistor. The recharge begins with the low I_{WEAKPU} and later changes to the stronger I_{ACTPU}. The detailed view of a rising edge in **Figure 4** illustrates the process.

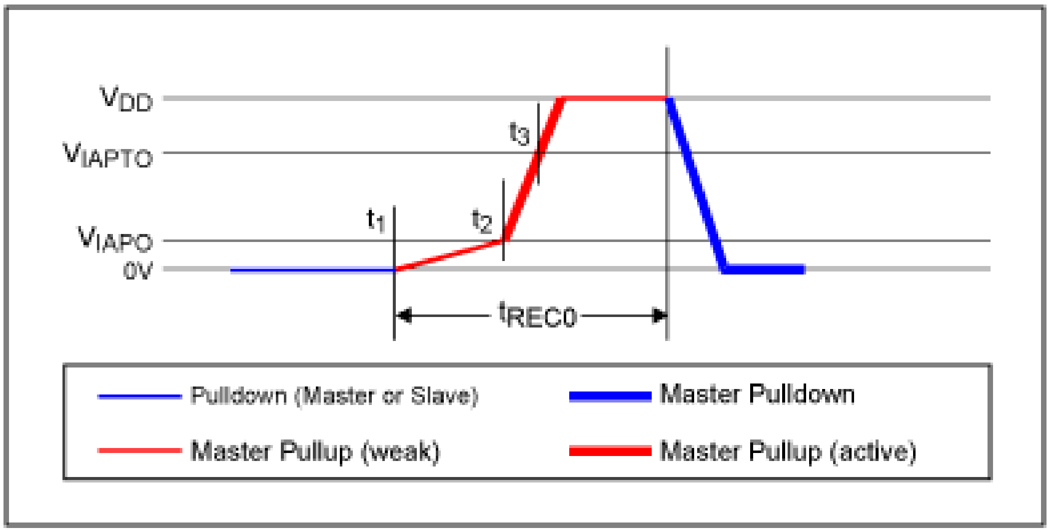

Figure 4. Rising edge details.

At t_1 the pulldown (master or slave) ends and the weak pullup current begins charging the 1-Wire line. The load on the bus and the I_{WEAKPU} value of the DS2480B determine the slope. At t_2 the voltage crosses the threshold voltage V_{IAPO}. Now the DS2480B switches over to I_{ACTPU}, which is significantly higher. Consequently, the voltage on the 1-Wire line rises faster. As the voltage crosses the threshold V_{IAPTO} at t_3, a timer is started, which keeps the I_{ACTPU} flowing for another 2µs (t_{APUOT}, flexible speed) or 0.5µs (overdrive speed). After the timer expires, the I_{WEAKPU} continues to power the 1-Wire bus until the DS2480B begins the next time slot or communication sequence.

The charging of a capacitor using a constant current source can be described as:

$V(t) = I_{CHARGE} \times t/C$ (Eq 1)

The time t_2 where the V_{IAPO} threshold is reached can be calculated by setting $V(t) = V_{IAPO}$, substituting I_{WEAKPU} for I_{CHARGE}, and resolving equation (1) for t_2:

$t_2 = C \times V_{IAPO}/I_{WEAKPU}$ (Eq 2)

At t_2 the charge current changes from I_{WEAKPU} to I_{ACTPU} and continues charging from V_{IAPO} to V_{IAPTO} and beyond. Expanding equation 2 accordingly yields t_3, the time for a recharge to V_{IAPTO}:

$t_3 = C \times [(V_{IAPTO} - V_{IAPO})/I_{ACTPU} + V_{IAPO}/I_{WEAKPU}]$ (Eq 3)

To estimate the number of slaves that the DS2480B can drive it is necessary to split the recharge into three phases and analyze each phase separately.

Phase 1	Recharge from 0 to 3.6V, the lowest V_{IAPTO}. The end of this phase approximately coincides with the beginning of the slave's recharge. The slave's low capacitance applies.
Phase 2	Recharge continues with I_{ACTPU} until t_{APUOT} expires. The slave's high capacitance applies.
Phase 3	Recharge continues with I_{WEAKPU} until the next time slot begins. The slave's high capacitance applies.

The recharging duration of Phase 1 is calculated using equation 3. For Phase 2, use equation 1 and substitute I_{ACTPU} for I_{CHARGE} and t_{APUOT} for t. This exercise yields the voltage increment that is achieved during the remaining time where I_{ACTPU} continues. For Phase 3, calculate the residual time available for recharge, and use equation 1 to determine the additional voltage increment that can be achieved with I_{WEAKPU}. For a given number of slaves, if the addition of V_{IAPTO} to the voltage increments from Phase 2 and 3 results in a value higher than or equal to the operating voltage, then a full recharge can be accomplished. *The highest number of slaves that meets this condition is the desired result.* This algorithm can be implemented as a spreadsheet with the number of slaves as a variable.

After completing the above calculations, the resulting number of slaves for **flexible speed** is 31. Note that this number is a conservative estimate. The actual achievable number of slaves could be significantly higher. The input parameter values in **Table 4** were used to calculate the result.

Table 4. Values to Calculate Number of Slaves for Flexible Speed

Parameter	Value	Comment
Operating voltage	5V	Nominal value
Slave low capacitance	50pF	High estimate, actual value could be lower
Slave high capacitance	600pF	Typical value
V_{IAPO} threshold	1V	Typical value
Phase 1 threshold	3.6V	Lowest V_{IAPTO} specification value
Weak pullup current	1.5mA	Lowest I_{WEAKPU} specification value
Active pullup current	9mA	Lowest I_{ACTPU} specification value
Active current continuation	2µs	The continuation timer starts at V_{IAPTO}
Recovery time	9µs	t_{RECO}

Performing the same calculation for **overdrive speed** results in nine slaves. When considering cable capacitance, it is necessary to verify that the duration of Phase 1 does not exceed 1µs. Again, this number is a conservative estimate. The actual achievable number of slaves could be significantly higher. The parameter values in **Table 5** were used to calculate the result.

Table 5. Values to Calculate Number of Slaves for Overdrive Speed

Parameter	Value	Comment
Operating voltage	5V	Nominal value
Slave low capacitance	50pF	High estimate, actual value could be lower
Slave high capacitance	600pF	Typical value
V_{IAPO} threshold	1V	Typical value
Phase 1 threshold	3.6V	Lowest V_{IAPTO} specification value
Weak pullup current	1.5mA	Lowest I_{WEAKPU} specification value
Active pullup current	9mA	Lowest I_{ACTPU} specification value
Active current continuation	0.5µs	The continuation timer starts at V_{IAPTO}
Recovery time	3µs	t_{RECO}

Note that for simplicity the start of the slaves' recharge is assumed to coincide with V_{IAPTO}. The actual recharge can begin sooner or later, varying dynamically with the data stream. If the recharge starts sooner, V_{IAPTO} is reached later, compensating for the extra charge needed. If the recharge starts later, there is less energy needed to recharge; the duration of Phase 1 is shorter, leaving more time for Phase 3 to compensate.

Note that these calculations do not account for the capacitance of the cable that connects master and slaves. To obtain the number of slaves that can be supported **for a given cable**, calculate the cable capacitance and add it to the total slave capacitance when calculating the duration of Phase 1 and the voltage increments achieved during Phases 2 and 3.

Appendix C

Network Overload Conditions

There can be two types of overload on a 1-Wire line, capacitive and DC. A capacitive overload appears as insufficient recovery time. It is typically seen as a spike at the end of a Write 0 time slot, i.e., when the next time slot begins before the recharge is completed. A capacitive overload is unlikely if the setup and load follow the recommendations in this application note.

DC overload occurs if there is a resistor of ~3kΩ or less connected between the 1-Wire and GND. The extra "leakage" causes the 1-Wire voltage during recovery times to drop below the driver's supply voltage. If this occurs, DC overload is visible on rising edges, as shown in **Figure 5**. After having reached V_{DD} level, the voltage on the 1-Wire line drops to a lower level as soon as the I_{ACTPU} ends.

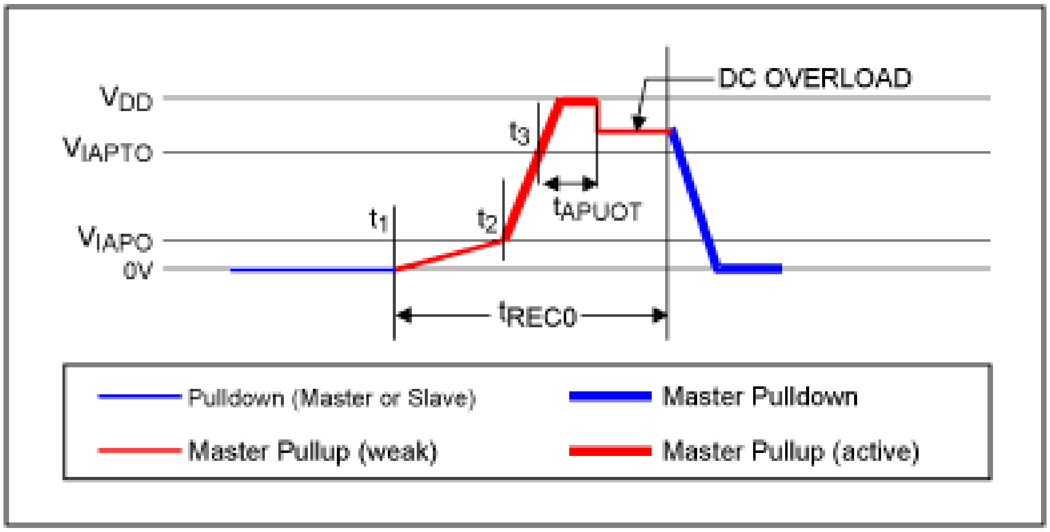

Figure 5. DC overload visible on rising edge.

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Related Parts
DS2480B: QuickView -- Full (PDF) Data Sheet -- Free Samples

AN4104, AN 4104, APP4104, Appnote4104, Appnote 4104