SAMSUNG

The Qi Wireless Power Transfer System

Power Class 0

Samsung Proprietary Power Delivery Extension Specification (Samsung Wireless Fast Charge)

Communications Protocol

Version 1.0.2
January 2020

Confidential and Proprietary

CLASSIFICATION

DISCLAIMER

RELEASE HISTORY

Version	Date	Description
1.0.0	August 2019	First edition
1.0.1	October 2019	Add overview, draft toward Samsung developers website
1.0.2	January 2020	Revision of overview

Contents

1 Overview

1.1 Introduction to Samsung Proprietary Power Delivery Extension

Samsung Proprietary Power Delivery Extension (PPDE) is the technology that enables Samsung mobile devices to be fast-charged with the wireless fast charger. Samsung Wireless Fast Charge is a brand of Samsung PPDE technology.

This specification document covers the minimum requirement of Samsung PPDE technology embodiment. It is also a technical standard document of Samsung Electronics. The specification defines the protocol such as proprietary packets, work flow and sequence. THE USE OF THIS SPECIFICATION DOES NOT ALLOW DEVELOPERS TO USE SAMSUNG'S LOGO NOR THE BRAND NAME. SAMSUNG WILL NOT BE RESPONSIBLE FOR ANY AND ALL CLAIMS AND/OR DAMAGES ARISING FROM OR RELATED TO THE DEVELOPER'S WIRELESS PRODUCT.

1.2 Purpose

Samsung has been a pioneer and an advocate of the wireless charging technology by implementing it in smartphones since 2015. Samsung smartphones are certified by the Wireless Power Consortium (WPC), compliant to WPC Basic Power Profile (BPP) specification of 5W. Samsung smartphones are also compliant to Power Matter Alliance (PMA) standard specification. Samsung Wireless Fast Charge, a proprietary extension to WPC BPP specification has enhanced the wireless power delivery higher than 5W to Samsung smartphones for the sake of user's benefit, which is not compatible with generic WPC Extended Power Profile (EPP) specification. Samsung is enthusiastic to help any 3rd -party developers to use this document, in order to establish the safe and reliable eco-system of Samsung Wireless Fast Charge. From this document, 3rd party developers can learn to design their wireless charger products to fast-charge Samsung smartphones.

1.3 Conformance requirement

Any manufacturers deploying Samsung PPDE technology are obligated to attain the WPC (Wireless Power Consortium) certification of their wireless charger products including Samsung PPDE compliance test at designated ATLs (Authorized Test Labs).

Information about WPC PPDE compliance test is available at :
https://members.wirelesspowerconsortium.com/members/members-info/swg/proprietary-mode-safety-tests.html

2 Samsung Proprietary Packet

Samsung Proprietary Power Delivery Extension (PPDE) is carried out through the specific process between PRX and PTX in power transfer phase, and the types and operations of the mandatory proprietary packets are follows.

2.1 PRX Proprietary Packet (ASK)

PRX uses 0x18 and 0x28 header of WPC ASK proprietary packet, requests whether PTX supports Samsung PPDE, sets up the proprietary charging mode, and sends a response to FSK packet received from PTX.

Table 1. PRX Proprietary Packet

Header	Message		Name	Function Description
	MSG1	MSG0		
0x18		0xFF	ACK	Response of Receiving FSK Packet
0x28	0x0C	0x00	Request PP_TX	Request of PPDE PTX availability
	0x06	0x05	PP_SET	PP setting of Power Transfer Phase
		0x2C		PP setting of Proprietary Power Transfer Phase

2.1.1 ACK

PRX sends ACK packet (0x18 0xFF) to PTX when PRX receives FSK packet from PTX.

2.1.2 Request PP_TX

When PRX goes into power transfer phase, PRX sends Request PP_TX packet (0x28 0x0C 0x00) in order to receive a reply for PTX regarding the proprietary charging availability. If PRX does not receive PP_TX packet with 0x01 message from PTX, PTX does not set proprietary power transfer.

2.1.3 PP_SET

After PRX check the proprietary charging availability, PRX sends PP_SET packet to PTX in order to set the power transfer mode of PRX and PTX.

If PRX sends PP_SET packet with 0x2C message to PTX, PTX shall go into proprietary power transfer mode.

If PRX sends PP_SET packet with 0x05 message to PTX, PTX shall go back to power transfer mode.

2.2 PTX Proprietary Packet (FSK)

PTX uses 0x02 header of WPC FSK proprietary packet in order to response whether PTX supports Samsung PPDE to PRX. And PTX should respond only when the request packet of PRX is received.

2.2.1 Signal Modulation Depth Requirement

The modulation depth of FSK sent from PTX to PRX shall be "Positive depth 0" of WPC specification.

Table 2. FSK modulation depth

Polarity	Depth	$\frac{1}{f_{mod}} - \frac{1}{f_{op}}$		Unit
		Minimum	Maximum	
positive	3	−282.00	−249.00	ns
positive	2	−157.00	−124.00	ns
positive	1	−94.50	−61.50	ns
positive	0	−63.25	−30.25	ns
negative	0	30.25	63.25	ns
negative	1	61.50	94.50	ns
negative	2	124.00	157.00	ns
negative	3	249.00	282.00	ns

2.2.2 Packet Timing

PTX should respond PP_TX packet after first control error packet following Request PP_TX from PRX.

PTX should send PP_TX packet after a specific delay after receiving control error packet.

Figure 1. PP_TX timing

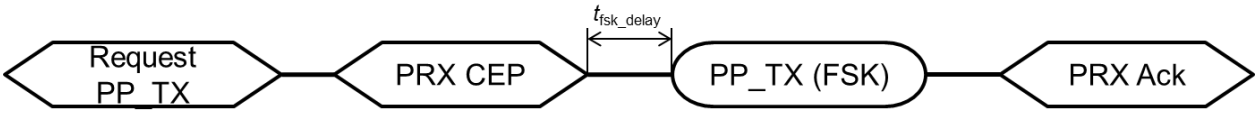


Table 3. FSK Packet timing

Parameter	Symbol	Minimum	Target	Maximum	Unit
FSK delay time	t_{fsk_delay}	3	5	10	ms

2.2.3 Packet Format

PTX uses 0x02 header of WPC FSK proprietary packet, responds availability of Samsung PPDE.

This FSK packet must contain the checksum byte.

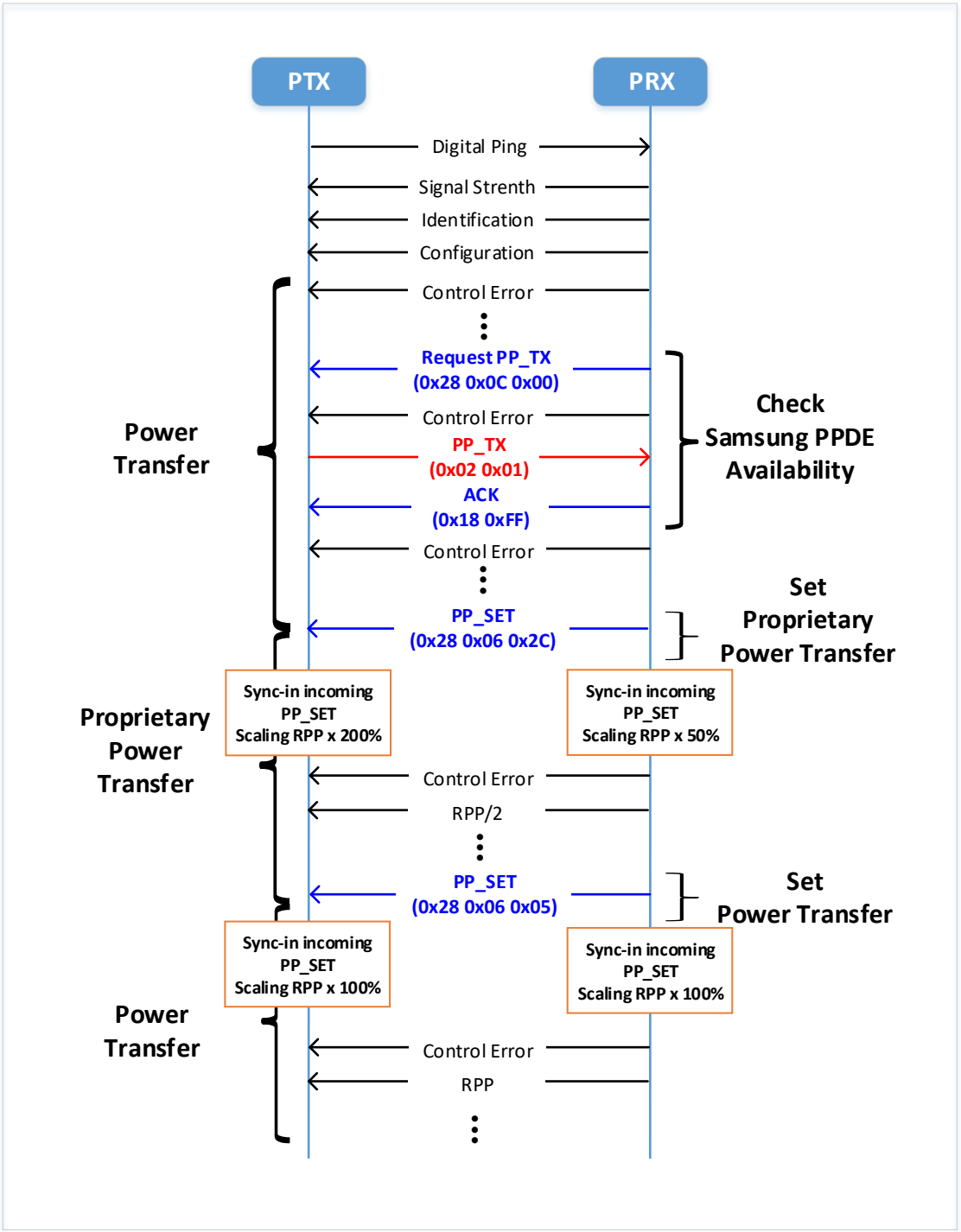
Table 4. PRX Proprietary Packet

Header	Message	Name	Function Description
0x02	0x01	PP_TX	PPDE Available

3 Work Flow and Sequence

The work flow and sequence of the Samsung Proprietary Power Delivery Extension (PPDE) are as follows

Figure 2. Sequence



1. Samsung PPDE starts from the beginning of power transfer phase.
2. PRX sends Request PP_TX packet in order to check PPDE availability of PTX.
3. PTX should responds PP_TX packet after the first control error packet sent following Request PP_TX packet from PRX.
4. PRX responds ACK packet which means PRX received FSK packet from PTX.
5. When the above procedure is completed, PRX sends PP_SET packet with 0x2C value to PTX in order to set Proprietary mode and PRX start to send RPP packet with 50% scaling.
6. PTX calculates RPP packet received later in the PP_SET packet with 200% scaling.
7. In proprietary power transfer, PTX receives PP_SET packet with 0x05 value, PTX calculates RPP packet with 100% scaling.