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RENESAS TECHNICAL UPDATE

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Product Category	MPU/MCU		Document No.	TN-SH7-A863A/E	Rev.	1.00
Title	Note on Setting the PWM Carrier Cycle in Complementary PWM Mode 1 to Complementary PWM Mode 3 for MTU, MTU2, or MTU2S		Information Category	Technical Notification		
Applicable Product	See below	Lot No. ALL	Reference Document	See below		

This document describes a note on setting values of timer cycle data registers and timer dead time data registers in complementary PWM mode 1 to complementary PWM mode 3 for the multi-function timer pulse unit (MTU, MTU2, or MTU2S) in the above applicable products.

Note

When outputting PWM waveforms in complementary PWM mode 1 to complementary PWM mode 3 under the following condition: Timer cycle data register(TCDR) ≤ Timer dead time data register(TDDR) × 2 + 2, data in the buffer register*1 may not be transferred to the compare register*1 and therefore the duty cycle may not be changed.

Measure

When generating PWM waveforms in complementary PWM mode 1 to complementary PWM mode 3, set TCDR and TDDR to values that satisfy the following condition:

$$TCDR > TDDR \times 2 + 2$$

Note: *1 Refer to the corresponding User's Manual: Hardware for details on buffer registers and compare registers.

Corrections in the Manual

The corrections are explained using "SH7214 Group, SH7216 Group User's Manual: Hardware" as an example.

11.3.26 Timer Cycle Data Register (TCDR)

[Before Change]

TCDR is a 16-bit register used only in complementary PWM mode. Set half the PWM carrier sync value as the TCDR register value. This register is constantly compared with the TCNTS counter in complementary PWM mode, and when a match occurs, the TCNTS counter switches direction (decrement to increment).

[After Change]

TCDR is a 16-bit register used only in complementary PWM mode. Set half the PWM carrier sync value **(note that this value should be at least double the value specified in TDDR + 3)** as the TCDR register value. This register is constantly compared with the TCNTS counter in complementary PWM mode, and when a match occurs, the TCNTS counter switches direction (decrement to increment).

11.4.8 Complementary PWM Mode

(2) Outline of Complementary PWM Mode Operation

(g)*2 PWM Cycle Setting

[Before Change]

In complementary PWM mode, the PWM pulse cycle is set in two registers—TGRA_3, in which the TCNT_3 upper limit value is set, and TCDR, in which the TCNT_4 upper limit value is set. The settings should be made so as to achieve the following relationship between these two registers:

With dead time: TGRA_3 set value = TCDR set value + TDDR set value

Without dead time: TGRA_3 set value = TCDR set value + 1

[After Change]

In complementary PWM mode, the PWM pulse cycle is set in two registers—TGRA_3, in which the TCNT_3 upper limit value is set, and TCDR, in which the TCNT_4 upper limit value is set. The settings should be made so as to achieve the following relationship between these two registers:

With dead time: TGRA_3 set value = TCDR set value + TDDR set value

TCDR set value > Double the TDDR set value + 2

Without dead time: TGRA_3 set value = TCDR set value + 1

TCDR set value > 4

Note: *2 In the case of the SH7047 and SH7144 Series, the subsection number is 6.

In the case of the SH7080, SH7137, SH7146, and SH/Tiny Series, the subsection number is 7.

Applicable Products and Reference Documents

Series	Group	Reference Document Title	Rev.	Document No.
SH7040	SH7040, SH7041, SH7042, SH7043, SH7044, SH7045	SH7040, SH7041, SH7042, SH7043, SH7044, SH7045 Group Hardware Manual	6.00	REJ09B0044-0600O
SH7046	SH7046, SH7048, SH7148	SH7046 Group Hardware Manual	4.00	REJ09B0270-0400
	SH7101, SH7104, SH7106, SH7108	SH7108, SH7109 Group Hardware Manual	1.00	REJ09B0069-0100
SH7047	SH7047, SH7049	SH-2 SH7047 Group Hardware Manual	2.00	REJ09B0020-0200Z
	SH7105, SH7107, SH7109	SH7108, SH7109 Group Hardware Manual	1.00	REJ09B0069-0100
SH7080	SH7083, SH7084, SH7085, SH7086	SH7080 Group User's Manual: Hardware	5.00	R01UH0198EJ0500
SH7137	SH7131, SH7132, SH7136, SH7137	SH7137 Group Hardware Manual	3.00	REJ09B0402-0300
SH7144	SH7144, SH7145	SH7144 Group, SH7145 Group Hardware Manual	4.00	REJ09B0108-0400
SH7146	SH7146, SH7149	SH7146 Group User's Manual: Hardware	4.00	R01UH0049EJ0400

Series	Group	Reference Document Title	Rev.	Document No.
SH7200	SH7201	SH7201 Group User's Manual: Hardware	3.00	R01UH0026EJ0300
	SH7203	SH7203 Group Hardware Manual	3.00	REJ09B0313-0300
	SH7205	SH7205 Group Hardware Manual	2.00	REJ09B0372-0200
	SH7206	SH7206 Group User's Manual: Hardware	4.00	R01UH0283EJ0400
SH7210	SH7211	SH7211 Group Hardware Manual	3.00	REJ09B0344-0300
SH7216	SH7214, SH7216	SH7214 Group, SH7216 Group User's Manual: Hardware	3.00	R01UH0230EJ0300
SH7231	SH7231	SH7231 Group User's Manual: Hardware	2.00	R01UH0073EJ0200
SH7239	SH7237, SH7239	SH7239 Group, SH7237 Group User's Manual: Hardware	1.00	R01UH0086EJ0100
SH7243	SH7243	SH7280 Group, SH7243 Group User's Manual: Hardware	3.00	R01UH0229EJ0300
SH7260	SH7261	SH7261 Group User's Manual: Hardware	3.00	R01UH0025EJ0300
	SH7262, SH7264	SH7262 Group, SH7264 Group User's Manual: Hardware	3.00	R01UH0134EJ0300
	SH7263	SH7263 Group Hardware Manual	3.00	REJ09B0290-0300
	SH7265	SH7265 Group Hardware Manual	2.00	REJ09B0351-0200
	SH7266, SH7267	SH7266 Group, SH7267 Group User's Manual: Hardware	2.00	R01UH0412EJ0200
	SH7268, SH7269	SH7268 Group, SH7269 Group User's Manual: Hardware	2.00	R01UH0048EJ0200
	SH726A, SH726B	SH726A Group, SH726B Group User's Manual: Hardware	1.00	R01UH0202EJ0100
SH7280	SH7285, SH7286	SH7280 Group, SH7243 Group User's Manual: Hardware	3.00	R01UH0229EJ0300
SH/Tiny	SH7124, SH7125	SH7125 Group, SH7124 Group Hardware Manual	5.00	REJ09B0243-0500