To our customers,

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Renesas Electronics website: [http://www.renesas.com](http://www.renesas.com)

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April 1\(^{st}\), 2010
Renesas Electronics Corporation

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Issued by: Renesas Electronics Corporation ([http://www.renesas.com](http://www.renesas.com))

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R8C/Tiny Series
General-purpose Program for Calculating Sum-of-Products

1. Abstract
This program calculates a sum of products using a sum-of-products calculating instruction (RMPA).

2. Introduction
This program calculates a sum of products using a sum-of-products calculating instruction (RMPA). Set the multiplier in a variable area (DATA11-13) and the multiplicand in a variable area (DATA21-23). The result of sum-of-products calculation is output to a variable area (ANS).
The program sets the number of sum-of-products in R3, the multiplicand address in A0, and the multiplier address in A1 before executing the RMPA instruction.

<table>
<thead>
<tr>
<th>Subroutine name : -</th>
<th>ROM capacity : 15 bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrupt during execution : Accepted</td>
<td>Number of stacks used : None</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Register/memory</th>
<th>Input</th>
<th>Output</th>
<th>Usage condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0</td>
<td>-</td>
<td>-</td>
<td>Used for calculation</td>
</tr>
<tr>
<td>R1</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>R2</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>R3</td>
<td>-</td>
<td>0000(_{16})</td>
<td>Number of some-of-products</td>
</tr>
<tr>
<td>A0</td>
<td>-</td>
<td>Last address of multiplicand</td>
<td>Multiplicand address</td>
</tr>
<tr>
<td>A1</td>
<td>-</td>
<td>Last address of multiplier</td>
<td>Multiplier address</td>
</tr>
<tr>
<td>DATA11 to 13</td>
<td>Multiplicand</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>DATA21 to 23</td>
<td>Multiplier</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>ANS</td>
<td>-</td>
<td>-</td>
<td>←</td>
</tr>
</tbody>
</table>

Usage precautions
3. Flowchart

```
ENTER

Set sum-of-products
calculation condition

Execute sum-of-products
calculation

Set calculation result

EXIT
```
4. The example of a reference program

```
.include apl.inc ; special page include file

;--------------------------------------------------------------------------
; R8C Program Collection No. 6
; CPU : R8C/Tiny
;--------------------------------------------------------------------------

VramTOP .EQU 000400H ; USER PROGRAM RAM START ADDRESS
VromTOP .EQU 00D000H ; 12Kbyte Flash version
Vsb .EQU 000400H ; Sets SB

.SECTION RAM,DATA

.ORG VramTOP ; RAM area
DATA11: .BLKB 1 ; Multiplicand 1
DATA12: .BLKB 1 ; Multiplicand 2
DATA13: .BLKB 1 ; Multiplicand 3
DATA21: .BLKB 1 ; Multiplier 1
DATA22: .BLKB 1 ; Multiplier 2
DATA23: .BLKB 1 ; Multiplier 3
ANS: .BLKB 2 ; Result of sum-of-products calculation

;----------------------------------------------------------------------------
; Title: Calculating sum-of-products
; Outline: Calculates a sum of products.
; Input: ------------------------> Output:
; R0 ( ) R0 (Calculation result)
; R1L ( ) R1L (Unused)
; R1H ( ) R1H (Unused)
; R2 ( ) R2 (Unused)
; R3 ( ) R3 (Indeterminate)
; A0 ( ) A0 (Indeterminate)
; A1 ( ) A1 (Indeterminate)
; Stack amount used: None
; Notes:

;----------------------------------------------------------------------------

.SECTION PROGRAM,CODE

.ORG VromTOP ; ROM area
.SB Vsb ; Declares SB register value
.SBSYM ANS

LDC #Vsb,SB

MOV.W #0,R0 ; Initializes calculation area
MOV.W #3,R3 ; Sets number of sum-of-products
MOV.W #DATA11,A0 ; Multiplicand address
MOV.W #DATA21,A1 ; Multiplier address
RMPA.B ; Executes sum-of-products calculation
MOV.W R0,ANS ; Sets calculation result

.END
```
5. Reference

SOFTWARE MANUAL
R8C/Tiny Series SOFTWARE MANUAL
(Acquire the most current version from Renesas web-site)

6. Web-site and contact for support

Renesas Web-site
http://www.renesas.com

Contact for Renesas technical support
Mail to: support_apl@renesas.com
<table>
<thead>
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<th>Rev.</th>
<th>Date</th>
<th>Description</th>
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</thead>
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<td>1.00</td>
<td>Dec 24, 2003</td>
<td>First edition issued</td>
</tr>
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