To our customers,

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

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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M16C/60 Series and M16C/20 Series

General-purpose Program for Converting from Lowercase Alphabet to Uppercase Alphabet

1. Abstract

This program converts a lowercase English alphabet in ASCII code into an uppercase English alphabet in ASCII code.

2. Introduction

This program converts a lowercase English alphabet in ASCII code into an uppercase English alphabet in ASCII code. Set the lowercase English alphabet in ASCII code in R0L. The converted uppercase English alphabet in ASCII code is output to R0L. Conversion information is output to the C flag.

<table>
<thead>
<tr>
<th>C</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Lowercase alphabet converted into uppercase alphabet</td>
</tr>
<tr>
<td>1</td>
<td>No converted because inconvertible code was input</td>
</tr>
</tbody>
</table>

Subroutine name : TOUPPER    ROM capacity : 16 bytes
Interrupt during execution : Accepted    Number of stacks used : None

<table>
<thead>
<tr>
<th>Register/memory</th>
<th>Input</th>
<th>Output</th>
<th>Usage condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0L</td>
<td>Lowercase alphabet (ASCII)</td>
<td>Uppercase alphabet (ASCII)</td>
<td>←</td>
</tr>
<tr>
<td>R0H</td>
<td>-</td>
<td>-</td>
<td>Unused</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>-</td>
<td>Unused</td>
</tr>
<tr>
<td>A0</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>A1</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>C flag</td>
<td>-</td>
<td>Conversion information</td>
<td>←</td>
</tr>
</tbody>
</table>

Usage precautions
3. Flowchart

```
ENTER

R0L ≥ 'a'?  No
Yes
R0L ≤ 'z'?  No
Yes
R0L - 20H -> R0L

Conversion succeeded
Clear C flag

Conversion failed
Set C flag

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

;*******************************************************************************
; * M16C General-purpose Programs *
; CPU : M16C *
;*******************************************************************************
VromTOP .EQU 0F0000H ; Declares start address of ROM

;==============================================================
; Title: Converting ASCII code lowercase alphabet into uppercase alphabet
; Contents of processing:
; The ASCII code input in R0L is converted from a lowercase English alphabet
; into an uppercase English alphabet and the result is returned to R0L.
; No conversion is performed if any code is input in R0L that is not a
; lowercase English alphabet.
; Procedure: (1) Input ASCII code in R0L.
; (2) Call the subroutine.
; (3) Converted ASCII code is loaded into R0L.
; Result: The C flag is cleared to 0 when the code was converted from a lowercase
; alphabet into an uppercase alphabet. The C flag is set to 1 when the code
; was not converted.
; Input: ------------------------------> Output:
; R0L (ASCII code) R0L (ASCII code)
; R0H ( ) R0H (Unused)
; R1 ( ) R1 (Unused)
; R2 ( ) R2 (Unused)
; R3 ( ) R3 (Unused)
; A0 ( ) A0 (Unused)
; A1 ( ) A1 (Unused)
; Stack amount used: None
;==============================================================

.SECTION PROGRAM,CODE
.ORG VromTOP ; ROM area

TOUPPER:

CMP.B '#a',R0L ; Lowercase alphabet 'a' or above?
JLTU TOUPNON ; -- no (not converted)
CMP.B '#z',R0L ; Lowercase alphabet 'z' or below?
JGTU TOUPNON ; -- no (not converted)
SUB.B #20H,R0L ; Converts from lowercase alphabet into
; uppercase alphabet
FCLR C ; Sets "converted" information
RTS ;

TOUPNON:

FSET C ; Sets "not-converted" information
RTS ;

.END ;
5. Reference

SOFTWARE MANUAL
M16C/60 M16C/20 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
## REVISION HISTORY

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Date</th>
<th>Description</th>
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</thead>
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<tr>
<td>1.00</td>
<td>Jul 08, 2002</td>
<td>First edition issued</td>
</tr>
</tbody>
</table>

Summary
Keep safety first in your circuit designs!

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