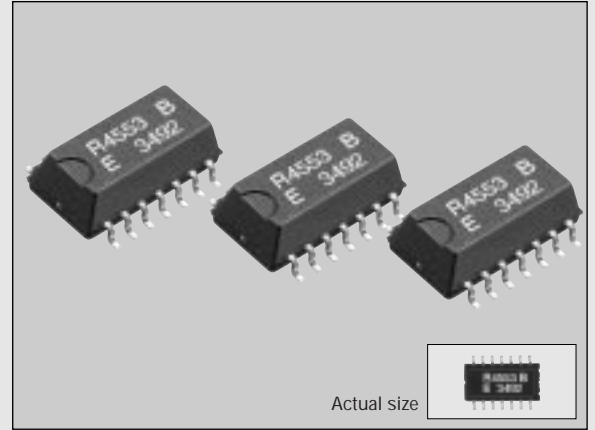


SERIAL-INTERFACE REAL TIME CLOCK MODULE

# RTC-4553

- Built-in crystal unit allows adjustment-free efficient operation.
- The small package makes high-density mounting possible. (SOP 14-pin)
- Automatic calendar function (year, month, day, day of the week, hour, minute, second).
- Automatic leap year correction. (up to 2099)
- Built-in 30 x 4-bit S-RAM.
- High-speed access.
- Reference pulse output. (1024 Hz, 1/10 Hz)
- Low current consumption. (1  $\mu$ A typical)
- Similar mounting method to that used for universal type SMD IC.



## Specifications (characteristics)

### Absolute Max. rating

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	V <sub>DD</sub>	V <sub>DD</sub> -GND	-0.3	+6.0	V
Input voltage	V <sub>IN</sub>	S <sub>IN</sub> , S <sub>CK</sub> , WR, CS <sub>0</sub> , CS <sub>1</sub>		V <sub>DD</sub> +0.3	
Output voltage	V <sub>OUT</sub>	S <sub>OUT</sub> , TP <sub>OUT</sub>			
Storage temperature	T <sub>STG</sub>	Stored without tape & reel	-55	+125	°C
Soldering conditions	T <sub>SOL</sub>		Twice at under 260°C within 10 sec. or under 230°C within 3 min.		

### Operating range

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating voltage	V <sub>DD</sub>	—	2.7	5.0	5.5	V
Operating temperature	T <sub>OPR</sub>		-30	—	+70	°C

### Frequency characteristics

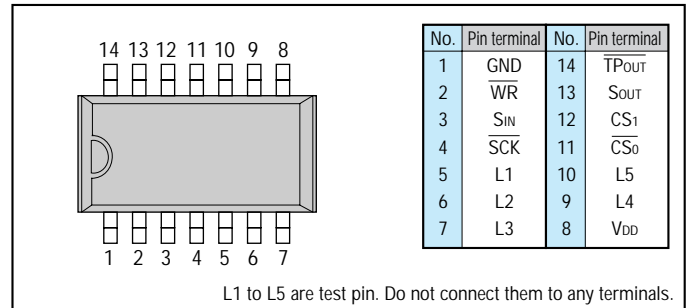
Item	Symbol	Condition	Range	Unit	
Frequency tolerance	$\Delta f/f_0$	Ta=25°C, V <sub>DD</sub> =5V	AA	5 $\pm$ 5	ppm
			A	5 $\pm$ 10	
			B	5 $\pm$ 20	
Frequency temperature characteristics	T <sub>OP</sub>	Ta=-10 to 70°C, V <sub>DD</sub> =5V Reference at 25°C	+10 -120	ppm	
Frequency voltage characteristics	f <sub>V</sub>	Ta=Fix, V <sub>DD</sub> =2 to 5.5V Reference at 5V	$\pm$ 5		
Aging	f <sub>A</sub>	Ta=25°C, V <sub>DD</sub> =5V, first year		ppm/year	

### DC characteristics

● V<sub>DD</sub>=5V $\pm$ 10% (GND=0V, Ta=-30°C to +70°C)

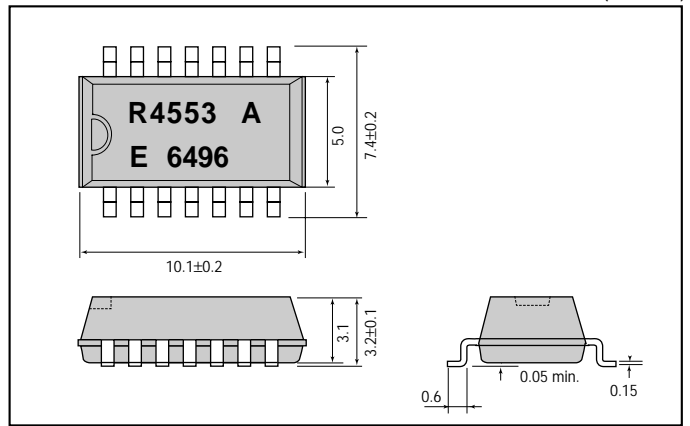
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Data holding voltage	V <sub>DH</sub>	—	2.0	—	5.5	V
Current consumption	I <sub>DD1</sub>	S <sub>CK</sub> =500 kHz	—	—	100	$\mu$ A
	I <sub>DD2</sub>	S <sub>CK</sub> =DC	—	1.0	3.0	
Output voltage	V <sub>OH</sub>	I <sub>OH</sub> =-400 $\mu$ A V <sub>DD</sub> -0.4	—	—	—	V
	V <sub>OL</sub>	I <sub>OL</sub> =1.6mA	—	—	0.4	
Off leak current	I <sub>OZH</sub>	V <sub>OUT</sub> =5.5V	-2.0	—	2.0	$\mu$ A
	I <sub>OZL</sub>	V <sub>OUT</sub> =0V	—	—	—	
Input voltage	V <sub>IH</sub>	—	4/5 V <sub>DD</sub>	—	—	V
	V <sub>IL</sub>	—	—	—	1/5 V <sub>DD</sub>	
Input current	I <sub>IH</sub>	V <sub>IN</sub> =5.5V	-2.0	—	2.0	$\mu$ A
	I <sub>IL</sub>	V <sub>IN</sub> =0V	—	—	—	
Oscillation start-up time	T <sub>OSC</sub>	Ta=25°C	—	—	3.0	s

### Terminal connection



### External dimensions

(Unit: mm)



● V<sub>DD</sub>=3V $\pm$ 10% (GND=0V, Ta=-30°C to +70°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Data holding voltage	V <sub>DH</sub>	—	2.0	—	3.3	V
Current consumption	I <sub>DD1</sub>	S <sub>CK</sub> =300 kHz	—	—	100	$\mu$ A
	I <sub>DD2</sub>	S <sub>CK</sub> =DC	—	1.0	3.0	
Output voltage	V <sub>OH</sub>	I <sub>OH</sub> =-400 $\mu$ A V <sub>DD</sub> -0.4	—	—	—	V
	V <sub>OL</sub>	I <sub>OL</sub> =1.6mA	—	—	0.4	
Off leak current	I <sub>OZH</sub>	V <sub>OUT</sub> =3.3V	-2.0	—	2.0	$\mu$ A
	I <sub>OZL</sub>	V <sub>OUT</sub> =0V	—	—	—	
Input voltage	V <sub>IH</sub>	—	4/5 V <sub>DD</sub>	—	—	V
	V <sub>IL</sub>	—	—	—	1/5 V <sub>DD</sub>	
Input current	I <sub>IH</sub>	V <sub>IN</sub> =3.3V	-2.0	—	2.0	$\mu$ A
	I <sub>IL</sub>	V <sub>IN</sub> =0V	—	—	—	
Oscillation start-up time	T <sub>OSC</sub>	Ta=25°C	—	—	3.0	s

Register table

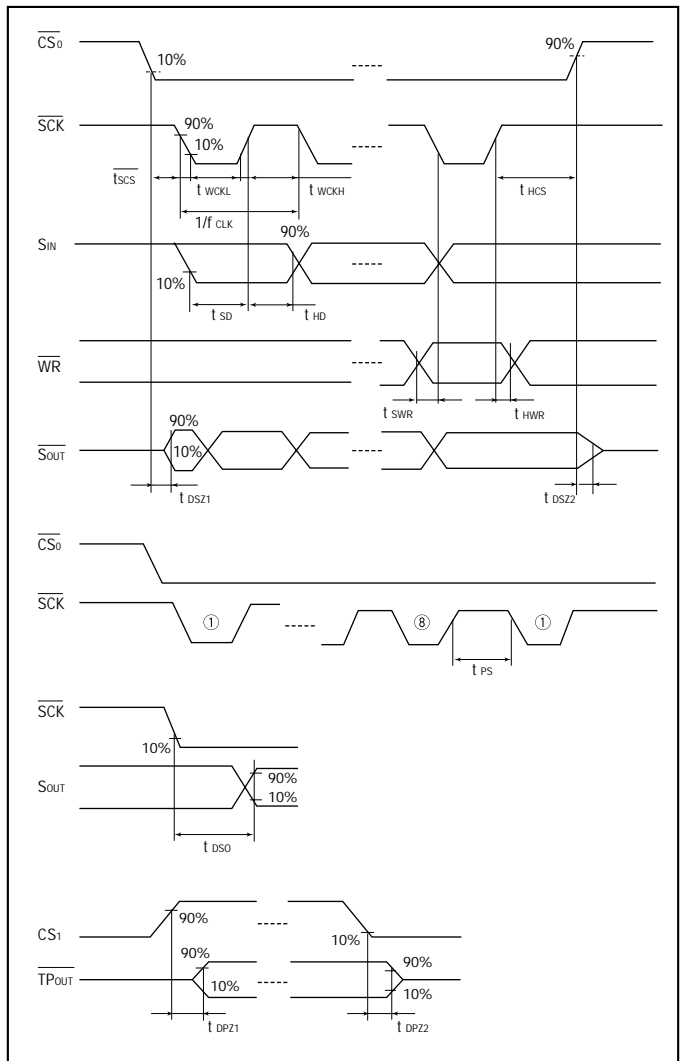
Address	MODE 0				Register symbol	MODE 0				MODE 1				MODE 2				
	Counter control register					User RAM Domain 1				User RAM Domain 2								
	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>		D <sub>3</sub>	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>	Register name	D <sub>3</sub>	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>	D <sub>3</sub>	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>
0	0	0	0	0	S <sub>1</sub>	S <sub>8</sub>	S <sub>4</sub>	S <sub>2</sub>	S <sub>1</sub>	1-second digit register	RA <sub>3</sub>	RA <sub>2</sub>	RA <sub>1</sub>	RA <sub>0</sub>	RA <sub>63</sub>	RA <sub>62</sub>	RA <sub>61</sub>	RA <sub>60</sub>
1	0	0	0	1	S <sub>10</sub>	0	S <sub>40</sub>	S <sub>20</sub>	S <sub>10</sub>	10-second digit register	RA <sub>7</sub>	RA <sub>6</sub>	RA <sub>5</sub>	RA <sub>4</sub>	RA <sub>67</sub>	RA <sub>66</sub>	RA <sub>65</sub>	RA <sub>64</sub>
2	0	0	1	0	MI <sub>1</sub>	mi <sub>8</sub>	mi <sub>4</sub>	mi <sub>2</sub>	mi <sub>1</sub>	1-minute digit register	RA <sub>11</sub>	RA <sub>10</sub>	RA <sub>9</sub>	RA <sub>8</sub>	RA <sub>71</sub>	RA <sub>70</sub>	RA <sub>69</sub>	RA <sub>68</sub>
3	0	0	1	1	MI <sub>10</sub>	0	mi <sub>40</sub>	mi <sub>20</sub>	mi <sub>10</sub>	10-minute digit register	RA <sub>15</sub>	RA <sub>14</sub>	RA <sub>13</sub>	RA <sub>12</sub>	RA <sub>75</sub>	RA <sub>74</sub>	RA <sub>73</sub>	RA <sub>72</sub>
4	0	1	0	0	H <sub>1</sub>	h <sub>8</sub>	h <sub>4</sub>	h <sub>2</sub>	h <sub>1</sub>	1-hour digit register	RA <sub>19</sub>	RA <sub>18</sub>	RA <sub>17</sub>	RA <sub>16</sub>	RA <sub>79</sub>	RA <sub>78</sub>	RA <sub>77</sub>	RA <sub>76</sub>
5	0	1	0	1	H <sub>10</sub>	PM/AM	0	h <sub>20</sub>	h <sub>10</sub>	10-hour digit register	RA <sub>23</sub>	RA <sub>22</sub>	RA <sub>21</sub>	RA <sub>20</sub>	RA <sub>83</sub>	RA <sub>82</sub>	RA <sub>81</sub>	RA <sub>80</sub>
6	0	1	1	0	W	0	w <sub>4</sub>	w <sub>2</sub>	w <sub>1</sub>	Day of the week digit register	RA <sub>27</sub>	RA <sub>26</sub>	RA <sub>25</sub>	RA <sub>24</sub>	RA <sub>87</sub>	RA <sub>86</sub>	RA <sub>85</sub>	RA <sub>84</sub>
7	0	1	1	1	D <sub>1</sub>	d <sub>8</sub>	d <sub>4</sub>	d <sub>2</sub>	d <sub>1</sub>	1-day digit register	RA <sub>31</sub>	RA <sub>30</sub>	RA <sub>29</sub>	RA <sub>28</sub>	RA <sub>91</sub>	RA <sub>90</sub>	RA <sub>89</sub>	RA <sub>88</sub>
8	1	0	0	0	D <sub>10</sub>	0	0	d <sub>20</sub>	d <sub>10</sub>	10-day digit register	RA <sub>35</sub>	RA <sub>34</sub>	RA <sub>33</sub>	RA <sub>32</sub>	RA <sub>95</sub>	RA <sub>94</sub>	RA <sub>93</sub>	RA <sub>92</sub>
9	1	0	0	1	MO <sub>1</sub>	mo <sub>8</sub>	mo <sub>4</sub>	mo <sub>2</sub>	mo <sub>1</sub>	1-month digit register	RA <sub>39</sub>	RA <sub>38</sub>	RA <sub>37</sub>	RA <sub>36</sub>	RA <sub>99</sub>	RA <sub>98</sub>	RA <sub>97</sub>	RA <sub>96</sub>
A	1	0	1	0	MO <sub>10</sub>	0	0	0	mo <sub>10</sub>	10-month digit register	RA <sub>43</sub>	RA <sub>42</sub>	RA <sub>41</sub>	RA <sub>40</sub>	RA <sub>103</sub>	RA <sub>102</sub>	RA <sub>101</sub>	RA <sub>100</sub>
B	1	0	1	1	Y <sub>1</sub>	y <sub>8</sub>	y <sub>4</sub>	y <sub>2</sub>	y <sub>1</sub>	1-year digit register	RA <sub>47</sub>	RA <sub>46</sub>	RA <sub>45</sub>	RA <sub>44</sub>	RA <sub>107</sub>	RA <sub>106</sub>	RA <sub>105</sub>	RA <sub>104</sub>
C	1	1	0	0	Y <sub>10</sub>	y <sub>80</sub>	y <sub>40</sub>	y <sub>20</sub>	y <sub>10</sub>	10-year digit register	RA <sub>51</sub>	RA <sub>50</sub>	RA <sub>49</sub>	RA <sub>48</sub>	RA <sub>111</sub>	RA <sub>110</sub>	RA <sub>109</sub>	RA <sub>108</sub>
D	1	1	0	1	C <sub>1</sub>	TPS	30ADJ	CNTR	24/12	Control register 1	RA <sub>55</sub>	RA <sub>54</sub>	RA <sub>53</sub>	RA <sub>52</sub>	RA <sub>115</sub>	RA <sub>114</sub>	RA <sub>113</sub>	RA <sub>112</sub>
E	1	1	1	0	C <sub>2</sub>	BUSY	PONC	—	*	Control register 2	RA <sub>59</sub>	RA <sub>58</sub>	RA <sub>57</sub>	RA <sub>56</sub>	RA <sub>119</sub>	RA <sub>118</sub>	RA <sub>117</sub>	RA <sub>116</sub>
F	1	1	1	1	C <sub>3</sub>	SYSR	TEST	MS <sub>1</sub>	MS <sub>0</sub>	Control register 3	Same as MODE 0				Same as MODE 0			

Note: \* TEST bit should be "0".

Switching characteristics (Ta=-30°C to +70°C, VDD=5V±10%, GND=0V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
SCK input frequency	f <sub>SCK</sub>	—	—	—	500	kHz
SCK "L" time	t <sub>WSCKL</sub>	—	—	—	—	—
SCK "H" time	t <sub>WSCKH</sub>	—	1.0	—	—	—
SCK pause time	t <sub>PS</sub>	—	—	—	—	—
CS <sub>0</sub> setup time	t <sub>SCS</sub>	—	0	—	—	μs
CS <sub>0</sub> hold time	t <sub>HCS</sub>	—	0.5	—	—	
S <sub>IN</sub> data setup time	t <sub>SD</sub>	—	0.2	—	—	
S <sub>IN</sub> data Hold time	t <sub>HD</sub>	—	—	—	—	
WR setup time	t <sub>SWR</sub>	—	1.0	—	—	
WR hold time	t <sub>HWR</sub>	—	0.5	—	—	ns
S <sub>OUT</sub> delay time	t <sub>DSO</sub>	—	—	150	500	
CS <sub>0</sub> and CS <sub>1</sub> enable to S <sub>OUT</sub> output	t <sub>DSZ1</sub>	CL=100pF	—	—	100	
CS <sub>0</sub> disenable to S <sub>OUT</sub> high Z	t <sub>DSZ2</sub>	—	—	—	—	
CS <sub>1</sub> enable to S <sub>OUT</sub> output	t <sub>DPZ1</sub>	—	—	—	—	
CS <sub>1</sub> enable to S <sub>OUT</sub> high Z	t <sub>DPZ2</sub>	—	—	—	—	

Timing chart



Block diagram

