

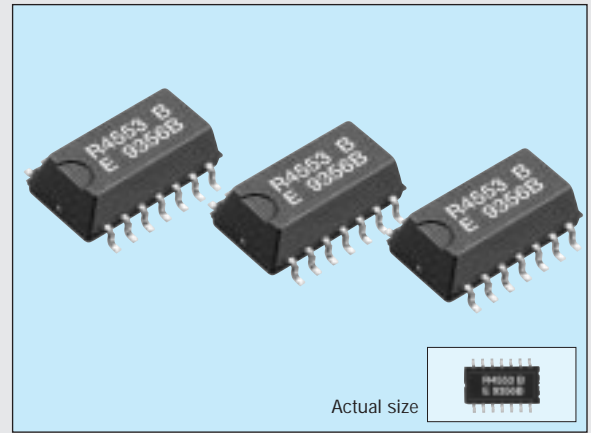
SERIAL-INTERFACE REAL TIME CLOCK MODULE WITH SRAM

# RTC-4553

Product number (please refer to page 2)

**Q4145535xxxxx00**

- Built-in crystal unit allows adjustment-free efficient operation.
- Automatic calendar function (year, month, day, day of the week, hour, minute, second).
- Automatic leap year correction.
- Built-in 30 x 4-bit S-RAM.
- Reference pulse output. (1024 Hz, 1/10 Hz)



The details are mentioned in the application manual.

<http://www.epsondevice.com>

## Specifications (characteristics)

### Absolute Max. rating

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	V <sub>DD</sub>	V <sub>DD</sub> -GND		+6.0	
Input voltage	V <sub>IN</sub>	S <sub>IN</sub> , S <sub>CK</sub> , WR, CS <sub>0</sub> , CS <sub>1</sub>	-0.3	V <sub>DD</sub> +0.3	V
Output voltage	V <sub>OUT</sub>	S <sub>OUT</sub> , TP <sub>OUT</sub>			
Storage temperature	T <sub>STG</sub>	Stored as bare product after unpacking	-55	+125	°C

### Operating range

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power voltage	V <sub>DD</sub>	—	2.7	5.0	5.5	V
Clock voltage	V <sub>CLK</sub>	—	2.0	—	5.5	V
Operating temperature	T <sub>OPR</sub>	No condensation	-30	—	+70	°C

### Frequency characteristics

Item	Symbol	Condition	Range	Unit	
Frequency tolerance	Δf/fo	Ta=+25 °C, V <sub>DD</sub> =5 V	AA	5±5	x 10 <sup>-6</sup>
			A	5±10	
			B	5±20	
Oscillation start-up time	T <sub>sta</sub>	Ta=+25 °C	3.0 Max.	s	
Frequency temperature characteristics	T <sub>op</sub>	Ta=-10 °C to +70 °C, V <sub>DD</sub> =5 V Reference at +25 °C	+10 -120	x 10 <sup>-6</sup>	
Frequency voltage characteristics	f/v	Ta=Fix, V <sub>DD</sub> =2 V to 5.5 V Reference at 5 V	±5		
Aging	fa	Ta=+25 °C, V <sub>DD</sub> =5 V, first year		x 10 <sup>-4</sup> /year	

### DC characteristics (GND=0 V, V<sub>DD</sub>=5 V ± 10 %, Ta=-30 °C to +70 °C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Current consumption	I <sub>DD1</sub>	S <sub>CK</sub> =500 kHz	—	—	100	μA
	I <sub>DD2</sub>	S <sub>CK</sub> =0 Hz	—	1.0	3.0	
Output voltage	V <sub>OH</sub>	I <sub>OH</sub> =-400 μA	V <sub>DD</sub> -0.4	—	—	V
	V <sub>OL</sub>	I <sub>OL</sub> =1.6 mA	—	—	0.4	
Off leak current	I <sub>ozH</sub>	V <sub>OUT</sub> =5.5 V	-2.0	—	2.0	μA
	I <sub>ozL</sub>	V <sub>OUT</sub> =0 V	—	—	—	
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> =5.5 V	-2.0	—	2.0	μA
	I <sub>IL</sub>	V <sub>IN</sub> =0 V	—	—	—	

## Terminal connection

No.	Pin terminal	No.	Pin terminal
1	GND	14	TP <sub>OUT</sub>
2	WR	13	S <sub>OUT</sub>
3	S <sub>IN</sub>	12	CS <sub>1</sub>
4	S <sub>CK</sub>	11	CS <sub>0</sub>
5	L1	10	L5
6	L2	9	L4
7	L3	8	V <sub>DD</sub>

L1 to L5 are test pin. Do not connect them to any terminals.

## External dimensions

(Unit: mm)

● RTC-4553 (SOP 14-pin)

Metal may be exposed on the top or bottom of this product. This won't affect any quality, reliability or electrical spec.

Register table

Address	MODE 0									MODE 1				MODE 2				
	Register symbol				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			

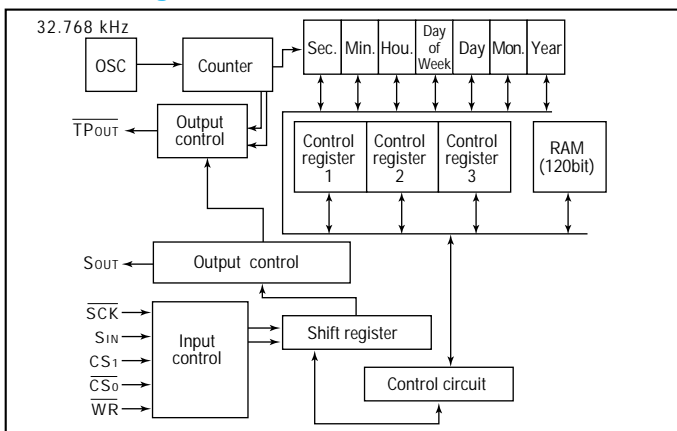
Note: \* TEST bit should be "0".

AC characteristics

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

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
SCK input frequency	fCLK	—	—	—	500	kHz
SCK "L" time	twckL	—	—	—	—	μs
SCK "H" time	twckH	—	1.0	—	—	
SCK pause time	tps	—	—	—	—	
CS <sub>0</sub> setup time	tscs	—	0	—	—	
CS <sub>0</sub> hold time	thcs	—	0.5	—	—	ns
S <sub>in</sub> data setup time	tsd	—	0.2	—	—	
S <sub>in</sub> data Hold time	tHD	—	—	—	—	
WR setup time	tswr	—	1.0	—	—	
WR hold time	thwr	—	0.5	—	—	ns
S <sub>out</sub> delay time	tdso	—	—	150	500	
CS <sub>0</sub> and CS <sub>1</sub> enable to S <sub>out</sub> output	tdsz1	Cl=100 pF	—	—	—	
CS <sub>0</sub> disable to S <sub>out</sub> high Z	tdsz2		—	—	100	
CS <sub>1</sub> enable to S <sub>out</sub> output	tdp21		—	—	—	
CS <sub>1</sub> enable to S <sub>out</sub> high Z	tdp22		—	—	—	

Block diagram



Timing chart

