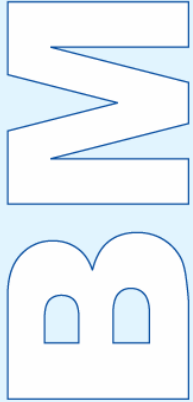




ChargerCore Family

BM-ChargeCore1.0-V1.2



Brief Manual of ChargerCore1.0 Family

Optimized AS-MCU for Li-Ion Battery Charger

V1.2

April 2006

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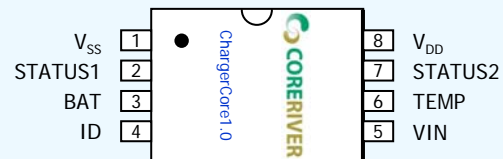
A. TTA Specification

B. Update History

1. Features

- ◆ Complete Charger for Li-Ion Batteries
- ◆ Very Low Thermal Dissipation
- ◆ CC (Constant Current) Profile
 - ✓ Charge Current : dependent on Maker
 - ✓ ID
 - 1.5K Ω : 750mA \pm 50mA
 - 4.7K Ω : 750mA \pm 50mA
 - 27K Ω : 450mA \pm 50mA
- ◆ CV (Constant Voltage) Profile
 - ✓ Charge Voltage : 4.2V -0.05V/+0.03V
- ◆ Wake-up
 - ✓ Wake-up Charging when the initial battery voltage is below 2.5V
 - ✓ 30 times repeat (charging during 5sec, standby during 2sec)
 - ✓ Fast Charging at 2.5V above
- ◆ Current Cut-Off
 - ✓ 30 ~ 100mA
- ◆ Recharge
 - ✓ When below 4.07V \pm 0.05V
- ◆ Chargeable Ambient Temperature Range
 - ✓ -5 $^{\circ}$ C \pm 3 $^{\circ}$ C ~ 45 $^{\circ}$ C \pm 3 $^{\circ}$ C
- ◆ Charging Time
 - ✓ Fast Charge : 4 hours
 - ✓ Recharge : 2 hours
- ◆ Over-Voltage Protection
 - ✓ Charge Cut-off when 4.35V \pm 0.05 above
- ◆ Error Mode
 - ✓ When battery voltage is greater than 4.35V
 - ✓ Short or Open in charging
 - ✓ Detecting Abnormal Battery
- ◆ LED Display
 - ✓ Red : in charging or in wake-up mode
 - ✓ Green : charge completion or in recharging
 - ✓ Yellow : Stand-by due to Temperature Emergency
 - ✓ Yellow Flickering : in Error mode
- ◆ E.S.D. protection up to 2,000V
- ◆ Latch-up protection up to \pm 200mA
- ◆ Korea TTA Specification Certification
- ◆ Package : 8-SPDIP and -SOIC

2. Pin Configurations

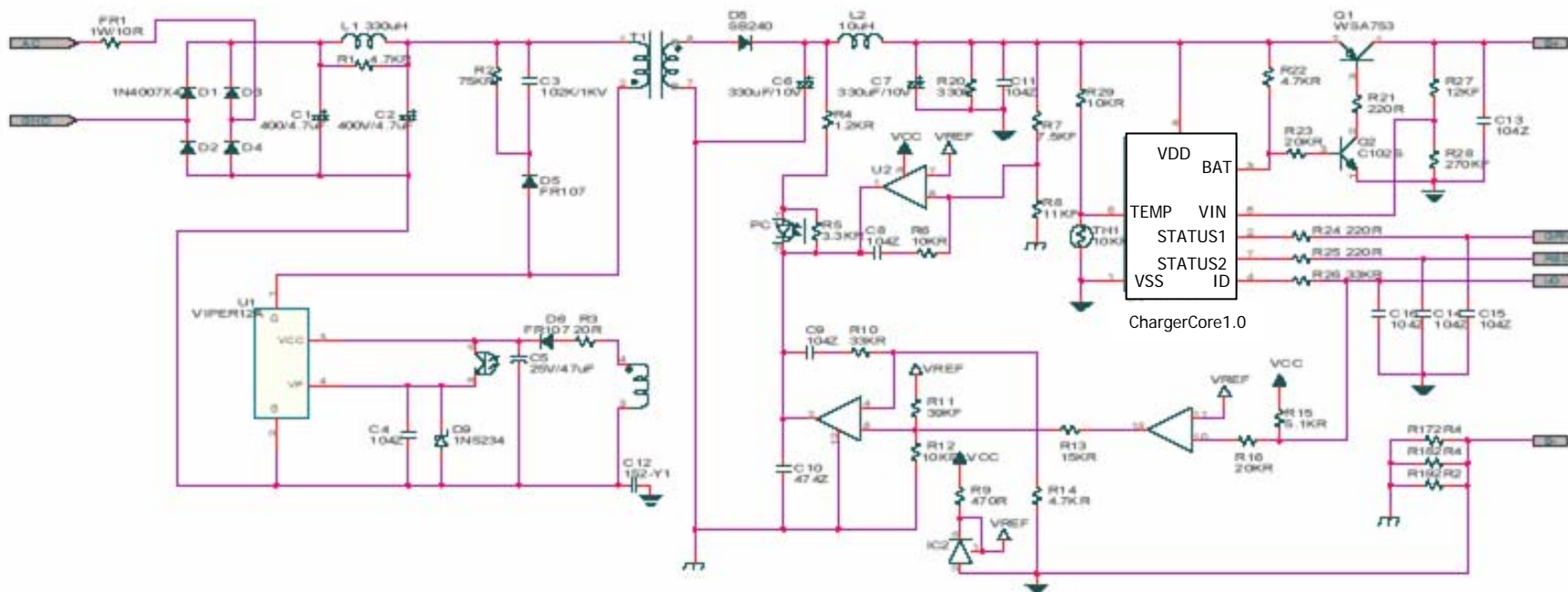


[8-SOIC / 8-SPIDP]

3. Pin Descriptions

Symbol	Direction	Description
V_{DD}	Input	Voltage Power Source
V_{SS}	Input	Voltage Power Ground
BAT	Input	<ul style="list-style-type: none"> ▪ Connected to battery
STATUS1	Output	<ul style="list-style-type: none"> ▪ Bit Programmable with Schmitt Trigger - Optional Pull-up Control Enable - Open-drain Output - Push-pull Output
STATUS2	Output	<ul style="list-style-type: none"> ▪ Bit Programmable with Schmitt Trigger - Optional Pull-up Control Enable - Open-drain Output - Push-pull Output (Default)
TEMP	Input	<ul style="list-style-type: none"> ▪ Input for an external NTC thermistor ▪ used for battery removal detection
VIN	Input	<ul style="list-style-type: none"> ▪ The input power source
ID	Output	<ul style="list-style-type: none"> ▪ Bit Programmable with Schmitt Trigger - Optional Pull-up Control Enable - Open-drain Output - Push-pull Output (Default)

4. Typical Application Circuit



5. Absolute Maximum Ratings

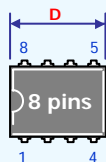
Items	Conditions	Ranges
Voltage on any pin relative to Ground	-	-0.5V to ($V_{DD}+0.5V$)
Voltage in V_{DD} relative to Ground	-	-0.5V to 6.5V
Output Voltage	-	-0.5V to ($V_{DD}+0.5V$)
Output Current High	One I/O pin active	-25mA
	All I/O pin active	-100mA
Output Current Low	One I/O pin active	+30mA
	All I/O pin active	+150mA
Operating Temperature	-	-40 °C to 85 °C
Storage Temperature	-	-65 °C to +150 °C
Soldering Temperature	-	160 °C for 10 seconds

6. DC Characteristics

* TA = -5 °C ~ +45 °C, V_{DD} = 2.4V ~ 5.5V unless otherwise specified.

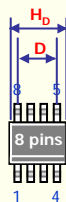
Parameter	Symbol	Pin	Conditions	Value			Unit
				Min.	Typ.	Max.	
Input Low Voltage	V _{IL1}	STATUS2, TEMP, VIN, ID	V _{DD} = 2.4V~5.5V	-0.5	-	0.2V _{DD} -0.1	V
	V _{IL2}	STATUS1, BAT		-0.5	-	0.3V _{DD}	
Input high Voltage	V _{IH1}	STATUS2, TEMP, VIN, ID	V _{DD} = 2.4V~5.5V	0.2V _{DD} +1.0	-	V _{DD} +0.5	V
	V _{IH2}	STATUS1, BAT		0.7V _{DD}	-	V _{DD} +0.5	
Output Low Voltage	V _{OL1}	STATUS1, STATUS2, TEMP, VIN, ID	I _{OL} = 20mA @V _{DD} =5V (I _{OL} = 5mA @V _{DD} =2.6V)	-	-	0.3V _{DD}	V
	V _{OL2}	BAT	I _{OL} = 10mA @V _{DD} =5V (I _{OL} = 2.5mA @V _{DD} =2.6V)	-	-	0.3V _{DD}	
Output High Voltage	V _{OH}	STATUS1, STATUS2, TEMP, VIN, ID	I _{OH} = -15mA @V _{DD} =5V (I _{OH} = -2.5mA @V _{DD} =2.6V)	0.7V _{DD}	-	-	V
	V _{OHP1}	STATUS2, TEMP, VIN, ID (pull-up resistor only)	I _{OH} = -140uA @V _{DD} =5V (I _{OH} = -20uA @V _{DD} =2.6V)	0.7V _{DD}	-	-	V
	V _{OHP2}	STATUS1 (pull-up resistor only)	I _{OH} = -10uA @V _{DD} =5V (I _{OH} = -1.5uA @V _{DD} =2.6V)	0.7V _{DD}	-	-	V
Input Leakage Current	I _{IL}	All pins except STATUS1	V _{IN} = V _{IH} or V _{IL}	-	-	±1	μA
Pin Capacitance	C _{IO}	All	V _{DD} = 5V	-	10	-	pF

7. Package Dimensions : 8-SPDIP/8-SOIC



[8-SPDIP]

Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
D	0.445	0.455	0.475	11.303	11.557	12.065



[8-SOIC]

Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
D	-	0.150	-	-	3.81	-
H _b	0.189	0.193	0.197	4.80	4.90	5.00

Appendix A : TTA Specification (1 of 3)

Test items		Test condition	Test description	SPEC
Category	Details			
Basic Function	Charging voltage	Room temperature, Load : Cut off current	4.15 ~ 4.23V _{DC}	4.23V _{DC} (set1 : set-up voltage)
	LED display / RED	Room temperature	RED ON	Charging is maintained.
	LED display/GREEN	Room temperature	GREEN ON	Completion of charging
	Overcharge detection	Room temperature	Charging is stopped.	4.3V _{DC} + 0.1V
	Abnormality detection	Room temperature	Charging is stopped.	Load open, Output Short
	Load Regulation	Room temperature, Load : Cut off current ~ 700mA, AC 220V	Measure with change of current (Load)	4.2V _{DC} (Set1 ± 0.05V)
	Line Regulation	Room temperature, AC 85 ~ 264V	Measure with change of AC voltage	4.2V _{DC} (Set1 ± 0.05V)
	Over-current detection	Room temperature, charging voltage 2.5V	The current when voltage drops below 2.5V by increasing load current	450mA ± 50mA (27kΩ) 750mA ± 50mA (4.7kΩ) 900mA ± 50mA (1.5kΩ)
	Output Ripple & Noise	<ul style="list-style-type: none"> Room temperature, AC 85 ~ 264V Load : Cut Off current ~ 700mA Connect 47uF ceramic capacitor at the output port in parallel, bandwidth 20MHz 	Measure with change of current (Load)	Max. 60mV _{pp}
	Reverse Current	Room temperature, output 4.2V, AC power OFF	Measure current flowing from a charger to a phone	Max. 0.5mA
	Compensation charging start voltage	Room temperature, AC 220V	LED display remains GREEN.	4.07V ± 0.05V
	Charging Cut Off Current	Room temperature, AC 220V	<ul style="list-style-type: none"> Set P/S to 4.15V. Then measure with change of current. LED display converts from RED to GREEN. 	Charging is completed at 30 ~ 100mA.
	AC Power ON / OFF	Room temp., 5 sec ON/OFF 30,000 cycles (AC 85V / 264V 15,000 cycles)	Normal operation	Normal operation

Appendix A : TTA Specification (2 of 3)

Test Items		Test condition	Test description	SPEC
Category	Details			
Environ- Mental stress test	Low temp. storage test	Leave it at room temp. for 2 hours.	Normal operation	Normal operation
		-40°C / 48 hours (65% increase in RH) (Power OFF)	No abnormality on the exterior	No abnormality on the exterior
	High temp. storage test	Leave it at room temp. for 2 hours.	Normal operation	Normal operation
		+75°C / 48 hours (65% increase in RH) (Power OFF)	No abnormality on the exterior	No abnormality on the exterior
	Temp. stress test	-40°C/+85°C / 2 hours respectively/15 Cycles	Normal operation	Normal operation
		Rise/drop period: shorter than 5 minutes. Leave it at room temp. for 3 hours.(Power OFF)	No abnormality on the exterior	No abnormality on the exterior
	High temp. high RH operation test	-40°C, 95% RH / 48 hours Max. Load AC 85 ~ 264V	Charging voltage: pass basic function test	4.2V _{DC} ± 0.05V
			Cut off charging at +40°C ± 3°C	Cut off charging
Low temp. operation test	0°C, 95% RH / 48 hours Max. Load AC 85 ~ 264V	Charging voltage: pass basic function test	4.2V _{DC} ± 0.05V	
		Cut off charging at -5°C ± 3°C	Cut off charging	
Electrical Characteristics (Basic stability)	ESD test	KN61000-4-2	No abnormal operation, no component destruction, no deterioration	KN61000-4-2
	Overvoltage applied	AC 300V 1 minute	Normal operation	Normal operation
	Thunderbolt surge	•Ring Wave : ±6kV, 500A / 30 sec period 5 cycles or •Combination Wave : ±2kV, 1kA/30 sec period 5 cycles	Normal operation	Normal operation
	Resisting voltage of insulation	Between the primary and the secondary ports, 3kV application/not exceeding 5mA. 220V:3kV- satisfaction of insulation resistance at the same time	Normal operation	Normal operation

Appendix A : TTA Specification (3 of 3)

Test items		Test condition	Test description	SPEC
Category	Details			
Safety test	Rise of surface temperature	AC : application of rated voltage + 10% Room temperature	Charging continues.	Not exceeding 55°C (ambient temperature 25°C)
	Power dissipation test	Charger power on	HS Power Off + Batt. condition After complete charging, measure with HS attached.	Not exceeding 1W
	AC Leakage Current	Room temperature	Input GND – Output GND, B+	Max. 0.10mA
	Heat generation of components	Room temp., Large capacity Battery charging (Charging current 750mA)	Measure heat at Switching IC, Transformer, Secondary Diode, and Output Tr.	Max. 85°C (Ambient temperature 25°C)
System strength test	Drop test	<ul style="list-style-type: none"> •Height : 120cm •Drop / Twice for each side 	Bare product condition	No abnormal operation, no component destruction, no deterioration

- ❖ RH : Humidity
- ❖ HS : Cellular phone
- ❖ H : Hour
- ❖ Cycle : Repeat
- ❖ ESD : Electric Static Discharge
- ❖ P/S : Power Supply

Appendix B : Update History

- ◆ V1.0
 - ✓ First release
- ◆ V1.1
 - ✓ Specification Update
 - ✓ Add on TTA Specification
- ◆ V1.2
 - ✓ Update TTA Specification