



# MP2658

## 36V, Standalone Switching Charger with Integrated MOSFETs for Multi-Cell Series Battery Pack

**RELIMINARY SPECIFICATIONS SUBJECT TO CHANGE**

### DESCRIPTION

The MP2658 is a highly integrated switching charger designed for portable devices with different battery chemistries. The MP2658 supports up to 7-cell series Li-ion, Li-polymer and LiFePO4 battery packs. It also supports Lead-acid, Super Capacitor, NiMH and NiCd battery packs from 2V to 31V. The device achieves up to 3A of charge current with any battery regulation voltages.

The device operates under a maximum 36V DC input voltage and hold-off up to 45V. When an input power supply is present, the MP2658 charges the battery with four phases in general: trickle charge, pre-charge, constant current charge, and constant voltage charge. While the device can be configured to different Pre-charge to fast charge thresholds and different charge termination modes by external pins to support Super Cap charging and different chemistries battery charging.

Power management is based on the input current and input voltage. If the input current exceeds the preset input current limit, or the input voltage decreases to the preset input voltage limit, the MP2658 automatically decreases the charge current to protect the input power supply from overload.

To guarantee safe operation, the MP2658 offers robust protection features such as battery over-voltage protection, battery temperature sensing and protection, thermal shutdown, and a charging safety timer.

The MP2658 is available in a QFN-19 (3mmx3mm) package.

### FEATURES

- Up to 36V Operating Input Voltage
- 45V Max Sustainable Voltage when Not Switching
- Up to 3A Charge Current
- Any Battery Regulation Voltage from 2V to 31V
- 0.5% Battery Regulation Voltage Accuracy
- Integrated Input Current Sensing and Reverse Blocking FET
- Internal Loop Compensation
- Input Current Limit Regulation
- Minimum Input Voltage Regulation
- Charge Operation Indicator
- Dead Battery Pack Recovery
- Battery Over-Voltage Protection
- Charge Safety Timer
- Battery NTC Thermal Monitor
- Available in a QFN-19 (3mmx3mm) Package

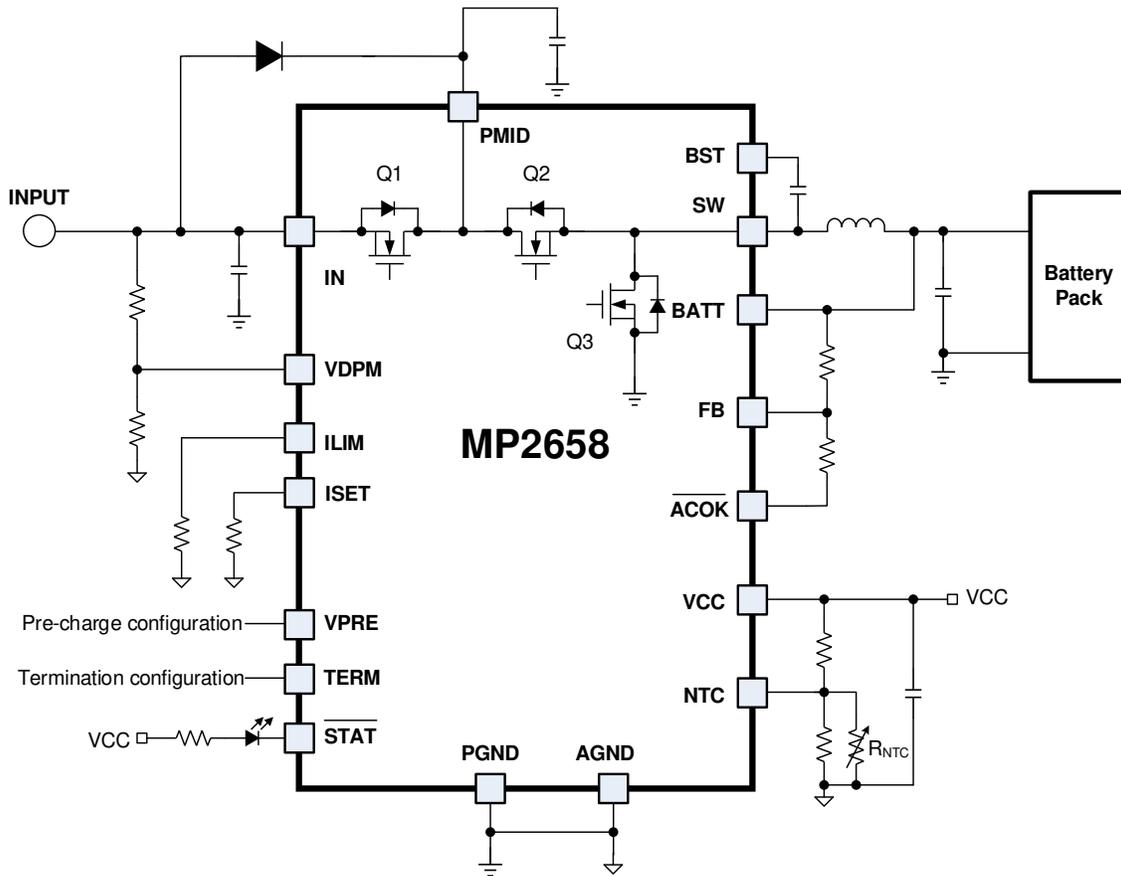
### APPLICATIONS

- Industrial Medical Equipment
- Power Tools
- Robots and Portable Vacuum Cleaners
- Wireless Speakers
- Walkie Talkies
- Surveillance System

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TYPICAL APPLICATION



Typical Application

VPRE Pin Connection	Pre-charge to Fast Charge threshold ( $V_{BAT\_PRE}$ )
AGND	70% of $V_{BATT\_REG}$
Float	75% of $V_{BATT\_REG}$
Pull up to VCC	Disable Pre-charge
100kΩ resistor to AGND	50% of $V_{BATT\_REG}$

TERM Pin Connection	Termination current enable/disable
AGND	Enable termination
Pull up to VCC	Disable termination
100kΩ resistor to AGND	Disable termination, battery floating voltage is 94% of $V_{BATT\_REG}$

Note:

Pre-charge to fast charge threshold ( $V_{BAT\_PRE}$ ) as percentage of  $V_{BATT\_REG}$  has the same ratio for  $V_{FB\_REF\_BATPRE}$  as percentage of  $V_{FB\_REF\_BATREG}$  in EC table.



**MP2658 – 36V SWITCHING CHARGER FOR MULTI-CELL BATTERY**

**PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE**

**ORDERING INFORMATION**

Part Number*	Package	Top Marking	MSL Rating
MP2658GQ-xxxx**	QFN-19 (3mmx3mm)	See Below	1
EV2658-Q-00A	Evaluation kit	N/A	

\* For Tape & Reel, add suffix -Z (e.g. MP2658GQ-xxxx-Z).

\*\* “xxxx” is the OTP setting option. The factory default is “0000.” This content can be viewed in the OTP map. Contact an MPS FAE to obtain an “xxxx” value.

**TOP MARKING**

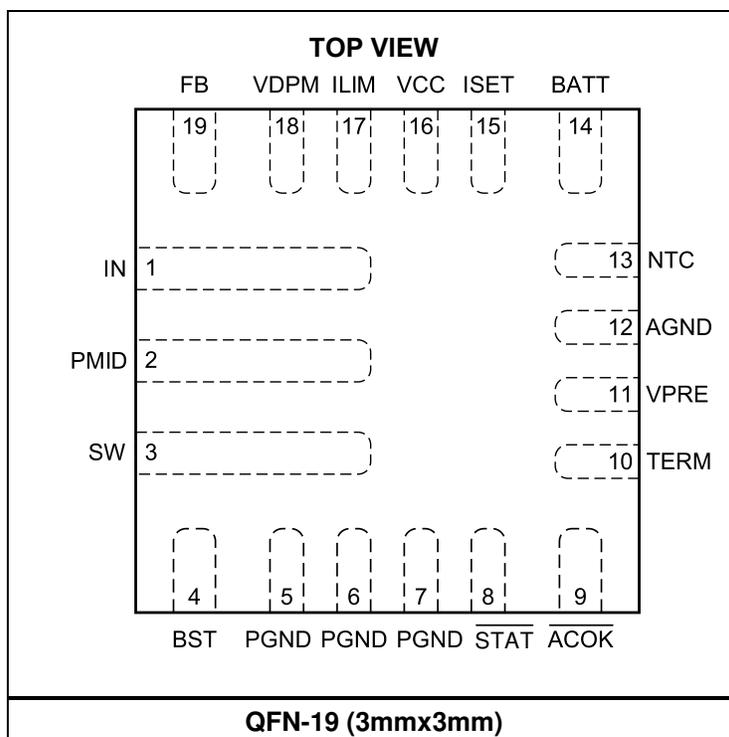
**BQBY**  
**LLLL**

BQB: Product code of MP2658GQ

Y: Year code

LLLL: Lot number

**PACKAGE REFERENCE**





## PIN FUNCTIONS

Pin #	Name	Type	Description
1	IN	Power	<b>Power input.</b> Place a 1 $\mu$ F capacitor from IN to PGND. See Application Section “Selecting the IN Capacitor”.
2	PMID	Power	<b>Decoupling capacitor of the power stage.</b> Bypass it with a ceramic 2.2 $\mu$ F capacitor from PMID to PGND, placed as close as possible to the IC with the shortest route. A 2A/40V schottky diode is required from IN pin to PMID pin.
3	SW	Power	<b>Switching node.</b>
4	BST	Power	<b>Bootstrap pin.</b> Connect a 100nF bootstrap capacitor between the BST and SW pins to form a floating supply to drive the high-side MOSFET above the supply voltage.
5, 6, 7	PGND	Power	<b>Power ground.</b>
8	STAT	O	<b>Status indication.</b> This pin acts as the indicator for charging operation status and fault status with an open-drain output (see Table 4).
9	ACOK	O	<b>Battery voltage feedback ground input.</b> Open-drain output, active low. Connect the feedback resistor divider’s low side resistor to this pin. The input of this pin is in high impedance when adapter is unplugged or the charger is disabled by VDPM pin.
10	TERM	I	<b>Charge termination setting.</b> Charge termination is disabled if this pin is pulled up to VCC.
11	VPRE	I	<b>Pre-charge voltage setting.</b> Pre-charge phase is disabled if this pin is pulled up to VCC.
12	AGND	Power	<b>Analog ground.</b> Short to PGND on PCB.
13	NTC	I	<b>Temperature-sense input.</b> Connect a negative temperature coefficient thermistor to NTC. The hot and cold temperature window can be configured with a resistor divider from VCC to NTC to AGND. Charging suspends when the NTC pin voltage is out of range.
14	BATT	Power	<b>Battery positive terminal.</b> Place a minimum 10 $\mu$ F capacitor from BATT to PGND. See Application Section “Selecting the BATT Capacitor”.
15	ISET	I	<b>Charging current setting.</b> Connect a resistor to AGND.
16	VCC	Power	<b>Internal circuit power supply.</b> Bypass to AGND with a 1 $\mu$ F ceramic capacitor. When an input source is present, a 5V output is generated on the VCC pin.
17	ILIM	I	<b>Input current limit setting.</b> Connect a resistor to AGND.
18	VDPM	I	<b>Input voltage clamp setting.</b> Connect to a resistor divider from IN to AGND. This pin also can be used to disable charging when pulled down to logic low (below 0.2V).
19	FB	I	<b>Battery voltage feedback input.</b> Connect this pin to resistor divider’s middle point to program battery charge voltage. When this pin is open by default, the converter stops switching.

**ABSOLUTE MAXIMUM RATINGS** <sup>(1)</sup>

IN, PMID, FB, ACOK, BATT to PGND.....	-0.3V to +45V
SW to PGND .....	-0.3V(-2V for 20ns) to +45V
BST to PGND.....	SW to SW + 5.5V
All other pins to AGND.....	-0.3V to +5.5V
Continuous power dissipation ( $T_A = 25^\circ\text{C}$ ) <sup>(2)</sup>	.....2.5W
Junction temperature.....	150°C
Lead temperature (solder) .....	260°C
Storage temperature.....	-65°C to +150°C

**ESD Rating**

Human body model (HBM) <sup>(3)</sup> .....	2000V
Charged device model (CDM) <sup>(4)</sup> .....	750V

**Recommended Operating Conditions** <sup>(5)</sup>

Supply voltage ( $V_{IN}$ ) .....	4.5V to 36V
Input current ( $I_{IN}$ ) .....	Up to 3A
Charge current ( $I_{CHG}$ ) .....	Up to 3A
Battery voltage ( $V_{BATT}$ ) .....	2V to 31V
Operating junction temp ( $T_J$ ) ....	-10°C to +125°C

<b>Thermal Resistance</b> <sup>(6)</sup>	$\theta_{JA}$	$\theta_{JC}$
QFN-19 (3mmx3mm) .....	50.....	12.... °C/W

**Notes:**

- 1) Exceeding these ratings may damage the device.
- 2) The maximum allowable power dissipation is a function of the maximum junction temperature  $T_J$  (MAX), the junction-to-ambient thermal resistance  $\theta_{JA}$ , and the ambient temperature  $T_A$ . The maximum allowable continuous power dissipation at any ambient temperature is calculated by  $P_D$  (MAX) =  $(T_J$  (MAX) -  $T_A$ ) /  $\theta_{JA}$ . Exceeding the maximum allowable power dissipation will cause excessive die temperature, and the regulator will go into thermal shutdown. Internal thermal shutdown circuitry protects the device from permanent damage.
- 3) Per ANSI/ESDA/JEDEC JS-001.
- 4) Per JESD22-C101.
- 5) The device is not guaranteed to function outside of its operating conditions.
- 6) Measured on JESD51-7, 4-layer PCB.

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