- **High energy**
- **Up to 3 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

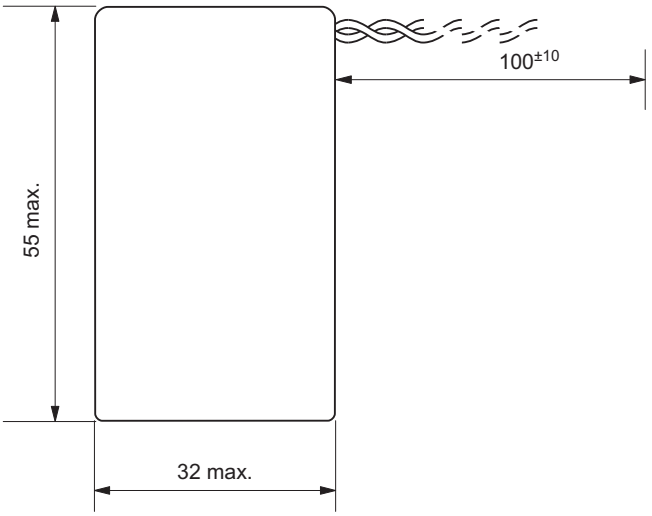
Type: TLP-91111/A

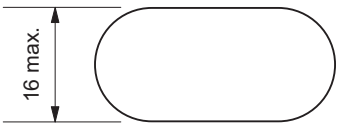
Performance Data
(Typical values for batteries stored at 25 °C for one year)

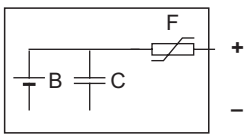
System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	2.4 Ah
Nominal current	2 mA
Max. 1 s pulse to 3 V	3 A
Max. pulse length @ 0.5 A	1000 s
Delay time to 3 V @ 0.5 A	< 1 ms
Weight	55 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

TLP-91111/A/SM







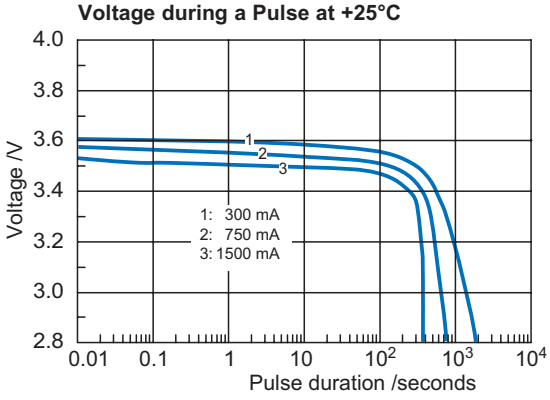
B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

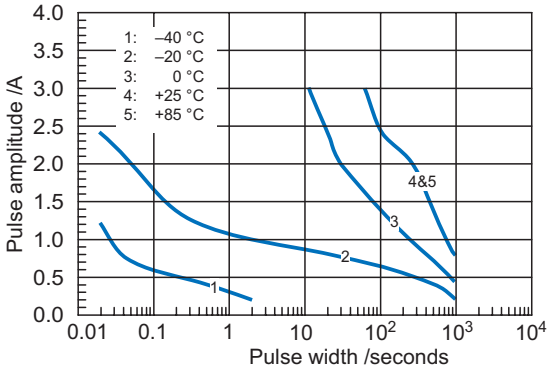
Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Terminations	Catalogue No.
TLP-91111/A/SM Flying leads	14 1 5761 001

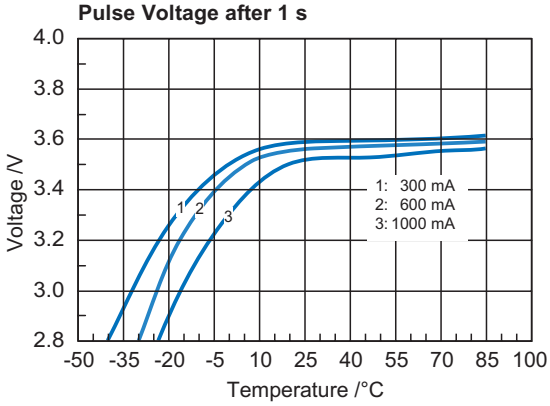
Voltage during a Pulse at +25°C



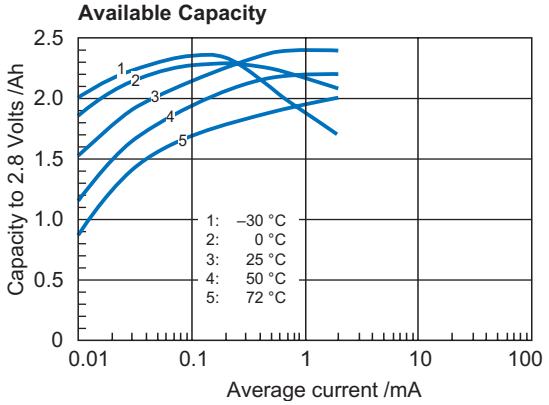
Maximum Pulse Width from 3.6 V to 2.8 V



Pulse Voltage after 1 s



Available Capacity



- **High energy**
- **Up to 1 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

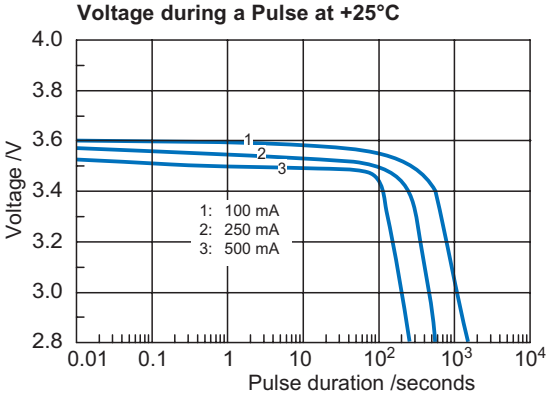
Type: TLP-91311/A

Performance Data
(Typical values for batteries stored at 25 °C for one year)

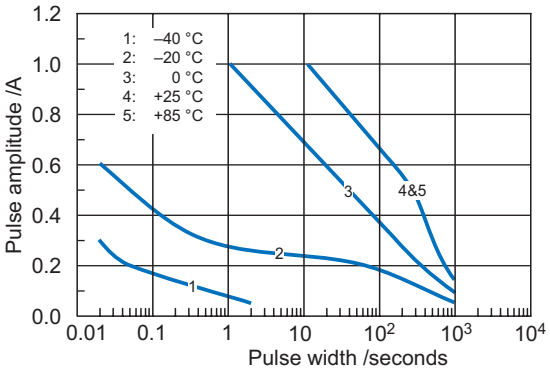
System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	2.4 Ah
Nominal current	2 mA
Max. 1 s pulse to 3 V	1 A
Max. pulse length @ 0.125 A	1000 s
Delay time to 3 V @ 0.125 A	< 1 ms
Weight	40 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

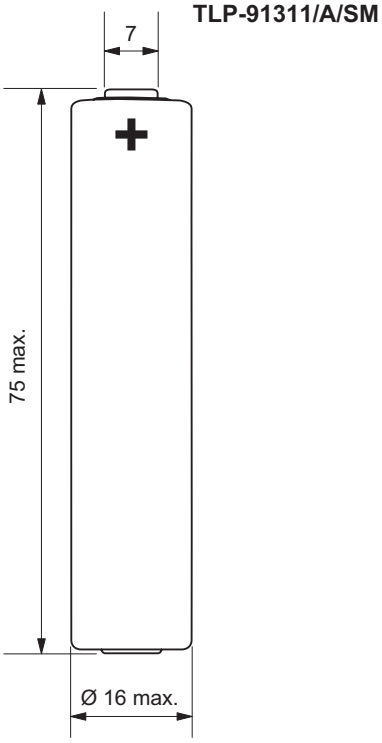
Voltage during a Pulse at +25°C



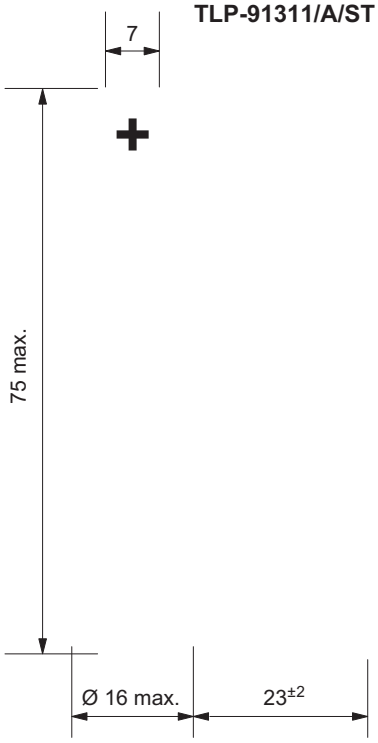
Maximum Pulse Width from 3.6 V to 2.8 V



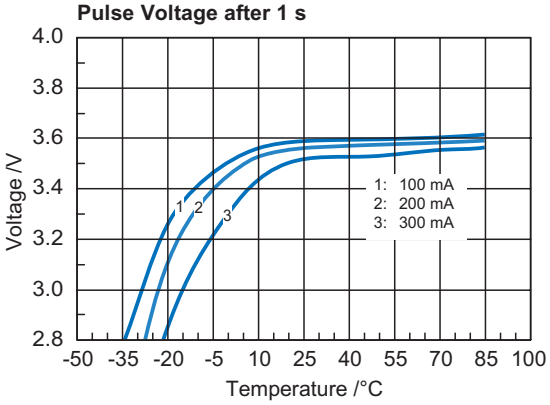
TLP-91311/A/SM

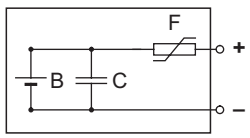


TLP-91311/A/ST



Pulse Voltage after 1 s



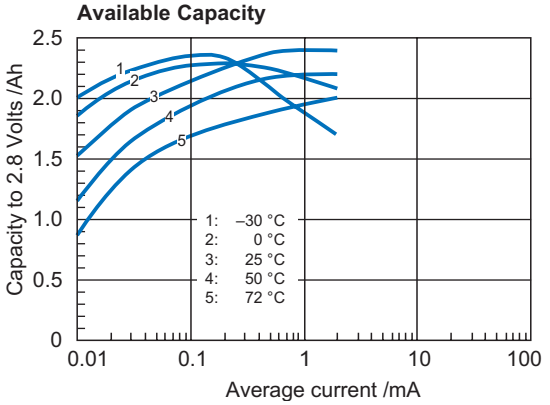


B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Capacity



Available Terminations		Catalogue No.
TLP-91311/A/SM	Pressure contacts	14 1 5763 001
TLP-91311/A/ST	Solder tags	14 1 5763 002

- **High energy**
- **Up to 3 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

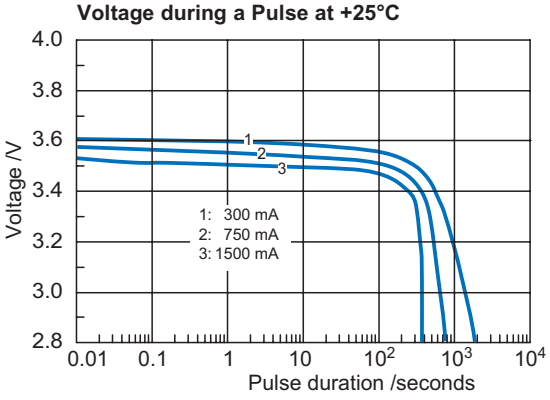
Type: TLP-92111/A

Performance Data
(Typical values for batteries stored at 25 °C for one year)

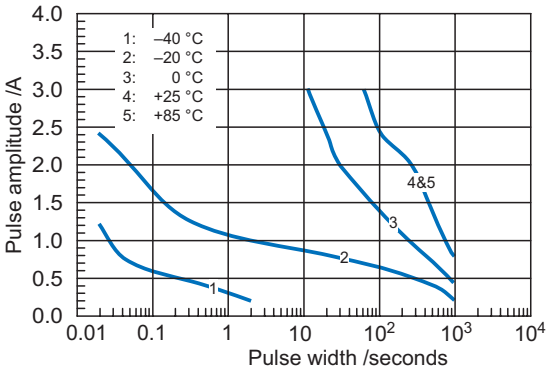
System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	8.5 Ah
Nominal current	3 mA
Max. 1 s pulse to 3 V	3 A
Max. pulse length @ 0.5 A	1000 s
Delay time to 3 V @ 0.5 A	< 1 ms
Weight	100 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

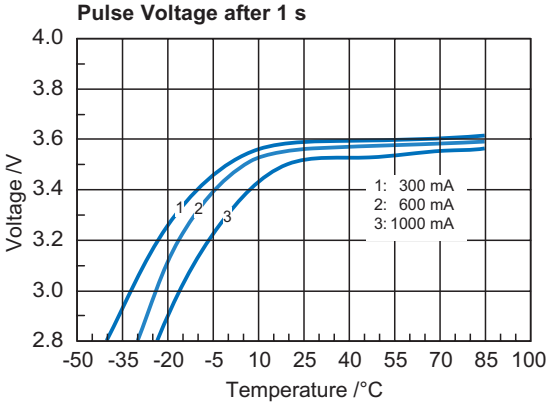
Voltage during a Pulse at +25°C



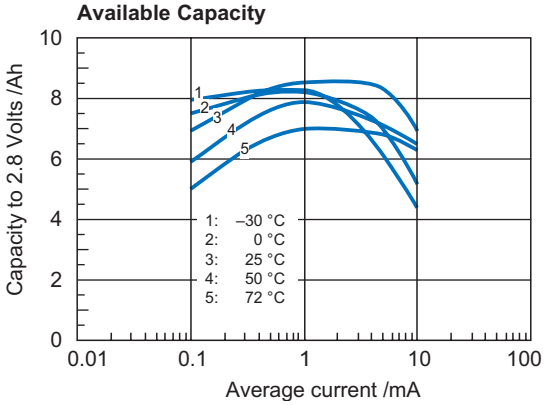
Maximum Pulse Width from 3.6 V to 2.8 V



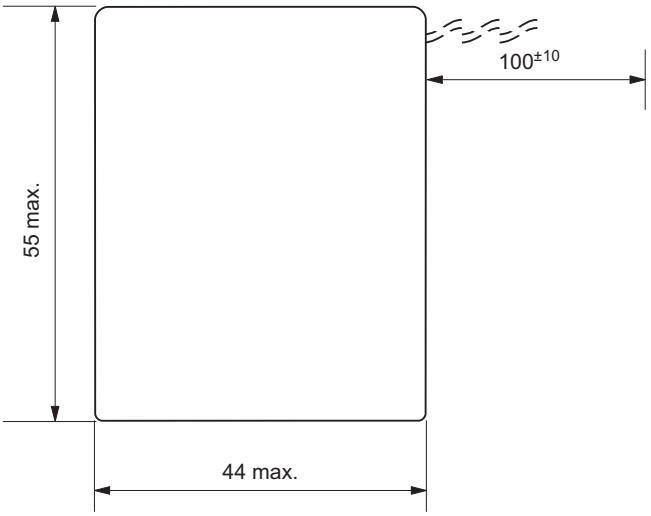
Pulse Voltage after 1 s

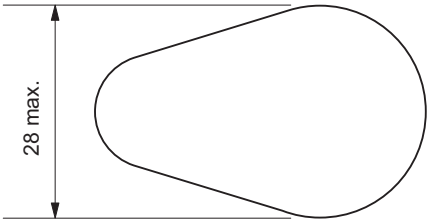


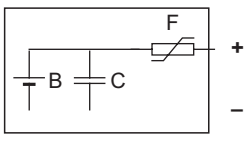
Available Capacity



TLP-92111/A/SM







B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Terminations	Catalogue No.
TLP-92111/A/SM Flying leads	14 1 5771 001

- **High energy**
- **Up to 1 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

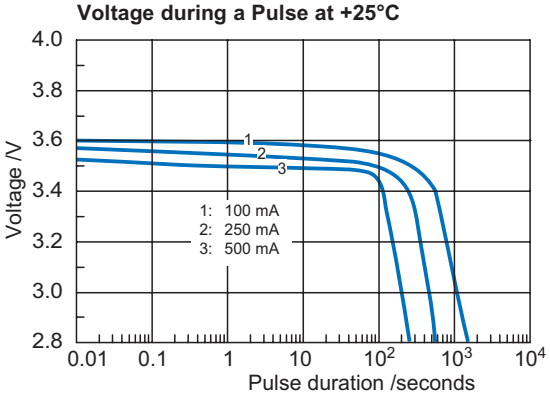
Type: TLP-92311/A

Performance Data
(Typical values for batteries stored at 25 °C for one year)

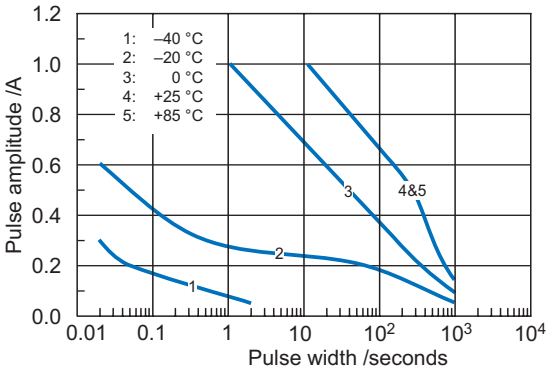
System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	8.5 Ah
Nominal current	3 mA
Max. 1 s pulse to 3 V	1 A
Max. pulse length @ 0.125 A	1000 s
Delay time to 3 V @ 0.125 A	< 1 ms
Weight	80 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

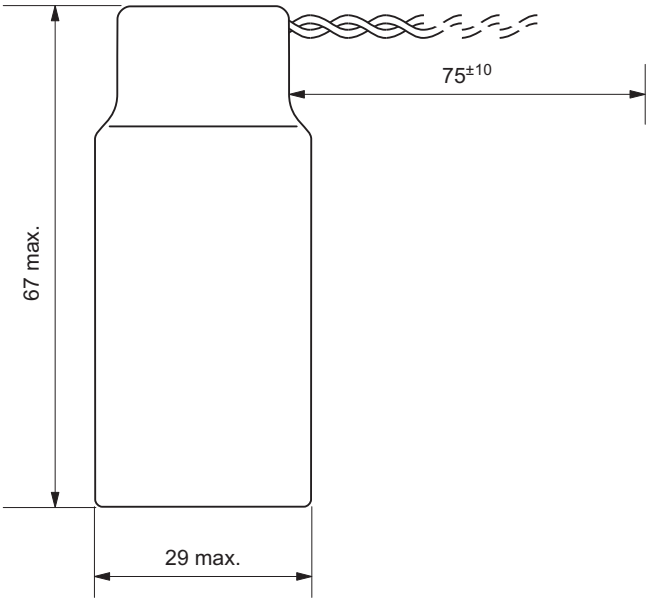
Voltage during a Pulse at +25°C



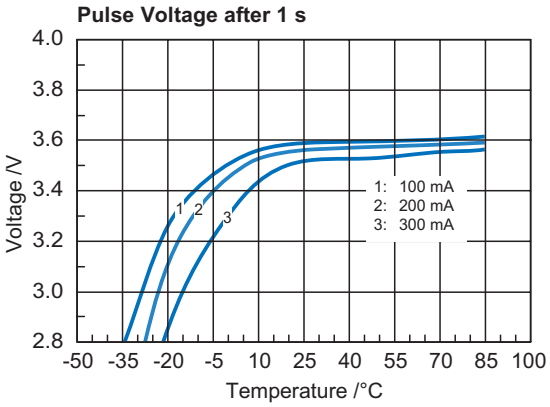
Maximum Pulse Width from 3.6 V to 2.8 V

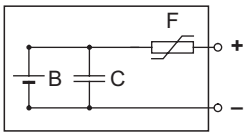


TLP-92311/A/SM



Pulse Voltage after 1 s



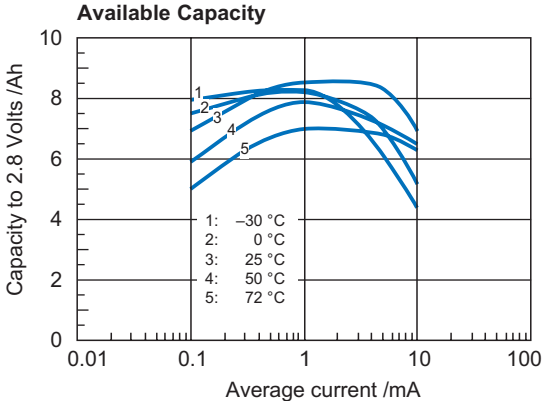


B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Capacity



Available Terminations	Catalogue No.
TLP-92311/A/SM Flying leads	14 1 5773 001

- **High energy**
- **Up to 3 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

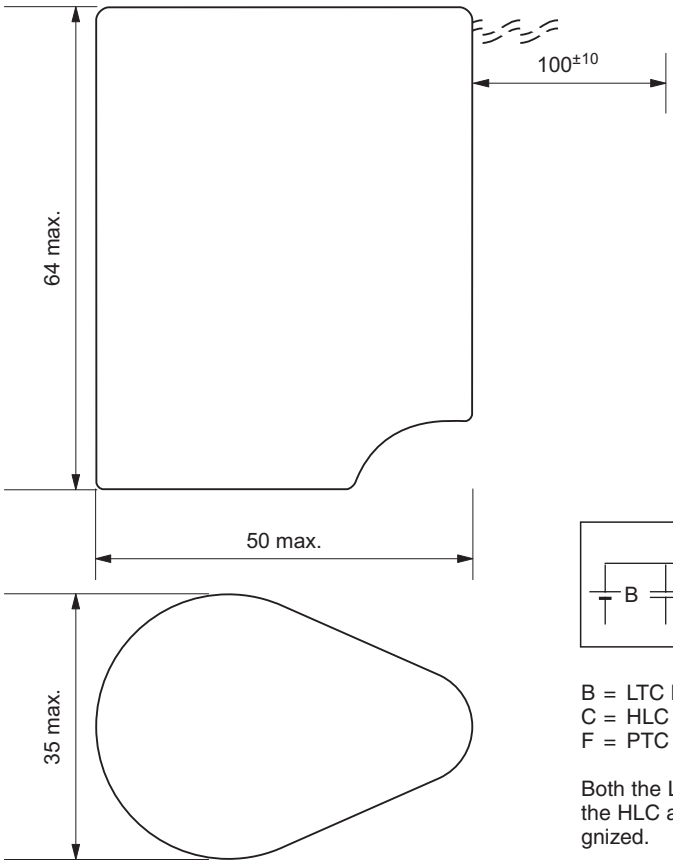
Type: TLP-93111/A

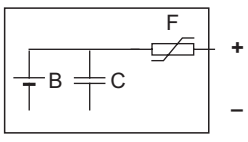
Performance Data
(Typical values for batteries stored at 25 °C for one year)

System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	19 Ah
Nominal current	6 mA
Max. 1 s pulse to 3 V	3 A
Max. pulse length @ 0.5 A	1000 s
Delay time to 3 V @ 0.5 A	< 1 ms
Weight	140 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

TLP-93111/A/SM





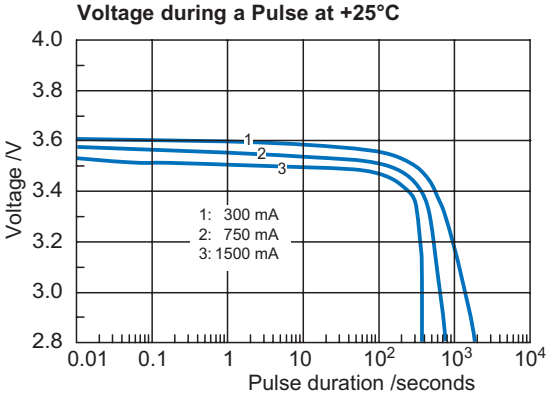
B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

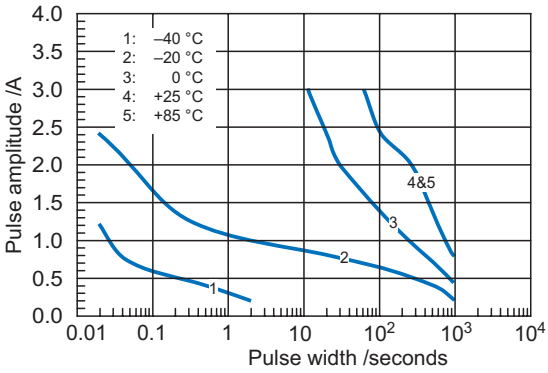
Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Terminations	Catalogue No.
TLP-93111/A/SM Flying leads	14 1 5781 001

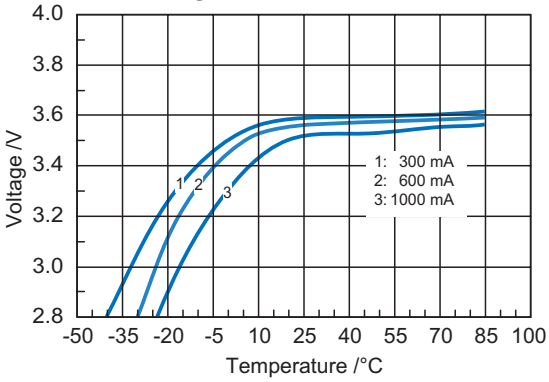
Voltage during a Pulse at +25°C



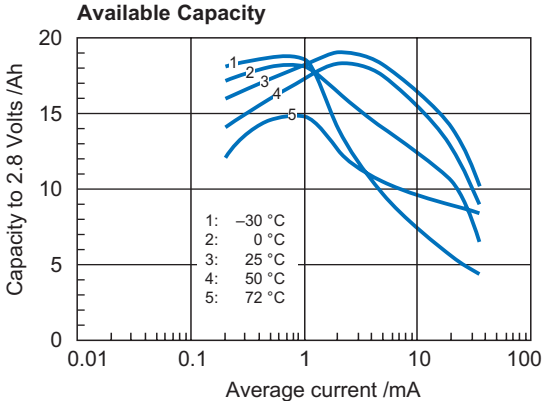
Maximum Pulse Width from 3.6 V to 2.8 V



Pulse Voltage after 1 s



Available Capacity



- **High energy**
- **Up to 1 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

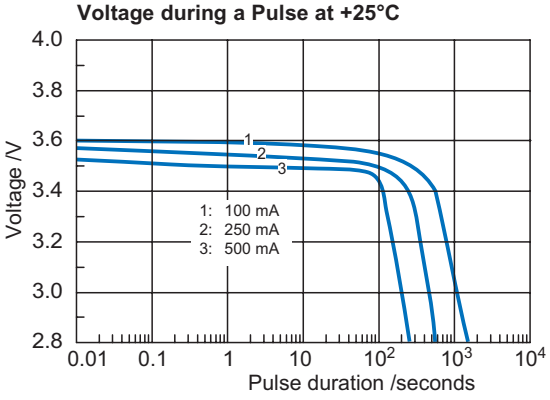
Type: TLP-93311/A

Performance Data
(Typical values for batteries stored at 25 °C for one year)

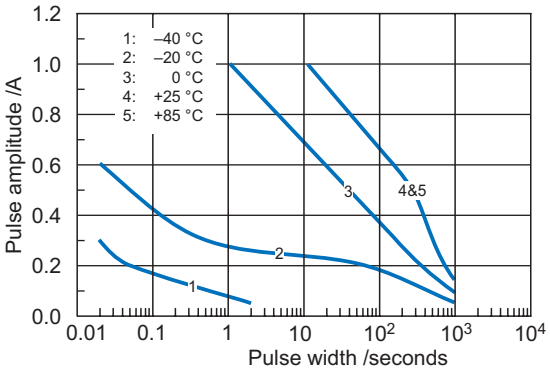
System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	19 Ah
Nominal current	6 mA
Max. 1 s pulse to 3 V	1 A
Max. pulse length @ 0.125 A	1000 s
Delay time to 3 V @ 0.125 A	< 1 ms
Weight	120 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

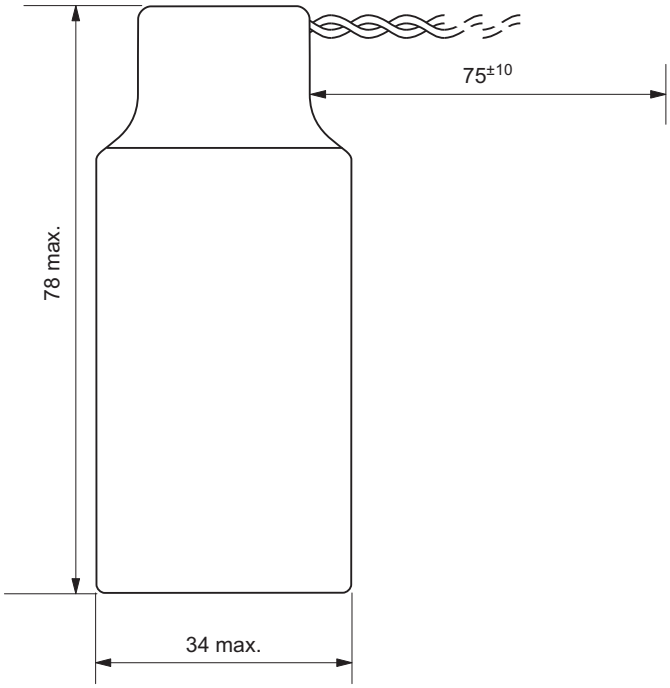
Voltage during a Pulse at +25°C



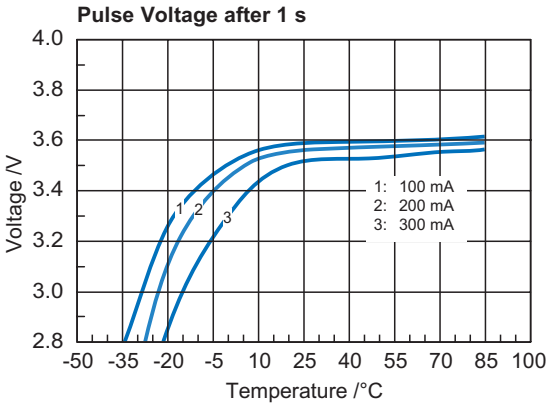
Maximum Pulse Width from 3.6 V to 2.8 V

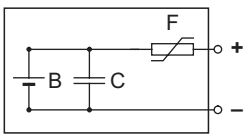


TLP-93311/A/SM



Pulse Voltage after 1 s



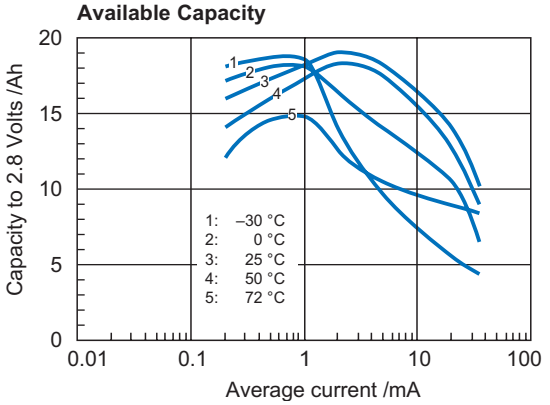


B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Capacity



Available Terminations	Catalogue No.
TLP-93311/A/SM Flying leads	14 1 5783 001

- **High energy**
- **Up to 3 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

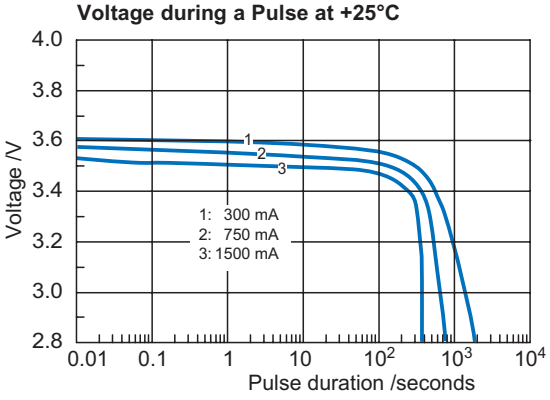
Type: TLP-96111/A

Performance Data
(Typical values for batteries stored at 25 °C for one year)

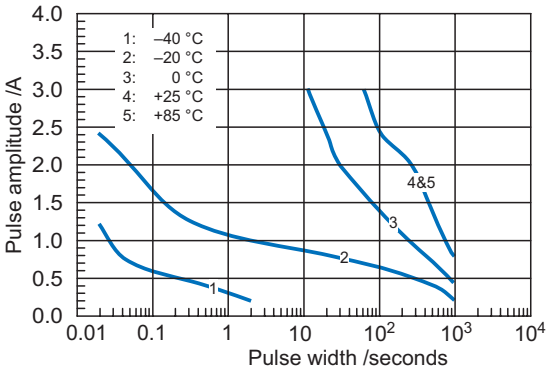
System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	1.2 Ah
Nominal current	0.6 mA
Max. 1 s pulse to 3 V	3 A
Max. pulse length @ 0.5 A	1000 s
Delay time to 3 V @ 0.5 A	< 1 ms
Weight	45 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

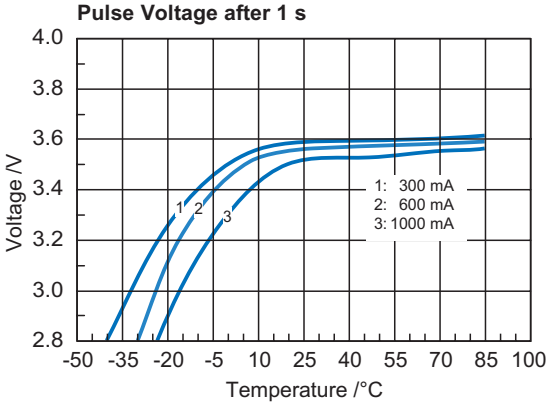
Voltage during a Pulse at +25°C



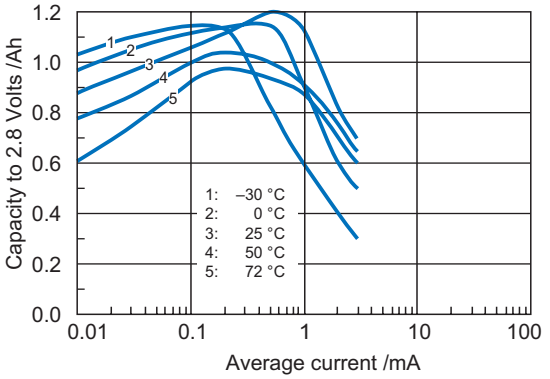
Maximum Pulse Width from 3.6 V to 2.8 V



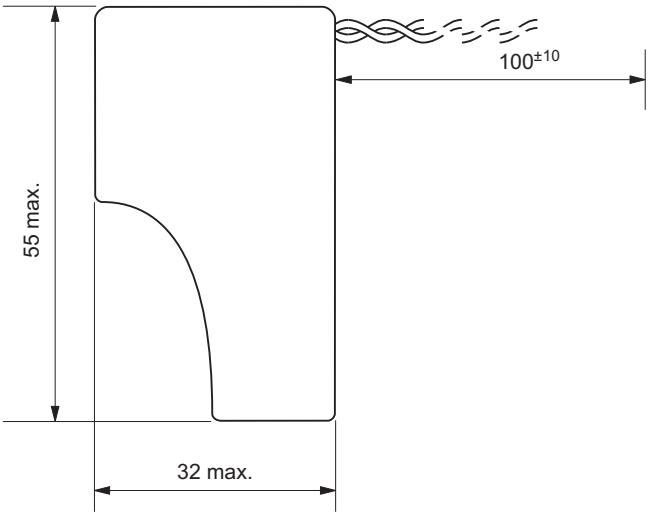
Pulse Voltage after 1 s

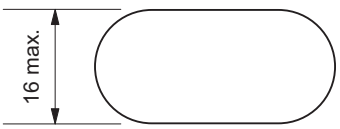


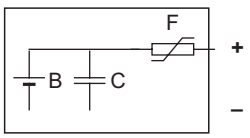
Available Capacity



TLP-96111/A/SM







B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Terminations	Catalogue No.
TLP-96111/A/SM Flying leads	14 1 5751 001

- **High energy**
- **Up to 1 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

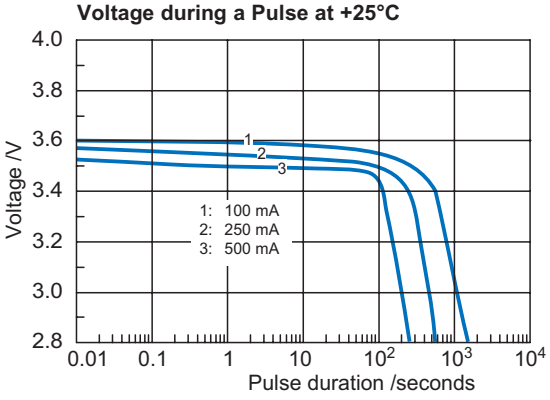
Type: TLP-96311/A

Performance Data
(Typical values for batteries stored at 25 °C for one year)

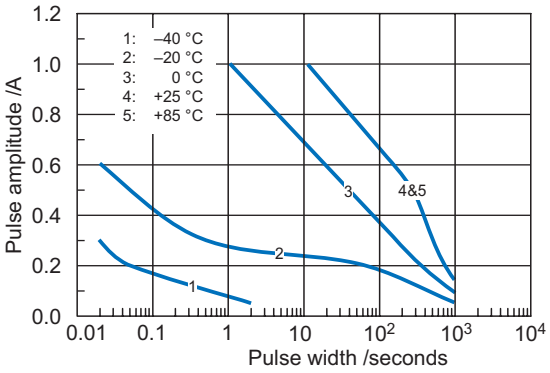
System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	1.2 Ah
Nominal current	0.6 mA
Max. 1 s pulse to 3 V	1 A
Max. pulse length @ 0.125 A	1000 s
Delay time to 3 V @ 0.125 A	< 1 ms
Weight	30 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

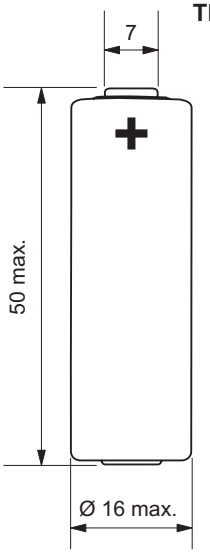
Voltage during a Pulse at +25°C



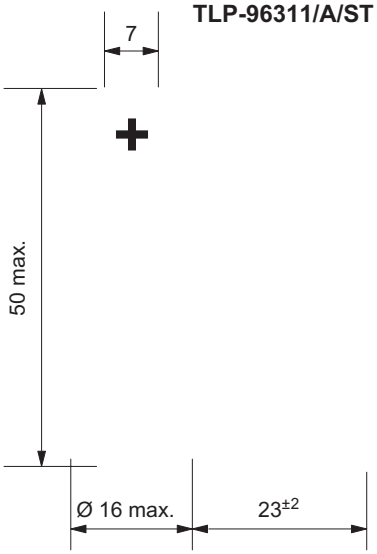
Maximum Pulse Width from 3.6 V to 2.8 V



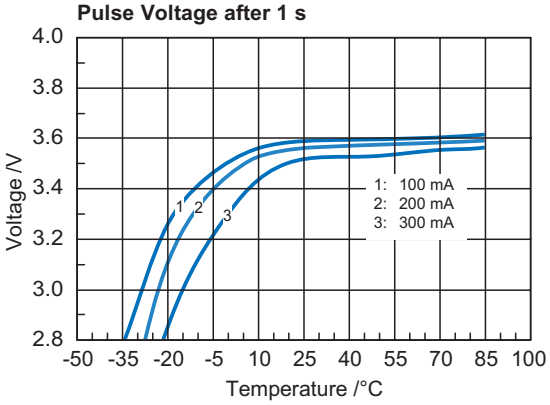
TLP-96311/A/SM

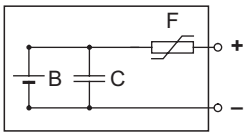


TLP-96311/A/ST



Pulse Voltage after 1 s



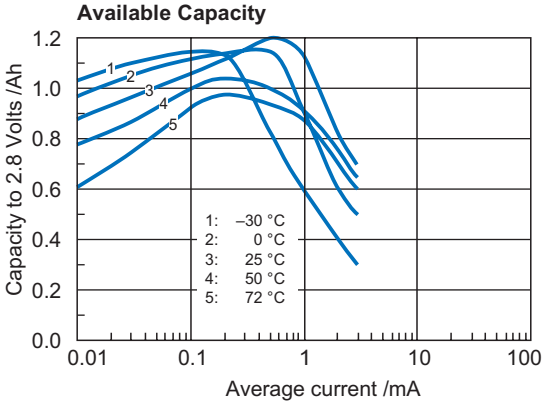


B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Capacity



Available Terminations		Catalogue No.
TLP-96311/A/SM	Pressure contacts	14 1 5753 001
TLP-96311/A/ST	Solder tags	14 1 5753 002

- **High energy**
- **Up to 3 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

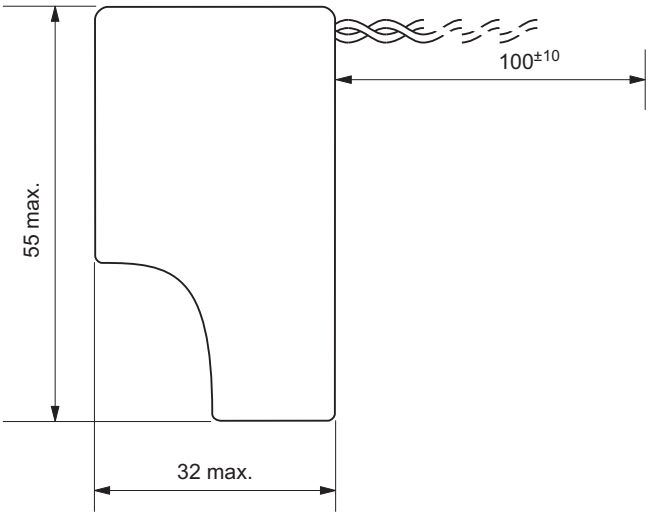
Type: TLP-97111/A

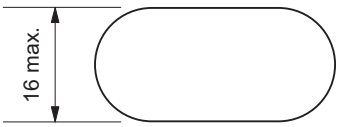
Performance Data
(Typical values for batteries stored at 25 °C for one year)

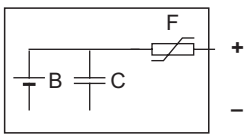
System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	1.65 Ah
Nominal current	1 mA
Max. 1 s pulse to 3 V	3 A
Max. pulse length @ 0.5 A	1000 s
Delay time to 3 V @ 0.5 A	< 1 ms
Weight	45 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

TLP-97111/A/SM







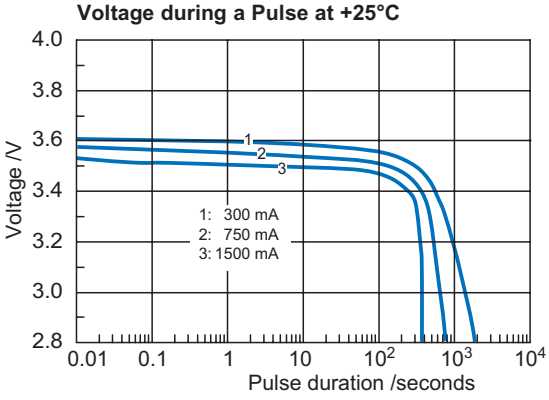
B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

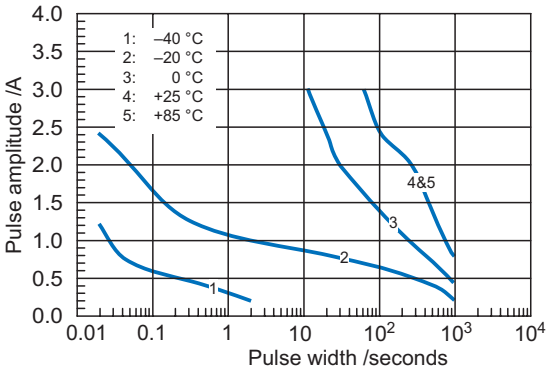
Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Terminations	Catalogue No.
TLP-97111/A/SM Flying leads	14 1 5721 001

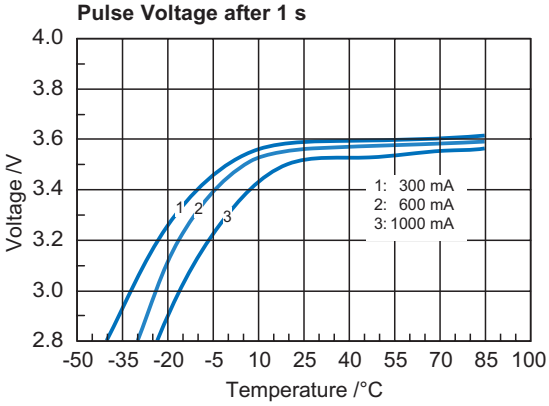
Voltage during a Pulse at +25°C



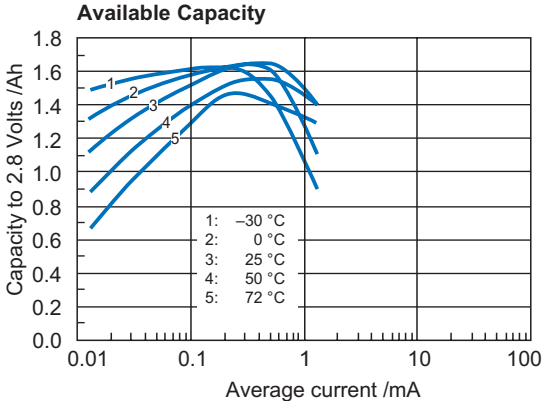
Maximum Pulse Width from 3.6 V to 2.8 V



Pulse Voltage after 1 s



Available Capacity



- **High energy**
- **Up to 1 A pulse capability**
- **Instant voltage response**
- **No passivation effect**

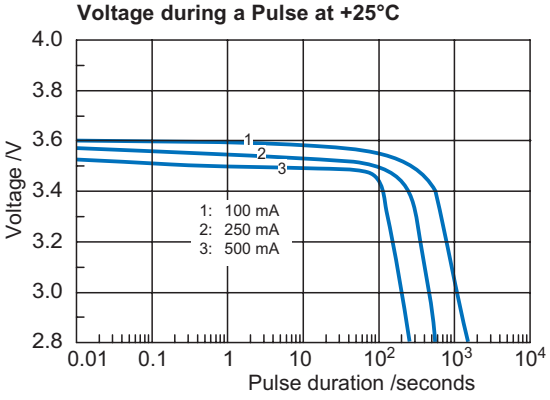
Type: TLP-97311/A

Performance Data
(Typical values for batteries stored at 25 °C for one year)

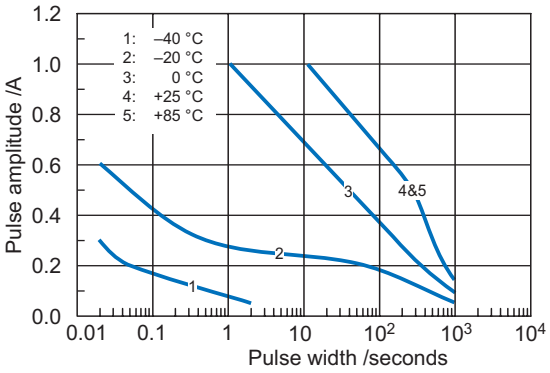
System	LTC and HLC
Nominal voltage	3.6 V
Nominal capacity	1.65 Ah
Nominal current	1 mA
Max. 1 s pulse to 3 V	1 A
Max. pulse length @ 0.125 A	1000 s
Delay time to 3 V @ 0.125 A	< 1 ms
Weight	35 g
Temperature range	–40 °C ... +85 °C
Capacity retention after 10 yr	85 %

The battery is designed for applications where low background currents are combined with high current pulses. The ***PulsesPlus*** battery combines the inherent benefits of bobbin type Lithium Thionyl Chloride (LTC) batteries with a novel hermetically sealed hybrid Layer Capacitor (HLC). The LTC battery contributes high energy density while the HLC contributes high pulse current capability. The overall self discharge is thus minimized while safety is maximized.

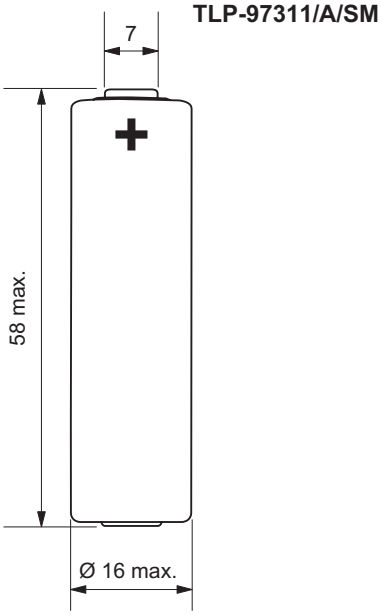
Voltage during a Pulse at +25°C



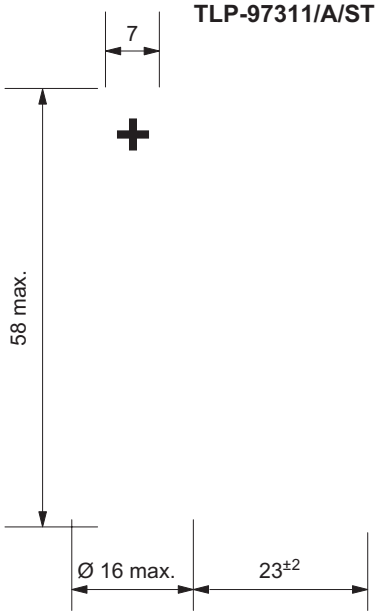
Maximum Pulse Width from 3.6 V to 2.8 V



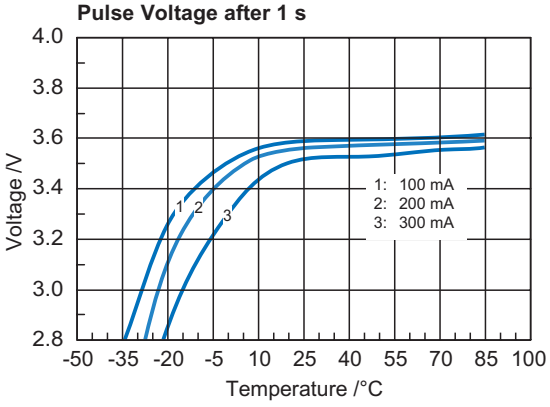
TLP-97311/A/SM

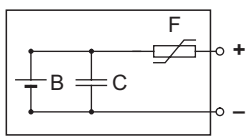


TLP-97311/A/ST



Pulse Voltage after 1 s



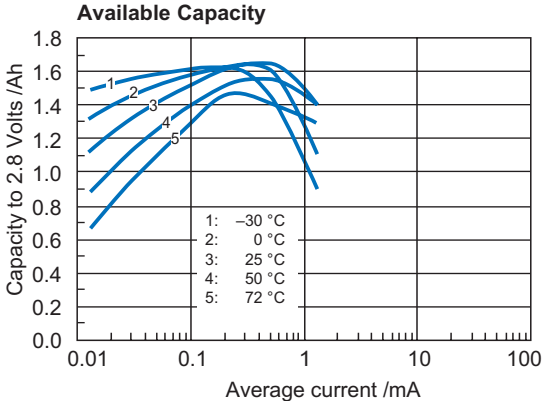


B = LTC battery
C = HLC
F = PTC (optional)

Both the LTC battery and the HLC are UL recognized.

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Available Capacity



Available Terminations		Catalogue No.
TLP-97311/A/SM	Pressure contacts	14 1 5723 001
TLP-97311/A/ST	Solder tags	14 1 5723 002

- **Hybrid Layer Capacitor**
- **For use in *PulsesPlus* batteries**

Type: HLC-1520

Performance Data
(Typical values in ***PulsesPlus*** batteries at 25 °C)

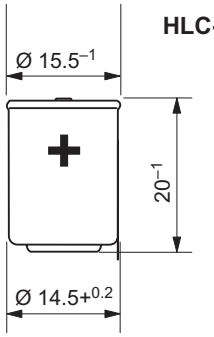
System	Li-intercalated compounds
Nominal voltage	3.6 V, optional 3.9 V
Nominal capacity	140 As (39 mAh) @ 3.6 V 280 As (78 mAh) @ 3.9 V
Nominal current	50 mA
Max. cont. discharge current	500 mA
Pulse current capability	2000 mA
Max. charge voltage	3.95 V
Max. charge current	25 mA
Self discharge rate	1 µA @25°C; 5 µA @85°C
Cell impedance	≤ 250 mΩ
Weight	7.5 g

CAUTION:
Fire, explosion, and severe burn hazard. Do not crush, disassemble, heat above 100 °C, or incinerate.

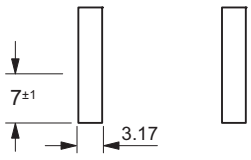
Use as part of ***PulsesPlus*™** battery only. Do not charge higher than 3.95 V.

See General Product Information for further safety recommendations

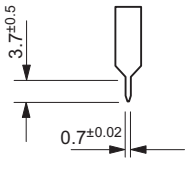
HLC-1520/S



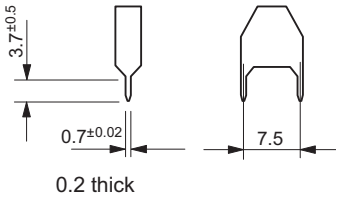
HLC-1520/T



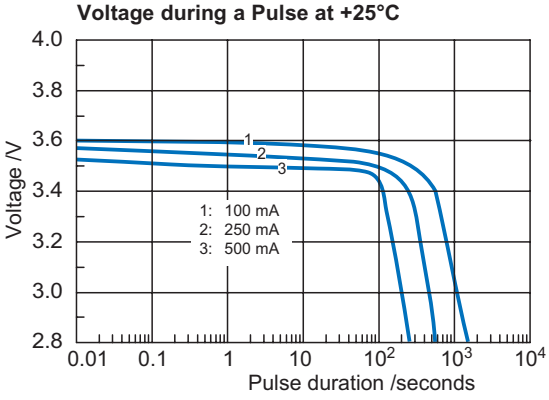
HLC–1520/PT2



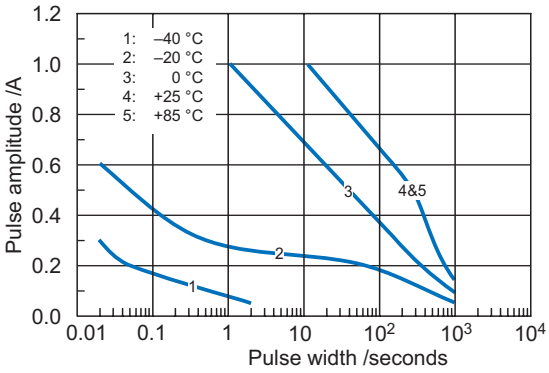
HLC–1520/TP



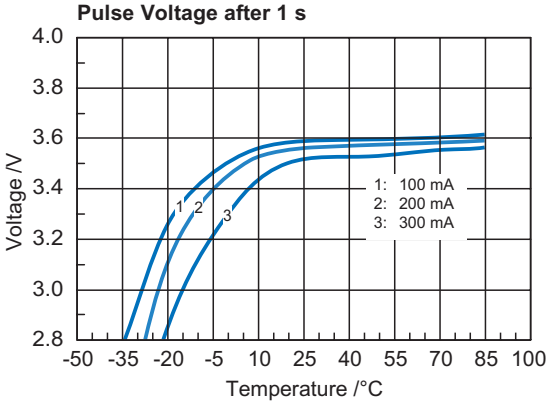
Voltage during a Pulse at +25°C



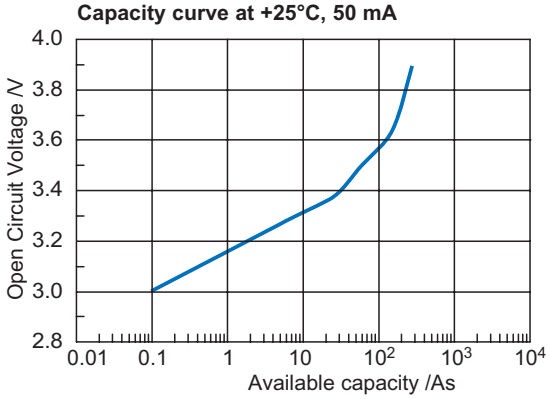
Maximum Pulse Width from 3.6 V to 2.8 V



Pulse Voltage after 1 s



Capacity curve at +25°C, 50 mA



Available Terminations		Catalogue No.
HLC-1520/S	Standard	11 5 10501 02
HLC-1520/T	Tags	11 5 10502 02
HLC-1520/PT2	Pins radial	11 5 10506 02
HLC-1520/TP	Polarized tags	11 5 10508 02

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

- **Hybrid Layer Capacitor**
- **For use in *PulsesPlus* batteries**

Type: HLC-1550

Performance Data
(Typical values in ***PulsesPlus*** batteries at 25 °C)

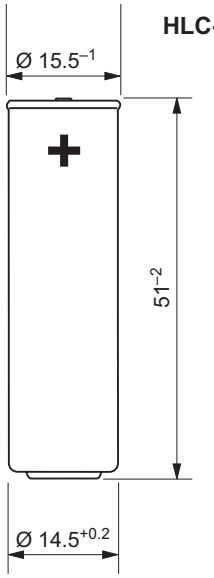
System	Li-intercalated compounds
Nominal voltage	3.6 V, optional 3.9 V
Nominal capacity	560 As (155 mAh) @ 3.6 V 1120 As (310 mAh) @ 3.9 V
Nominal current	50 mA
Max. cont. discharge current	2000 mA
Pulse current capability	5000 mA
Max. charge voltage	3.95 V
Max. charge current	100 mA
Self discharge rate	3 µA @25°C; 15 µA @85°C
Cell impedance	≤ 100 mΩ
Weight	20 g

CAUTION:
Fire, explosion, and severe burn hazard. Do not crush, disassemble, heat above 100 °C, or incinerate.

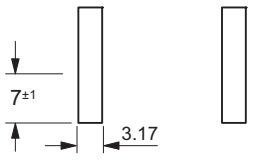
Use as part of ***PulsesPlus*™** battery only. Do not charge higher than 3.95 V.

See General Product Information for further safety recommendations

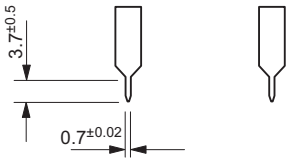
HLC-1550/S



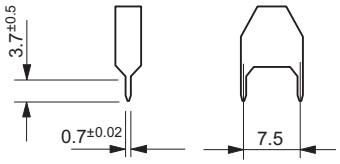
HLC-1550/T



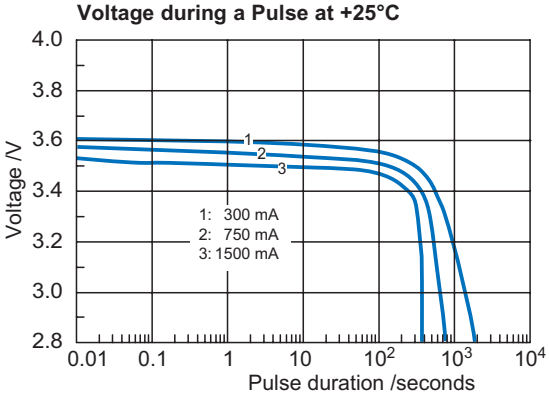
HLC–1550/PT2



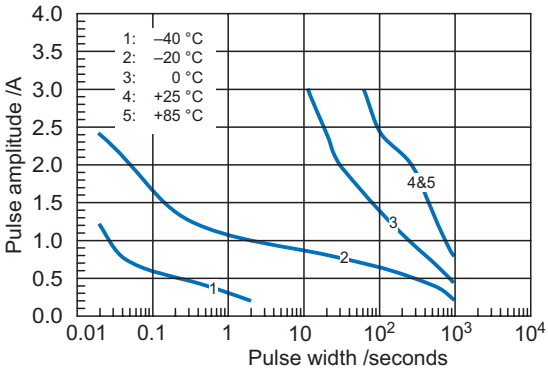
HLC–1550/TP



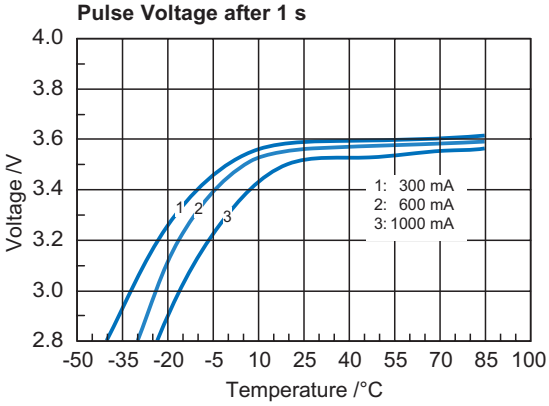
Voltage during a Pulse at +25°C



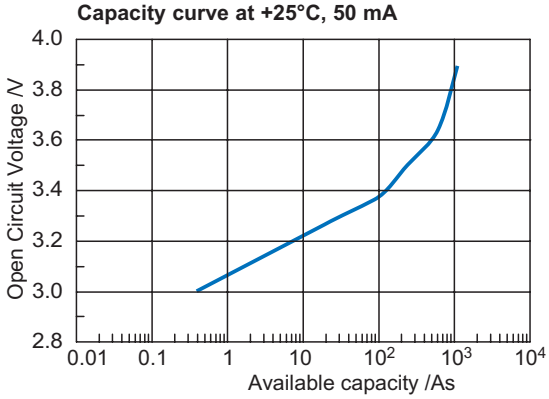
Maximum Pulse Width from 3.6 V to 2.8 V



Pulse Voltage after 1 s



Capacity curve at +25°C, 50 mA



Available Terminations		Catalogue No.
HLC-1550/S	Standard	11 5 10601 02
HLC-1550/T	Tags	11 5 10602 02
HLC-1550/PT2	Pins radial	11 5 10606 02
HLC-1550/TP	Polarized tags	11 5 10608 02

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.

Product group: Hybrid Layer Capacitors (HLC)



General

Hybrid Layer Capacitors are a kind of rechargeable battery. They are used as a capacitor in ***PulsesPlus*** batteries, where they are connected in parallel to Sonnenschein Lithium Batteries. The electrodes of HLC's comprise lithium intercalation compounds. They have low impedance and can deliver high current pulses. The performance and reliablity properties of HLC's have been carefully optimized to match those of Sonnenschein Lithium Batteries. The result is a battery with a maximum of both energy and power density for stand alone use of up to ten years or more.

HLC's are normally charged to 3.6 V, optionally to 3.9 V.

Temperature range

–40 °C ... +85 °C	for operation in ***PulsesPlus*** batteries
–30 °C ... +60 °C	for independent storage and use

Electrical characteristics

Discharge end voltage: 2.8 V — Discharge below 2.5 V at 25 °C and discharge below 2 V at –40 °C may lead to an increase of the internal resistance.

Shelf life	in ***PulsesPlus*** batteries	used independently
@ 25 °C	10 years	1 year
@ 60 °C	7 years	4 weeks
@ 85°C	≥ 1 year	1 week

Cycle life	at 3.6 V	at 3.9 V
to 1 % DOD	400 000 cycles	100 000 cycles
to 10 % DOD	40 000 cycles	10 000 cycles
to 100 % DOD	4 000 cycles	1 000 cycles

(DOD = depth of discharge)

Safety

WARNING: HLC's are designed for use in ***PulsesPlus*** batteries. When used independently, they must not be fast charged.

Overcharge above 3.95 V may lead to capacity loss and/or an increase of internal resistance

Overcharge above 4.4 V may lead to excessive internal pressure. This may result in explosion or rupture.

UL recognition: under file MH 12193

Transport

HLC's have passed the UN transport tests. They contain less than 1 g lithium equivalent and are not subject to dangerous goods regulations. They can be transported by air according to IATA DGR, special provision A45 and by rail/road/sea according to RID/ADR/IMDG code, special provision 188.

Any values given here are for informational purpose only. They also depend on actual conditions of use and are not warranties of future performance. Subject to change.