Photoflash Capacitor Charger for DSC

REV: 00

General Description

The LD7268A is an ideal charge control IC for flash units with internal soft start, adjustable charging current and output voltage. It provides a proprietary charging algorithm, which charges photoflash capacitor quickly and efficiently. The LD7268A could operate for constant charging current mode or the mode with lowering the charging current at lower battery voltage. As well, a built-in totem pole IGBT driver can drive IGBT quickly and save the board space.

The LD7268A is available in a space-saving MSOP-10 package and is ideal for DSC flash unit.

Features

- Adjustable Charging Current
- Adjustable Output Voltage
- 1.8V~5V Battery Voltage Range
- Internal Soft Start
- Tiny Transformer
- Totem-Pole IGBT Driver

Applications

- DSC Flash Unit
- Film Camera Flash Unit

† Patent pending

Typical Application

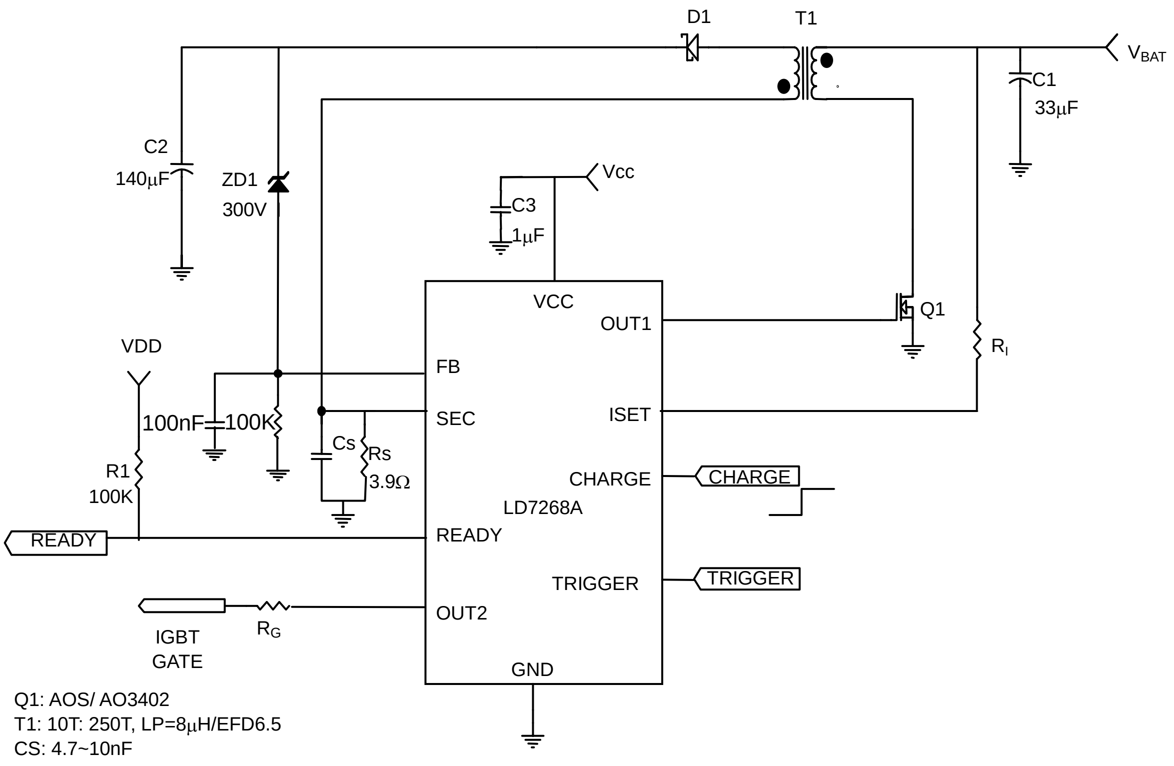
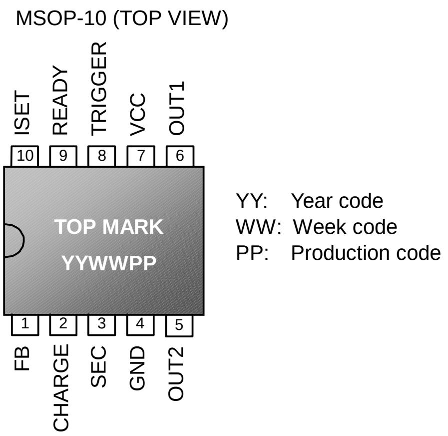


Fig. 1

Pin Configuration



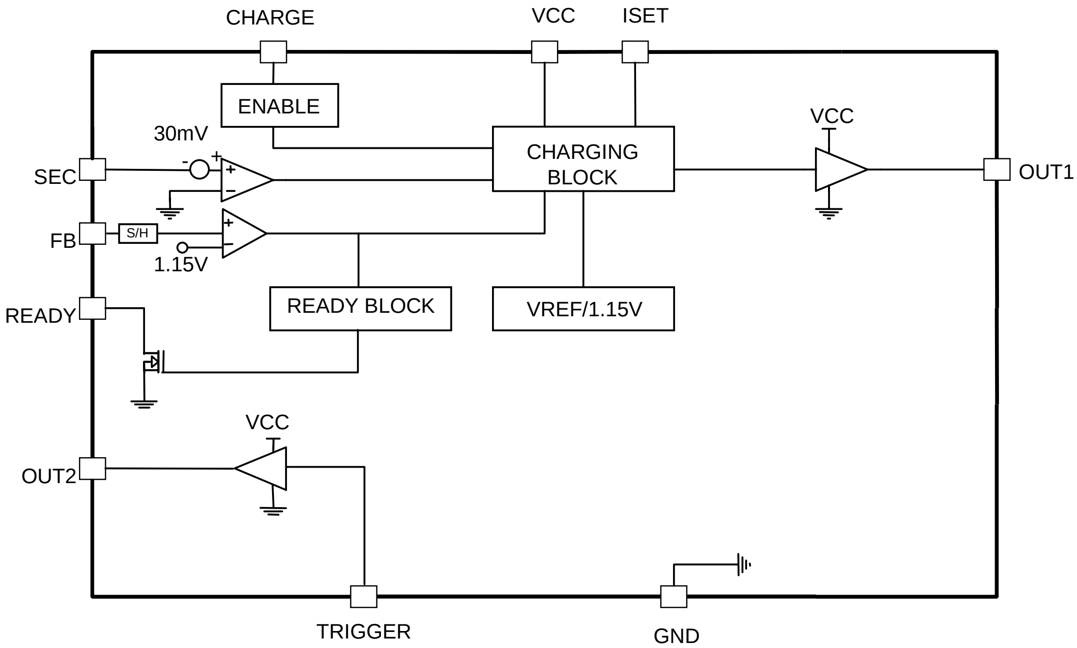
Ordering Information

Part number	Package	Top Mark	Shipping
LD7268APL	MSOP-10 (PB FREE)	7268APL	2500 /tape & reel

Pin Descriptions

PIN	NAME	FUNCTION
1	FB	Output voltage feedback
2	CHARGE	Charging on/off control pin. High=enable low=disable
3	SEC	Secondary winding pin
4	GND	IC GND
5	OUT2	Totem-pole output (IGBT driver)
6	OUT1	Totem-pole output (MOS driver)
7	VCC	Input power of IC
8	TRIGGER	Trigger on/off control pin. High=enable low=disable
9	READY	Charge ready open drain output.
10	ISET	Adjust charging current with R to VBAT.

Block Diagram



Absolute Maximum Ratings

Supply Voltage Vcc	-0.3~6.0V
SEC pin	-0.6~(Vcc+0.3) V
FB, Charge, Trigger, ISET pin	-0.3~(Vcc+0.3) V
Operating Temperature Range	-30°C to 85°C
Storage Temperature Range	-55°C to 125°C
Junction Temperature	125°C
Lead Temperature (Soldering, 10sec)(LD7268APL)	260 °C
ESD Level (Human Body Model)	2KV

Caution:

Stresses beyond the ratings specified in “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Characteristics

(T_A = +25°C unless otherwise stated, V_{CC}=3.3V)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Power					
Operating Voltage V_{CC}		2.2		5.5	V
Shutdown Current I_{CC}	Charge=Off, Trigger=Off			1	μA
Nominal Supply Current	V_{CC}=3.3V, D=50%		0.8		mA
FB					
Reference Voltage			1.15		V
Reference Voltage Tolerance				1	%
MOS Driver					
Rising Time	V_{CC}=3.3V, C_L=1nF		40		nS
Falling Time	V_{CC}=3.3V, C_L=1nF		40		nS
IGBT Driver					
Output ON resistor	V_{CC}=3.3V		4	6	Ω
Output OFF resistor	V_{CC}=3.3V		6	9	Ω
Rising Time	V_{CC}=3.3V, C_L=3.9nF		70		nS
Falling Time	V_{CC}=3.3V, C_L=3.9nF		100		nS
ON/OFF					
Trigger On/Off	Enable	1.4			V
	Disable			0.6	V
Charge On/Off	Enable	1.4			V
	Disable			0.6	V
Impedance to GND					
Charge Pin to GND			100K		Ω
Trigger Pin to GND			100K		Ω
Others					
Max Turn On Time	Ri open		6		μS
Max Turn On Time Tolerance				6.6	%
SEC Trip Voltage			30		mV
Propagation Delay	(Trigger=High) delay to OUT2		60		nS

Typical Performance Characteristics

COUT=140μF

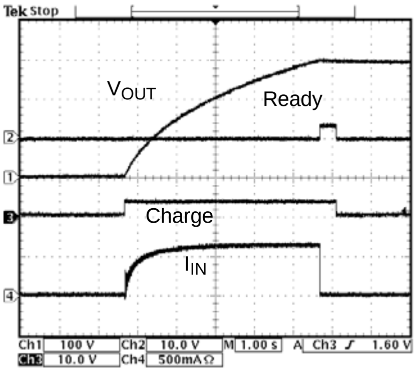


Fig. 2 Charging waveform V_{IN}=3V, I_{IN}=600mA

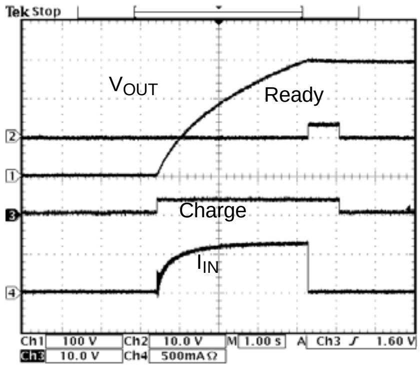


Fig. 3 Charging Waveform V_{IN}=4.2V, I_{IN}=600mA

COUT=47μF

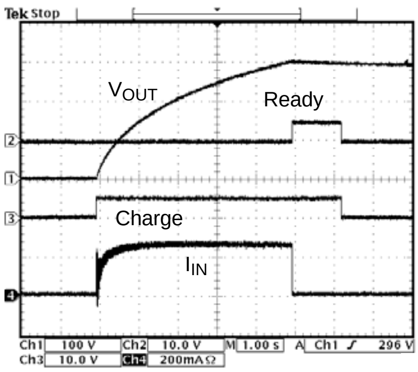


Fig. 4 Charging Waveform V_{IN}=3V, I_{IN}=280mA

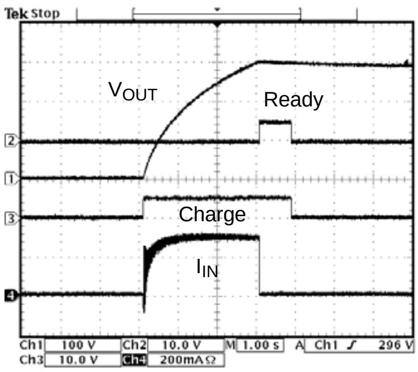


Fig. 5 Charging Waveform V_{IN}=4.2V, I_{IN}=280mA

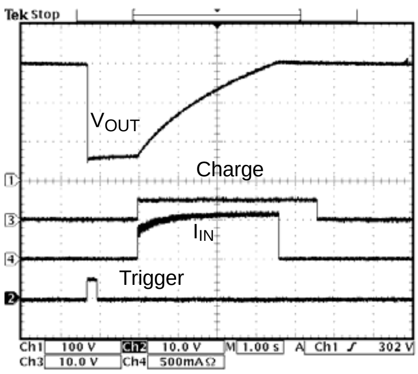


Fig. 6 Charging Waveform V_{IN}=4.2V

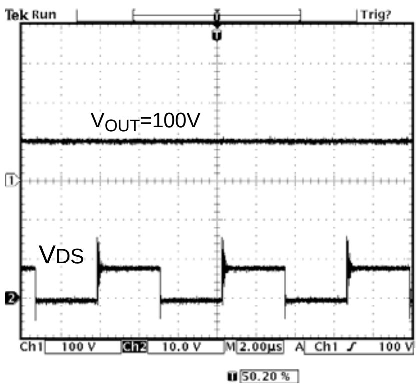


Fig. 7 VDS Waveform

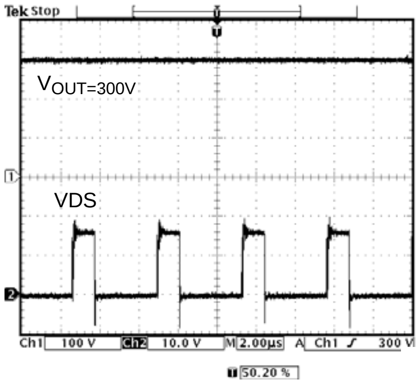


Fig. 8 VDS Waveform

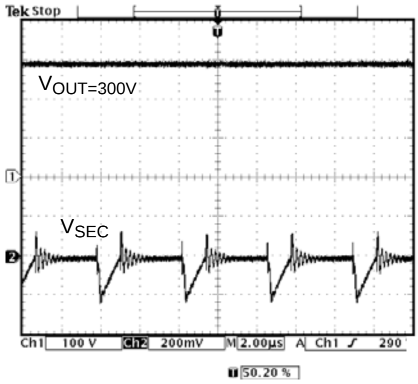


Fig. 9 VSEC Waveform

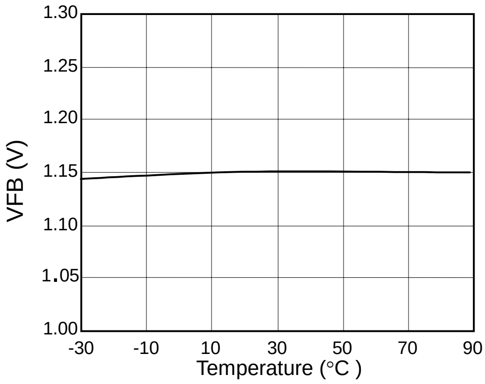


Fig. 10 FB Voltage vs. Temperature

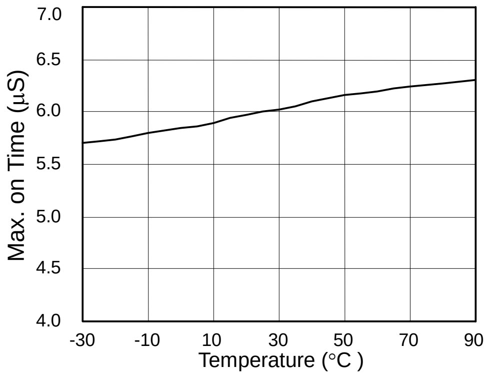


Fig. 11 Max on Time vs. Temperature

Function Description

Constant Charging Current

The LD7268A provides the solution of constant charging current for the lithium battery.

Just adjust R_I to achieve the desired peak primary charging current.

$R_I \approx 51 L_P \times I_P$ KΩ

L_P: primary inductance (µH)

I_P: desired peak primary current (A)

Ex: Desired I_P is 1.6A, L_P =8µH, then R_I =650K/1%

Note that the peak primary current must be less than the saturation current of transformer otherwise the transformer will be saturated.

Fig. 12 shows the example of this application

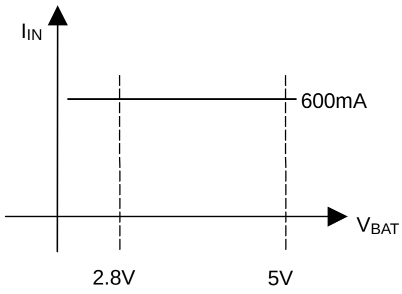


Fig. 12

Lower Charging Current at Low Battery Voltage

The LD7268A could operate at the mode with lowering the charging current at lower battery voltage, which is intended to use for 2AA battery. It provides a proprietary piecewise linearly charging current control to keep constant charging current at higher voltage and linearly lower charging current at lower battery voltage.

The Fig. 13 shows an example of the LD7268A to achieve this application.

(1) If we want to set the cut off voltage at V_{BAT}=2.5V, then

Choose R_I according to the following equation.

$R_I = 330 \times Vcutoff$ KΩ

For this example, $R_I = 330 \times 2.5K\Omega = 825K\Omega$

(2) The max on time of LD7268A is 6.0µS, then the on time of V_{BAT}=3.3V is about 4.55µS (4.55µS=2.5V*6.0µS/3.3V)

(3) The ON time of V_{BAT} <2.5V keeps at 6.0µS.

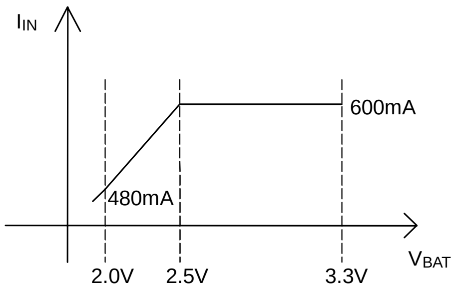


Fig. 13

Acceptable Minimum Ri

The acceptable minimum Ri for the LD7268A is

$$Ri\min \geq 28 \times \left(\frac{Vout}{N} + Vbat\max\right) \quad K\Omega,$$

N: turn ration of transformer

Ex: N=25, V_{OUT}=300V, Vbatmax=4.2V

→Ri >450KΩ

Please always keep RI value higher than the minimums described above to remain the proper operation in the whole battery range. If the RI value can't meet the requirement in charging application, please use a larger Lp to adjust the input current lower.

Transformer Selection

A carefully chosen transformer could result in best performance of the LD7268A. Usually, it's suitable to choose a transformer of L_P=8~22µH for V_{BAT} in the voltage range of 1.8V~5V. Also, the turn ratio of the transformer should be considered. Choose it according to the VDS rating of Q1. For example, if V_{DS} rating of Q1 is 30V, then the suitable turn ratio is about N=20~25.

Adjust Output Voltage

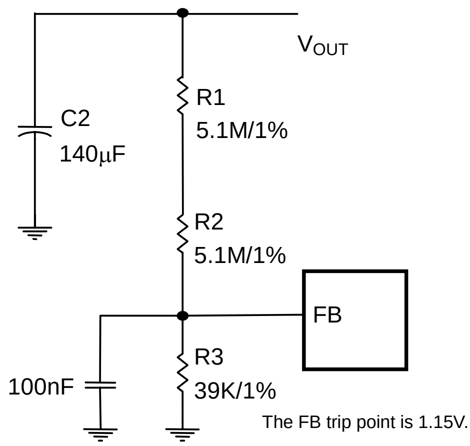


Fig. 14

The LD7268A could sense output voltage by using an output resistor divider or a high voltage zener diode.

Fig.14 shows the application circuit of resistor divider.

$$V_{OUT} = VFB \times (1 + \frac{R1+R2}{R3})$$

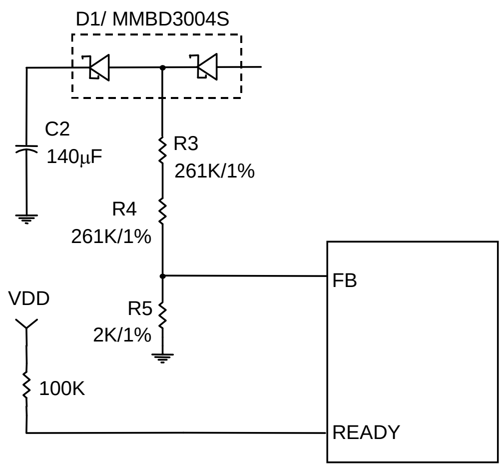


Fig.15

A resistor divider can be connected to the central of the rectifying diode to eliminate the leakage current in the application of Fig. 14 after the charging completes. The Fig. 15 shows the application circuit.

$$V_{OUT} = V_{FB} \times (1 + \frac{R3 + R4}{R5})$$

Choose the lower resistor (R5 in Fig. 15) connected form FB to GND, less than 2K ohm. Larger resistor combined with parasitic capacitance at FB pin would affect the Vout detection accuracy.

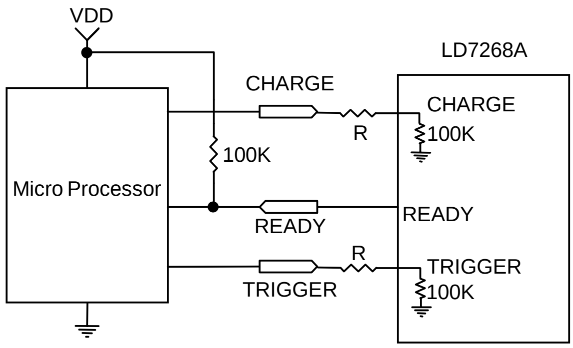


Fig. 16

Interface

CHARGE, READY and TRIGGER can be easily interfaced to a microprocessor.

The CHARGE pin is the ON/OFF control of charging circuit.
High=enable, Low =disable

The READY pin is an indicator of charging and output voltage state.
High= the charging is completed and CHARGE pin is high
Low= otherwise

The TRIGGER pin is the ON/OFF control of the strobe to generate a light pulse.
High=enable, Low =disable

Because the impedance of CHARGE pin and TRIGGER pin to GND is about 100KΩ. Thus, the user could use a resistor to form as a divider to increase the enable and disable level.

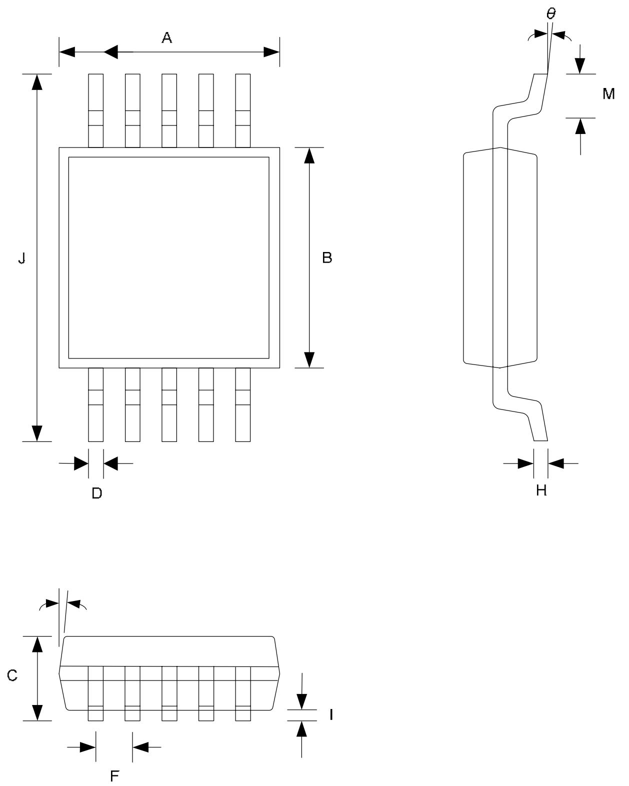
Note that the trigger function is only active while the CHARGE pin goes low.

Layout Consideration

1. The layout of this IC should be far away from any high voltage nodes or paths.
2. Keep the bypass capacitor 1μF very close to IC.
3. Keep output voltage feed back network, R_I, R_S and C_S very close to the IC.
4. The signal ground plane of FB and the SEC pin should be connected to the power ground with a via or only one point to minimize the effect of power ground currents.
4. The Switching node, such as OUT1, should be kept as small as possible and routed away from FB and SEC pin.
5. The PCB traces carrying discontinuous currents and any high current path should be made as short and wide as possible.
6. Please refer to the EV kit for the example of the PCB layout.

Package Information

MSOP-10



Symbols	Dimensions in Millimeters		Dimensions in Inch	
	MIN	MAX	MIN	MAX
A	2.896	3.099	0.114	0.122
B	2.896	3.099	0.114	0.122
C	0.813	1.219	0.032	0.048
D	0.152	0.305	0.006	0.012
F	0.470	0.530	0.018	0.020
H	0.127	0.229	0.005	0.009
I	0.051	0.152	0.002	0.006
J	4.699	5.105	0.185	0.201
M	0.406	0.660	0.016	0.026
θ	0°	6°	0°	6°

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