

## DESCRIPTION

The PT5126 is 1 Full-On Drive H-Bridge channel with three different packages. The driver features wide range operating from 2V to 24V and low power consumption by fast switching speed.

- PWM control, Max. input frequency: 200KHz
- Operating temperature range: -40 to +85°C
- Charge-pump less
- Shoot-through current protection
- Built-in protection circuits
  - Under Voltage Lock Out
  - Thermal Shut Down

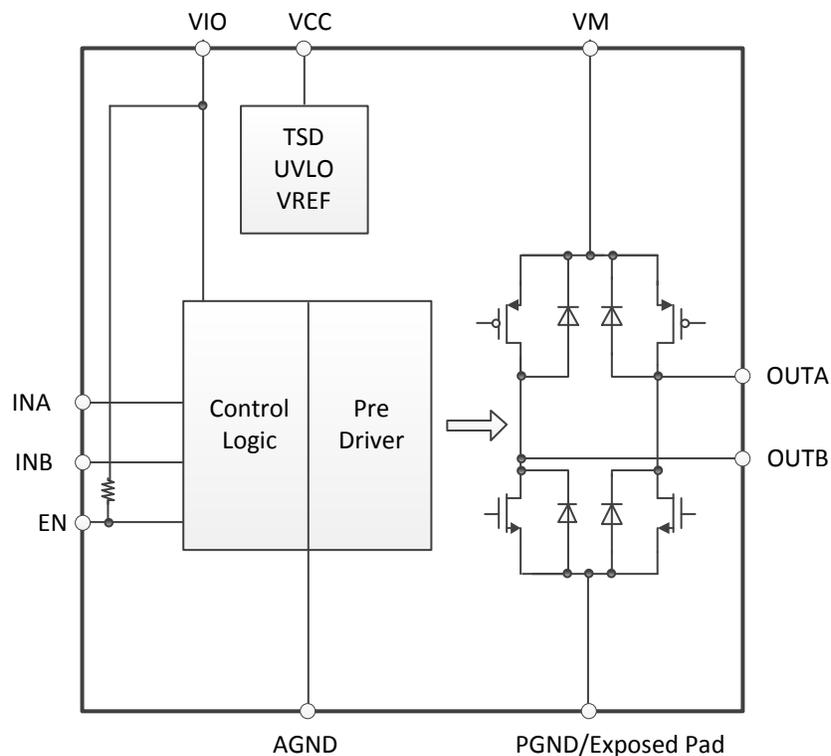
## FEATURES

- It is low consumption by BCD process adoption
- One small package: HSOP8
- Wide power-supply voltage range:
  - Control (VCC): 2.7V to 5.5V
  - Motor (VM): 2.0V~24V
- High DC output current: Max.=2.8A
- Ultra low RDSON(TOP+BOT): 0.49ΩTYP@25°C, 1A
- Low current consumption when power-down: <math><0.05\mu\text{A}</math> @25°C

## APPLICATION

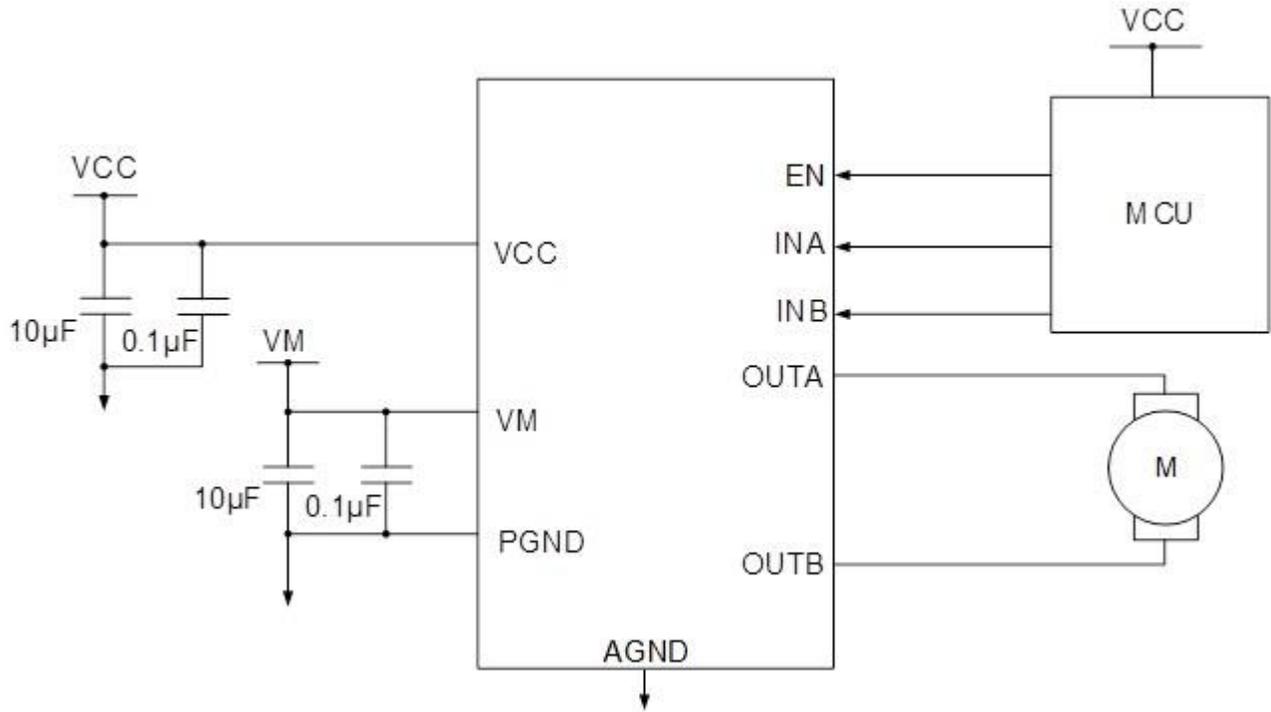
- Lens for DSLR
- Auto icemaker or dumper drive for refrigerator
- HV bi-direction DC Motor
- Intelligent electronic lock

## BLOCK DIAGRAM



# APPLICATION CIRCUITS

## HSOP8

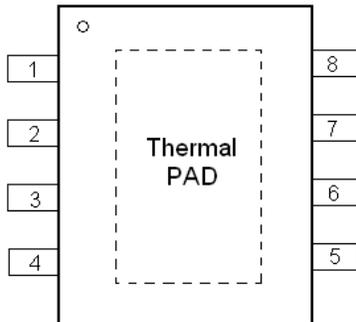


## ORDER INFORMATION

Valid Part Number	Package Type	Top Code
PT5126-HS	8 pins, HSOP	PT5126-HS

## PIN CONFIGURATION

### HSOP8

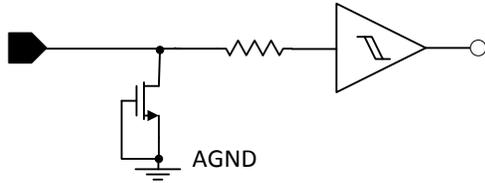


## PIN DESCRIPTION

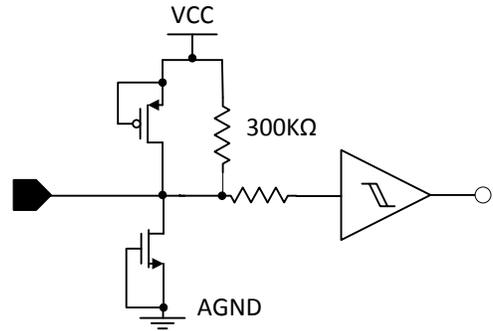
Pin Name	I/O	Description	Pin No.
			HSOP8
AGND	GND	Logic GND	1
VCC	Power	Power supply for Logic circuit	2
VM	Power	Power supply for driver	3
OUTA	O	H-Bridge output terminal A of the driver	4
OUTB	O	H-Bridge output terminal B of the driver	5
INA	I	Control input	6
INB	I	Control input	7
EN	I	Logic Enable [300KΩ pull up for VCC]	8
PGND	GND	Power MOS GND	Thermal PAD

# INPUT/OUTPUT CONFIGURATION

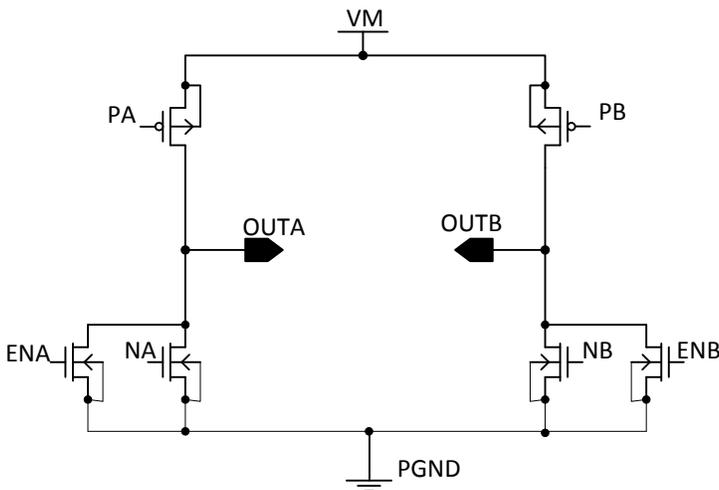
INA, INB



EN



OUTA, OUTB



Note:

INA=INB=H and EN=H, OUTA and OUTB are low level in brake state, here the power NMOS NA and NB are on, the enable NMOS ENA and ENB are off. The NA and NB have the ability of sink current.

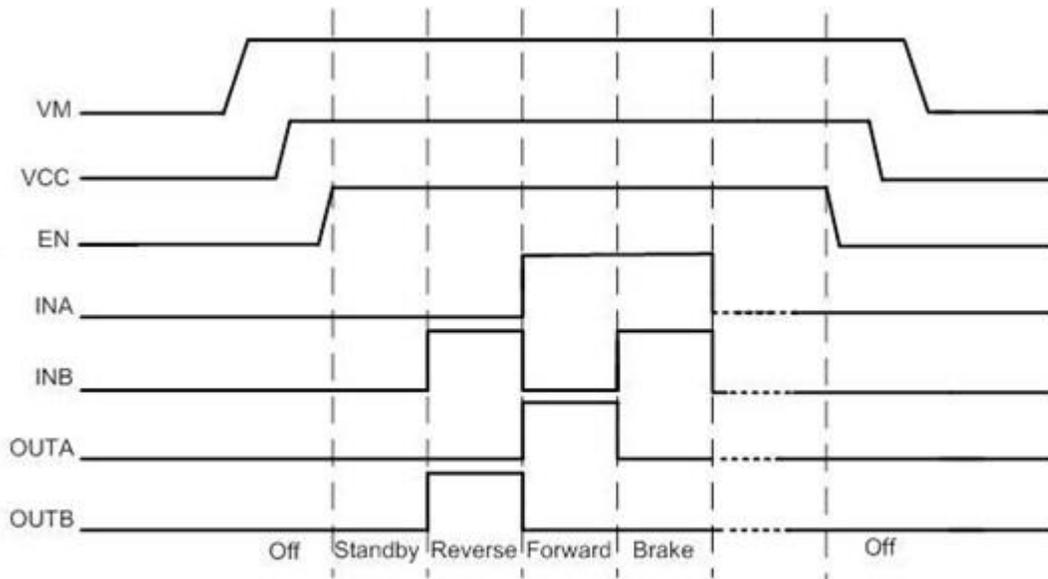
INA=INB=X and EN=L, OUTA and OUTB are low level in off state, here the power NMOS NA and NB are off, the enable NMOS ENA and ENB are on. The ENA and ENB only pull down the OUTA and OUTB, and they haven't the ability of sink current.

# FUNCTION TABLE

## INPUT-OUTPUT LOGIC TABLE

EN	Input Signal		Output Driver		Actuator status
	INA	INB	OUTA	OUTB	
H	L	L	Z	Z	Standby
H	L	H	L	H	Reverse
H	H	L	H	L	Forward
H	H	H	L	L	Brake
L	X	X	L	L	Off

## FUNCTION SEQUENCE



Note: VM & VCC power on have no timing sequence  
 VM & VCC power off have no timing sequence  
 EN power on have no timing sequence  
 EN power off have no timing sequence

## **PROTECTION FUNCTION**

### ***THERMAL SHUTDOWN (TSD) CIRCUIT***

The PT5126 includes a thermal shutdown circuit, which turns the output transistors off when the junction temperature ( $T_j$ ) exceeds 175°C (typ.).

The output transistors are automatically turned on when  $T_j$  cools past the shutdown threshold, which is lowered by a hysteresis of 30°C.

TSD = 175°C  
 $\Delta$ TSD = 30°C

\* In thermal shutdown mode, the circuits powered by VCC are work normal, and the circuits powered by VM are shut down.

### ***UNDER VOLTAGE LOCKOUT (UVLO) CIRCUIT***

The PT5126 includes an under voltage lockout circuit, which puts the output transistors in the high-impedance state when VCC decreases to 2.13V (typ.) or lower.

The output transistors are automatically turned on when VCC increases past the lockout threshold, which is raised to 2.21 V by a hysteresis of 0.08 V.

\* In UVLO shutdown mode, a part of circuits powered by VCC are work normal, and the circuits powered by VM are shut down.

### ***SHOOT-THROUGH CURRENT PROTECTION***

During Dead Time (Shoot through current circuit is operated.), Power MOS both of HI side and Low side are turned off. But in this time, internal parasitic diode is turned on according to current direction.

## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit	Note
Supply voltage VCC	VCC	-0.5	6	V	-
Control input voltage	INA/INB/EN	-0.5	6	V	-
Supply voltage VM	VM	-0.5	26	V	-
H-Bridge output current DC	Iload_dc_MD	-	2.8	A	-
H-Bridge output current AC	Iload_peak_MD	-	5.0	A	Note1
Continuous power dissipation	Pd Ta=85°C	-	1083	mW	Note2
Operation temperature	Ta	-40	85	°C	-
Junction temperature	Tj	-	150	°C	-
Storage temperature	Tstg	-40	150	°C	-
Minimum ESD rating(HBM)	Vesd	2000	-	V	-
Minimum ESD rating(MM)	Vesd	200	-	V	-

Notes:

1. Terminal OUTA,OUTB pulse with  $\leq 200\text{ms}$  :Duty 1%
2. Glass epoxy board : 4 layer circuit board,  $R_j=39^\circ\text{C/W}$   
EP pin is connected to GND. (EP pin has 4 thermal VIA holes.)

## RECOMMENDED OPERATION CONDITIONS

Parameter	Symbol	Min	Typ.	Max	Unit
Supply voltage VCC	VCC	2.7	3.3	5.5	V
Control input voltage	INA/INB/EN	1.62	1.8/3.3	VCC	V
Supply voltage VM	VM	2	-	24	V
Logic input frequency	Fin	0	-	200	KHz
Logic input duty for frequency=200KHz (Ta=25°C, VCC=3.3V, VM=12V, Rload=50Ω)	Duty	6%	-	94%	%

# ELECTRICAL CHARACTERISTICS

 (Unless otherwise specified,  $T_a=25^{\circ}\text{C}$ ,  $V_{CC}=3.3\text{V}$ ,  $V_M=7.4\text{V}$ )

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>VDET</b>						
VCC UVLO	VCDET_LV		1.90	2.13	2.50	V
<b>TSD (Note)</b>						
Thermal shut down temperature	TDET		-	175	-	$^{\circ}\text{C}$
Hysteresis	TDETHYS		-	30	-	$^{\circ}\text{C}$
<b>Power supply current</b>						
VM standby current1	IVM_NOPOW	$V_{CC}=L$	-	0.005	0.05	$\mu\text{A}$
VM standby current2	IVM_STBY	$EN=L$	-	0.005	0.05	$\mu\text{A}$
VCC work current	IVCC_WORK	$EN=H, INA=INB=L$	-	110	300	$\mu\text{A}$
VCC off current	IVCC_OFF	$EN=L$	-	11	30	$\mu\text{A}$
Operation circuit current	IVCC_PWM	$INA=200\text{KHz}, INB=H$	-	0.38	0.8	$\text{mA}$
<b>Driver</b>						
Output on resistance 1 (HSD or LSD)	RON1	$V_{CC}=3.3\text{V}, I_{OUT}=100\text{mA}$ $T_a=25^{\circ}\text{C}$	-	0.23	0.27	$\Omega$
Output on resistance 2 (HSD or LSD)	RON2	$V_{CC}=3.3\text{V}, I_{OUT}=1.0\text{A}$ $T_a=25^{\circ}\text{C} (T_j=65^{\circ}\text{C})$	-	0.245	0.29	$\Omega$
Output on resistance 3 (HSD or LSD)	RON3	$V_{CC}=3.3\text{V}, I_{OUT}=1.0\text{A}$ $T_a=85^{\circ}\text{C} (T_j=125^{\circ}\text{C})$	-	0.295	0.35	$\Omega$
Diode forward voltage	VF_MD	$IF=100\text{mA}$	-	0.7	1.2	V
<b>Control terminal</b>						
H level input voltage (INA, INB, EN)	VIH		$0.7 \times V_{CC}$	-	-	V
L level input voltage (INA, INB, EN)	VIL		-	-	$0.3 \times V_{CC}$	V
H level input current (INA, INB)	IIH1	$EN=H$ or L	-	-	1	$\mu\text{A}$
L level input current (INA, INB)	IIL1	$EN=H$ or L	-	-	1	$\mu\text{A}$
H level input current (EN)	IIH1		-	-	1	$\mu\text{A}$
L level input current (EN)	IIL1		-	11	30	$\mu\text{A}$
<b>Full Swing</b>						
Turn on time 1	TfONH	$V_{CC}=3.3\text{V}, V_M=7.4\text{V}$ $I_{OUT}=500\text{mA}$ , Output state: Forward $\rightarrow$ Reverse. Refer to Fig.1	-	0.42	1.0	$\mu\text{s}$
Turn off time 1	TfOFFH		-	0.11	0.5	$\mu\text{s}$
Output rise time 1	Tfr		-	0.09	1.0	$\mu\text{s}$
Output fall time 1	Tff		-	0.04	0.5	$\mu\text{s}$
Turn on time 2	TrONH	$V_{CC}=3.3\text{V}, V_M=7.4\text{V}$ $I_{OUT}=500\text{mA}$ , Output state: Reverse $\rightarrow$ Forward. Refer to Fig.1	-	0.38	1.0	$\mu\text{s}$
Turn off time 2	TrOFFH		-	0.11	0.5	$\mu\text{s}$
Output rise time 2	Trr		-	0.09	1.0	$\mu\text{s}$
Output fall time 2	Trf		-	0.04	0.5	$\mu\text{s}$

Note: OUTA and OUTB are Hi-Z (off state) at thermal shut down.

# SWITCHING CHARACTERISTICS WAVEFORM

## SWITCHING WAVEFORM

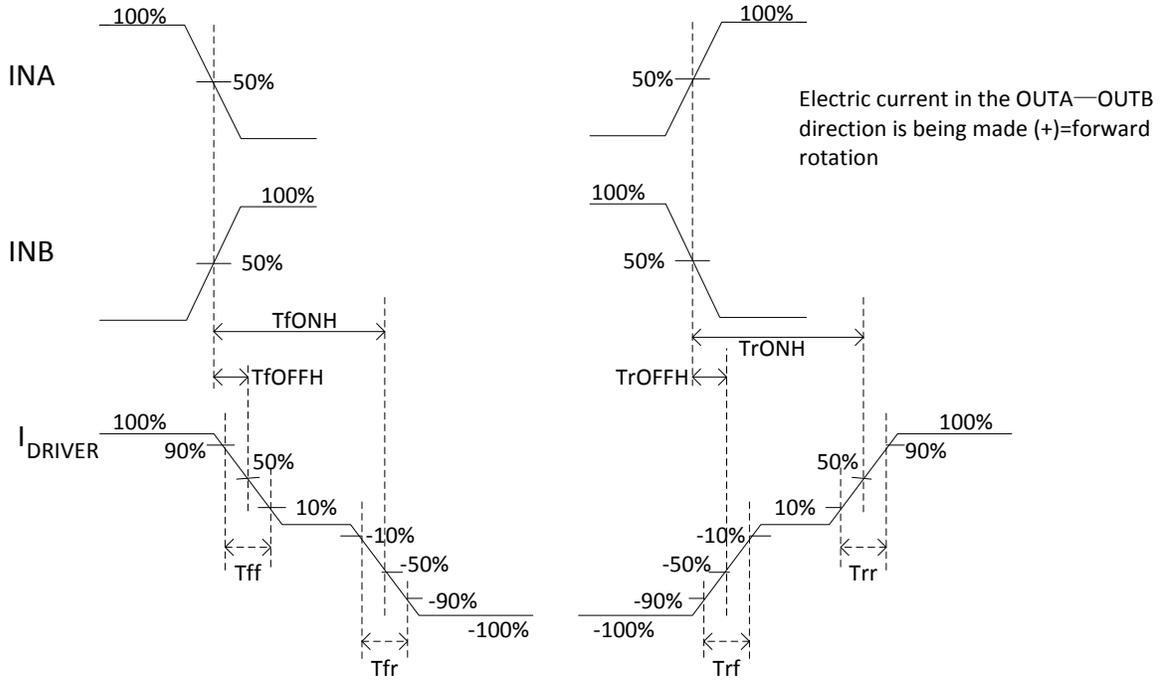
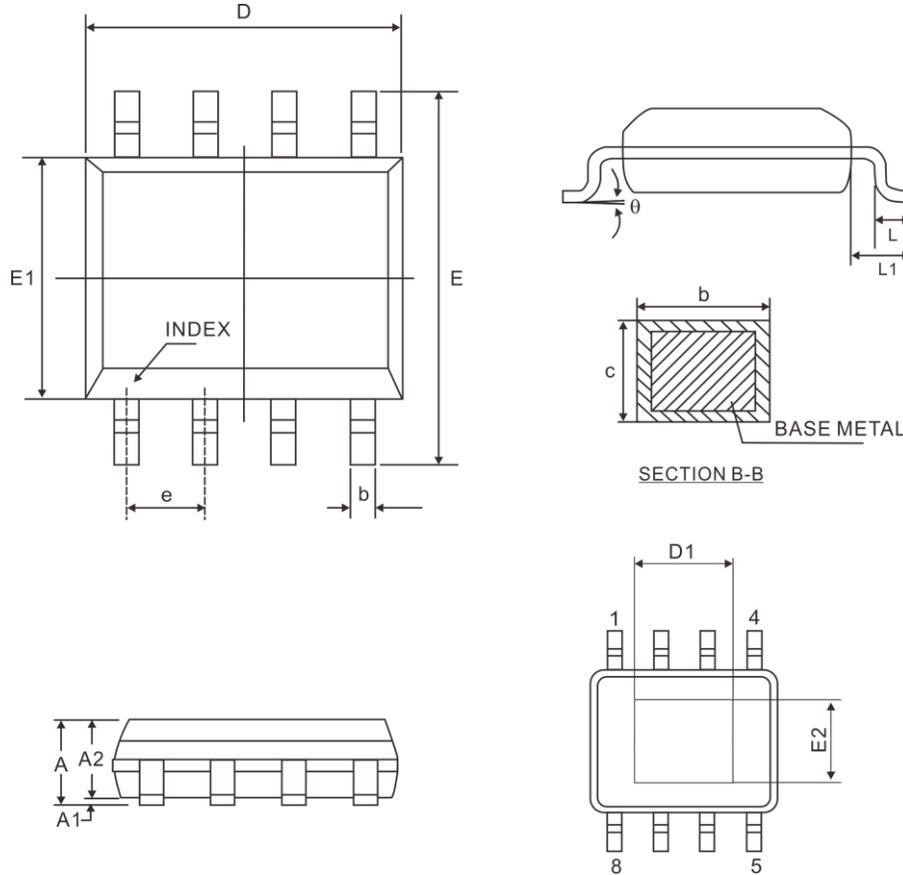


Fig.1 switching characteristics waveform

# PACKAGE INFORMATION

## 8-PIN, HSOP



Symbol	Dimensions(mm)		
	Min.	Nom.	Max.
A	-	-	1.70
A1	0.00	-	0.15
A2	1.25	-	-
b	0.31	-	0.51
c	0.17	-	0.25
e	1.27 BSC		
D	4.90 BSC		
D1	3.1	3.3	3.5
E	6.00 BSC		
E1	3.90 BSC		
E2	2.2	2.4	2.6
L	0.40	-	1.27
L1	1.04 REF		
$\theta$	0°	-	8°

Notes:

1. Refer to JEDEC MS-012 BA
2. All dimensions are in millimeter.
3. D1 and E2 refer to supplier spec. The JEDEC MS-012BA classify D1 and E2 minimum value are 1.5mm and 1.0mm.

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