

## 16-Channel LED Driver for LCD Panel Backlighting

### 1.0 Features

- 16ch LED driver with external power MOSFET, with 5V and 9-16V(Typ=12V) input supply voltage range
- Patented BroadLED™ adaptive switch mode technology for high current matching at maximum efficiency
  - » Channel Current matching accuracy  $\pm 3\%$
  - » Enables use of cheaper, loosely binned LED arrays for lower BOM cost
- Dynamic external Boost or Buck controller interface to optimize system power efficiency
  - » Dual interface controls one or two DC-DC converters
  - » Programmable LED channel assignment for individual DC-DC converters
- High speed SPI interface and SPI daisy-chain support
- PWM-generator clock
  - » Internal OSC
  - » External clock (HSYNC)
  - » PLL-synthesized clock from external signal
- Industry only Patented Gate Sensing to detect channel short without external component
- Dimming control
  - » 12-bit PWM dimming range from 0% to 99.9%
  - » Supports direct PWM dimming control
- Supports Scan Mode
- Supports VSYNC frequency from 50Hz to 480Hz.
- Programmable external MOS driver slew rate
- Integrated OTP with 2 times programmable access
  - » With ECC for one bit error
  - » Two bit OTP error fault generation
- Programmable burn-in mode and direct PWM mode
- Supports different channel delay in all VSYNC range setting for every channel
- Comprehensive protection features
  - » LED open fault detection
  - » Programmable LED short level fault detection
  - » Over-temperature shutdown
  - » Over two OTP bits error shutdown
  - » Microcontroller interruption interface

### 2.0 Description

The iW7027 is a versatile, 16-channel, high precision LED backlight driver for medium to large size LCD display panels.

The LED current sink MOSFETs are external, allowing maximum flexibility for different current and voltage configurations. Built-in safety features include over-temperature shutdown, open and short LED detection.

High Speed SPI daisy-chain interface simplifies the system design when multiple IW7027s are used to support more than 16 LED strings.

Scan mode provide flexible PWM mode to reduce motion blur.

Internal PLL simplifies the system requirement with only Vsync signal needed.

It uses Dialog's patented 2-pin sensing technology to realize LED short detection.

### 3.0 Applications

- LED backlighting for LCD-TV sets and LCD monitors

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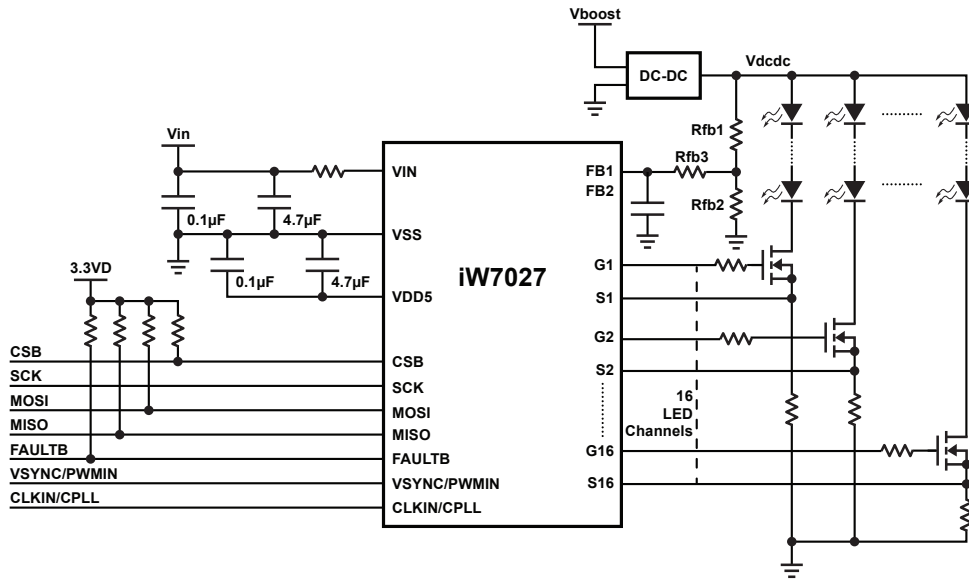


Figure 3.1 : iW7027 Application 1 Boost Diagram

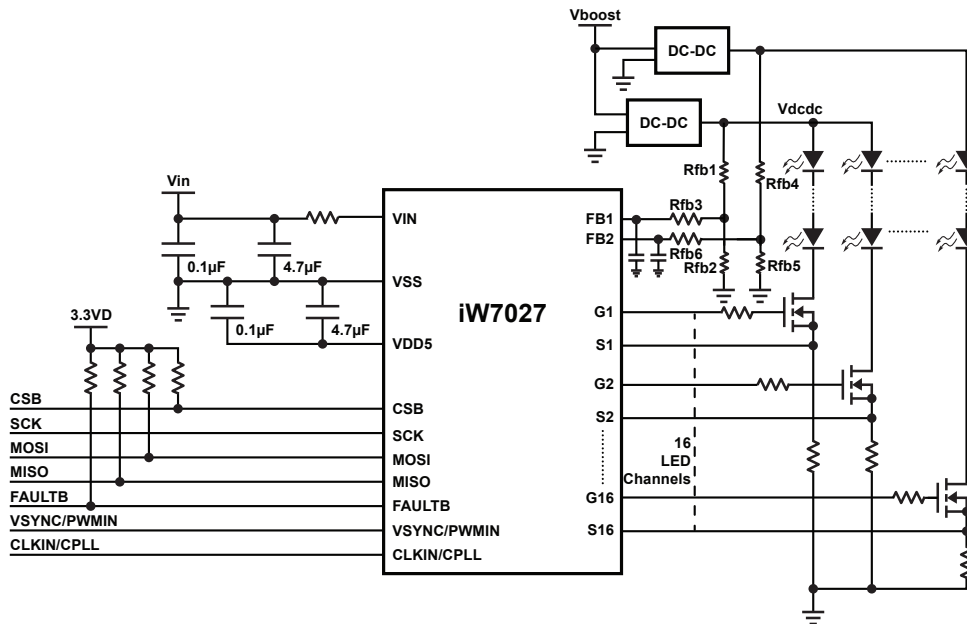


Figure 3.2 : iW7027 Application 2 Boost Diagram

## 16-Channel LED Driver for LCD Panel Backlighting

### 4.0 Pinout Description

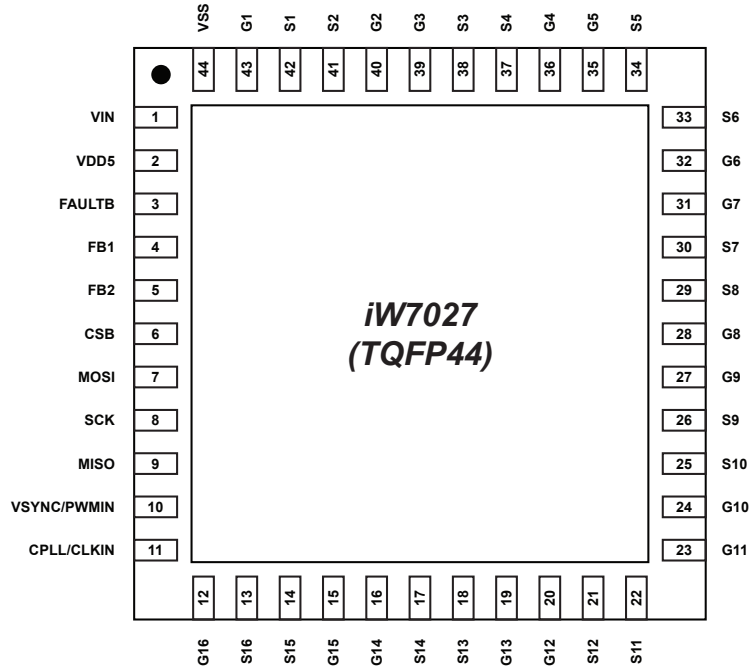


Figure 4.1 : iW7027 Pin Configuration for QFP44 Package

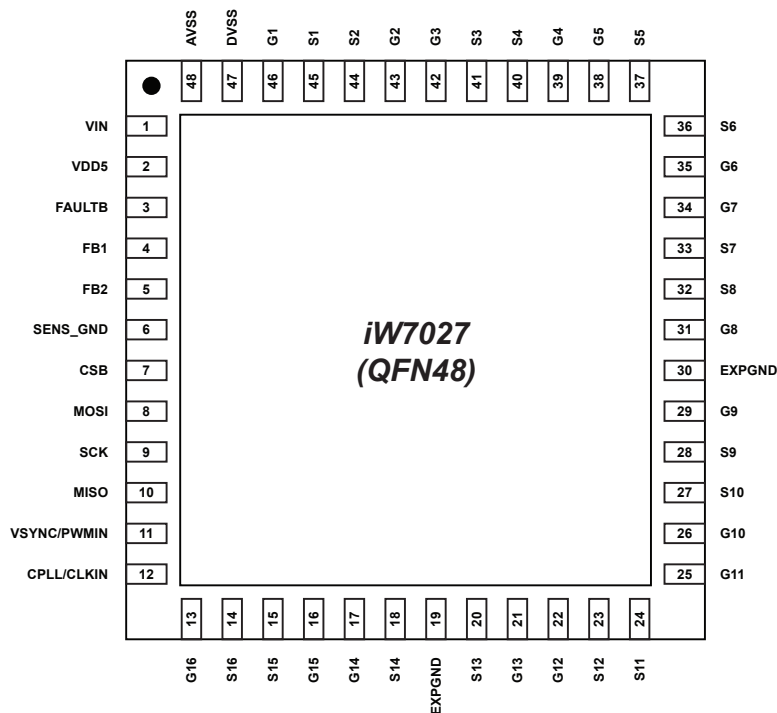


Figure 4.2 : iW7027 Pin Configuration for QFN48 Package

## 16-Channel LED Driver for LCD Panel Backlighting

### Pinout Description (continued)

Pin #		Name	Type	Pin Description
QFP44	QFN48			
1	1	VIN	Supply Input	Input voltage to the main supply rail.
2	2	VDD5	Analog Output	5V input and LDO Compensation Pin.
3	3	FAULTB	Analog Output	Fault status (Active Low) - Open drain. pull-up to 5V with a 100KΩ resistor.
4	4	FB1	Analog Output	Analog DAC output interface with external Buck or Boost converter for LED
5	5	FB2	Analog Output	Analog DAC output interface with external Buck or Boost converter for LED.
	6	SENS_GND	Sense Ground	Sense ground for ILED, Connect to external R <sub>SENSE</sub> ground.
6	7	CSB	Digital Input	Slave select input for SPI (Chip Select Bar). Active LOW.
7	8	MOSI	Digital Input	Master output, slave input for SPI.
8	9	SCK	Digital Input	SCK, serial clock input for Serial Peripheral Interface (SPI)/In direct PWM mode, can be reused as PWM In.
9	10	MISO	Digital 3 State Output	Master input, slave output for SPI.
10	11	VSYNC/ PWSMIN	Digital Input	VSYNC clock input in SPI dimming mode.
11	12	CPLL/CLKIN	Analog In/Out	PLL compensation output/External Clock In.
12	13	G16	Analog Output	Gate of external MOSFET.
13	14	S16	Analog Input	Source of external MOSFET.
14	15	S15	Analog Input	Source of external MOSFET.
15	16	G15	Analog Output	Gate of external MOSFET.
16	17	G14	Analog Output	Gate of external MOSFET.
17	18	S14	Analog Input	Source of external MOSFET.
XXXX	19	EXPGND	Analog Ground	Ground for ILED. Connected to External R <sub>SENSE</sub> Ground.
18	20	S13	Analog Input	Source of external MOSFET.
19	21	G13	Analog Output	Gate of external MOSFET.
20	22	G12	Analog Output	Gate of external MOSFET.
21	23	S12	Analog Input	Source of external MOSFET.
22	24	S11	Analog Input	Source of external MOSFET.
23	25	G11	Analog Output	Gate of external MOSFET
24	26	G10	Analog Output	Gate of external MOSFET

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### Pinout Description (continued)

Pin #		Name	Type	Pin Description
QFP44	QFN48			
25	27	S10	Analog Input	Source of external MOSFET
26	28	S9	Analog Input	Source of external MOSFET
27	29	G9	Analog Output	Gate of external MOSFET
XXXX	30	EXPGND	Analog Ground	Ground for ILED, Connect to External Rsense Ground.
28	31	G8	Analog Output	Gate of external MOSFET
29	32	S8	Analog Input	Source of external MOSFET
30	33	S7	Analog Input	Source of external MOSFET
31	34	G7	Analog Output	Gate of external MOSFET
32	35	G6	Analog Output	Gate of external MOSFET
33	36	S6	Analog Input	Source of external MOSFET
34	37	S5	Analog Input	Source of external MOSFET
35	38	G5	Analog Output	Gate of external MOSFET
36	39	G4	Analog Output	Gate of external MOSFET
37	40	S4	Analog Input	Source of external MOSFET
38	41	S3	Analog Input	Source of external MOSFET
39	42	G3	Analog Output	Gate of external MOSFET
40	43	G2	Analog Output	Gate of external MOSFET
41	44	S2	Analog Input	Source of external MOSFET
42	45	S1	Analog Input	Source of external MOSFET
43	46	G1	Analog Output	Gate of external MOSFET
44	XXXX	VSS	Ground	Chip ground
	47	DVSS	Ground	Digital Ground
	48	AVSS	Ground	Analog Ground
		EPGND	Ground	Thermal PAD

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### 5.0 Absolute Maximum Ratings

Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

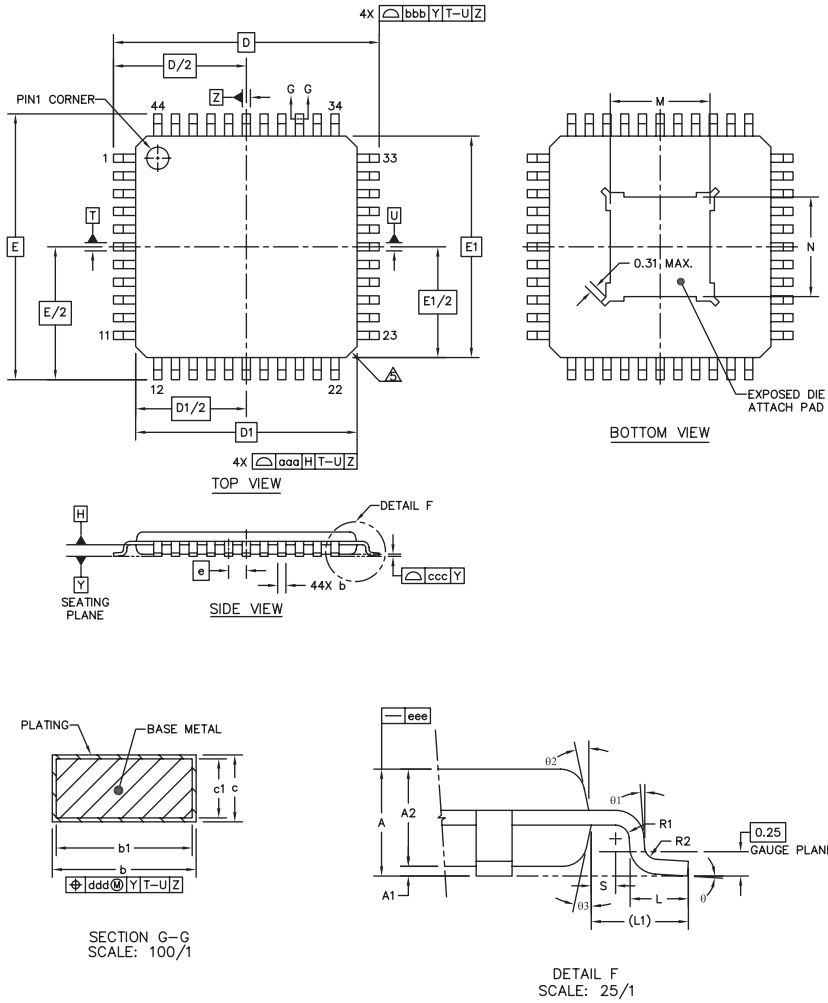
Parameter	Symbol	Min	Units
VDD5 supply voltage	$V_{IN}$	-0.3 to 7	V
$V_{IN}$ supply voltage		-0.3 to 20	V
VSSA		-0.3 to 0.3	V
Logic I/O pins (SCK, SDO, SDI, CSB, & VSYNC)		-0.3 to 7	V
Maximum operating junction temperature	$T_{JMAX}$	-40 to 150	°C
Storage temperature	$T_{STG}$	-40 to 150	°C
Latch-up Current		>100	mA
ESD rating per JEDEC JESD22-A114 - HBM		±2,000	V

### 6.0 Recommended Operating conditions

Parameter	Symbol	Conditions	Min	Typ	Max	Units
$V_{IN}$ supply voltage			4.5/9	5/12	5.5/16	V
VDD5 supply voltage			4.5	5	5.5	V
Thermal resistance junction	$\theta_{JA}$			TBD		°C /W
Junction temperature	$T_J$		-40		150	°C
Operate temperature (Co-operate)			-40		90	°C

# 16-Channel LED Driver for LCD Panel Backlighting

## 7.0 Physical Dimensions



	SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS	A	---	---	1.2
STAND OFF	A1	0.05	---	0.15
MOLD THICKNESS	A2	0.95	1	1.05
LEAD WIDTH(PLATING)	b	0.32	0.37	0.42
LEAD WIDTH	b1	0.32	0.35	0.38
L/F THICKNESS(PLATING)	c	0.09	---	0.2
L/F THICKNESS	c1	0.09	---	0.16
BODY SIZE	X	D	12 BSC	
	Y	E	12 BSC	
	X	D1	10 BSC	
LEAD PITCH	Y	E1	10 BSC	
		e	0.8 BSC	
FOOTPRINT	L	0.45	0.6	0.75
	L1		1 REF	
	0	0'	3.5'	7'
	01	0'	---	---
	02	11'	12'	13'
	03	11'	12'	13'
	R1	0.08	---	---
	R2	0.08	---	0.2
	S	0.2	---	---
EP SIZE	X	M	4.4	4.5
	Y	N	4.4	4.5
PACKAGE EDGE TOLERANCE	aaa		0.2	
LEAD EDGE TOLERANCE	bbb		0.2	
COPLANARITY	ccc		0.1	
LEAD OFFSET	ddd		0.2	
MOLD FLATNESS	eee		0.05	

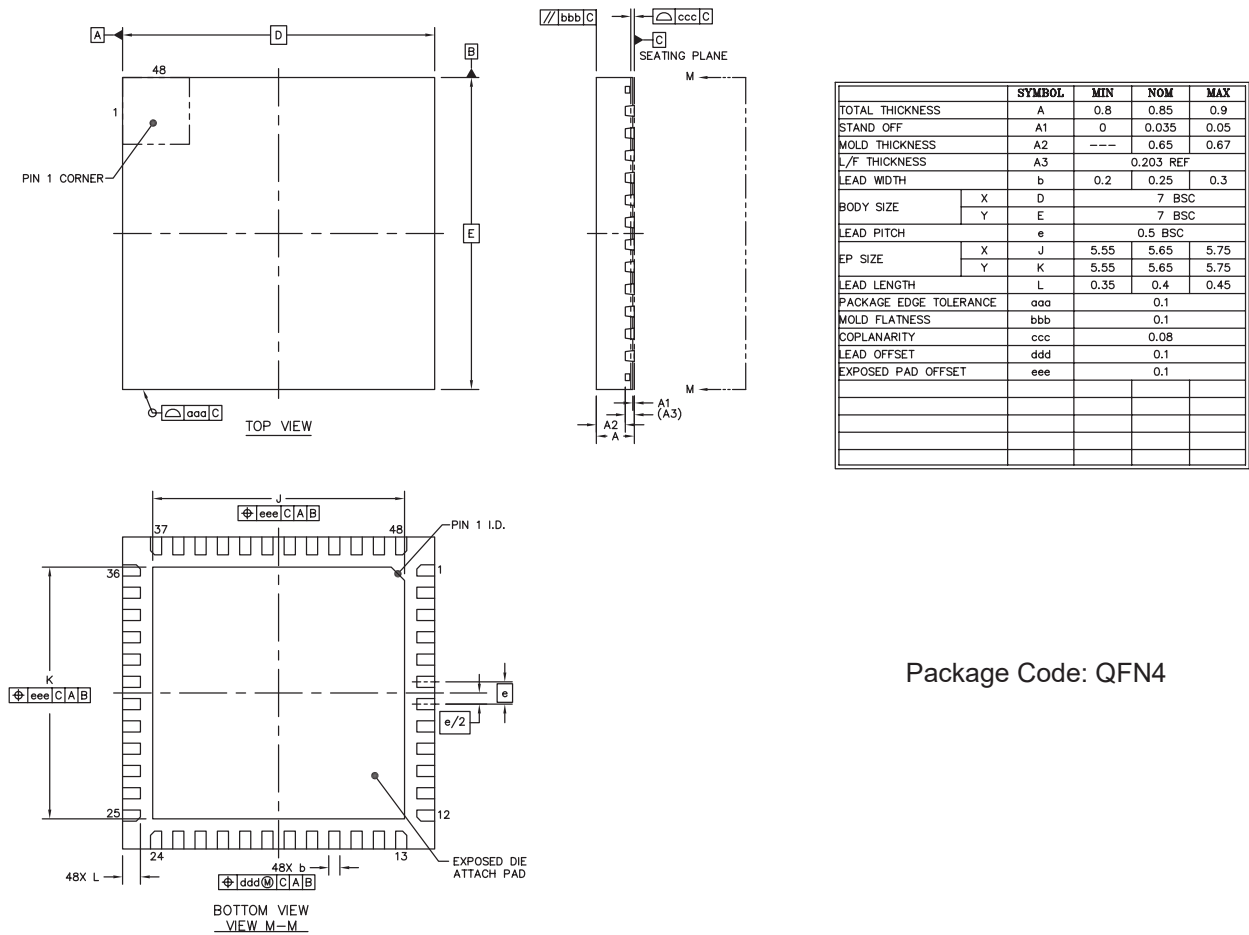
NOTES

- DATUM T, U, AND Z TO BE DETERMINED AT DATUM PLANE H.
  - DIMENSIONS D AND E TO BE DETERMINED AT SEATING PLANE DATUM Y.
  - DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLDFROTRUSION. ALLOWABLE PROTRUSION IS 0.25 PER SIDE. DIMENSIONS D1 AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE DATUM H.
  - DIMENSION b DOES NOT INCLUDE DAM BAR PROTRUSION. ALLOWABLE DAM BAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED THE MAXIMUMb DIMENSION BY MORE THAN 0.08 mm. DAM BAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD IS 0.07 mm.
- △ EXACT SHAPE OF EACH CORNER IS OPTIONAL.

Package Code: TQ2E

Figure 7.1 : Physical Dimensions, TQFP-44 Package

## 16-Channel LED Driver for LCD Panel Backlighting



Package Code: QFN4

Figure 7.2 : Physical Dimensions, QFN-48 Package

### 8.0 Ordering Information

Part Number	Package	Description
iW7027-00-QFN4	QFN-7m-48L	Tape & Reel <sup>1</sup>
iW7027-00-TQ2E	TQFPEP-10m-44L	Tray <sup>2</sup>
iW7027-00-TQ2E-1	TQFPEP-10m-44L	Tape & Reel <sup>3</sup>

Note 1: Tape & Reel packing quantity is 4,000/reel. Minimum ordering quantity is 4,000.

Note 2: Tray packing quantity is 1,600 units in 10 trays/box. Minimum ordering quantity is 1,600 units.

Note 3: Tape & Reel packing quantity is 1,250/reel. Minimum ordering quantity is 1,250.



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### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Contact Information

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