

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP280, TLP280-4

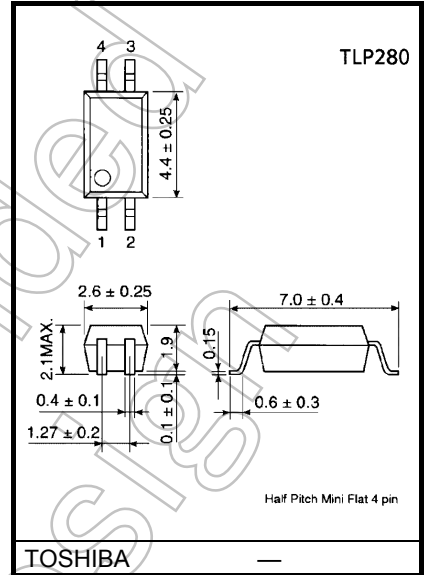
Programmable Controllers
 AC/DC-Input Module
 PC Card Modem (PCMCIA)

TLP280 and TLP280-4 is a very small and thin coupler, suitable for surface mount assembly in applications such as PCMCIA fax modem, programmable controllers.

TLP280 and TLP280-4 consist of photo transistor, optically coupled to two gallium arsenide infrared emitting diodes connected inverse parallel, and can operate directly by AC input current

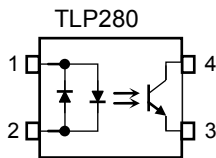
- Collector-emitter voltage: 80 V (min)
- Current transfer ratio: 50% (min)
 Rank GB: 100% (min)
- Isolation voltage: 2500 Vrms (min)
- UL recognized: UL1577, file No. E67349
- BSI approved: BS EN 60065: 2002,
 BS EN 60950-1: 2002
 Certificate No. 8143, 8144

Unit: mm

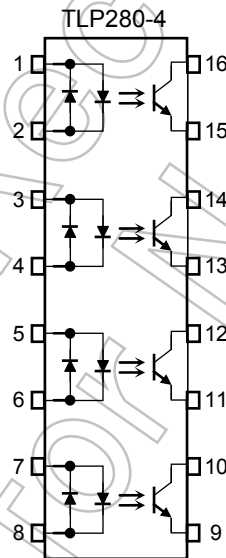


Weight: 0.05 g (typ.)

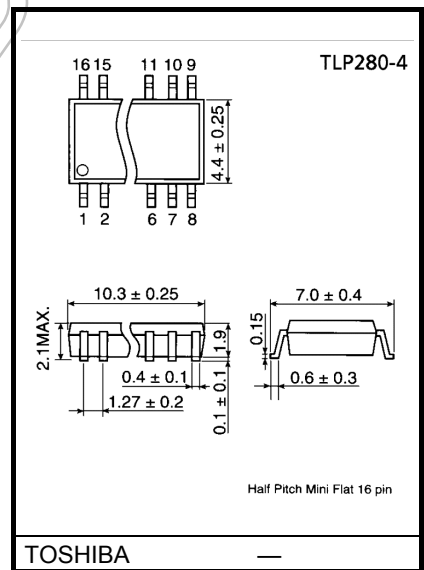
Pin Configuration (top view)



- 1 : Anode
- 2 : Cathode
- 3 : Emitter
- 4 : Collector



- 1,3,5,7 : Anode-Cathode
- 2,4,6,8 : Cathode Anode
- 9,11,13,15 : Emitter
- 10,12,14,16 : Collector



Weight: 0.19 g (typ.)

Start of commercial production
 1996/03

Current Transfer Ratio

Part Number	Classification (* 1)	Current Transfer Ratio (%) (I_C / I_F)		Marking of Classification
		$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}, T_a = 25^\circ\text{C}$		
		min	max	
TLP280**	Blank	50	600	Blank, YE, GR, BL, GB
	Rank Y	50	150	YE
	Rank GR	100	300	GR
	Rank BL	200	600	BL
	Rank GB	100	600	GB
TLP280-4	Blank	50	600	Blank, GB
	Rank GB	100	600	GB

* : For the supply status of TLP280 rank Y and BL products, please contact with our sales representative.

* 1: When ordering product, please specify both the part number and the classification, e.g. TLP280(GB).

(Note): Application type name for certification test, please use standard product type name, i.e.

TLP280(GB): TLP280, TLP280-4(GB): TLP280-4.

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic		Symbol	Rating		Unit
			TLP280	TLP280-4	
LED	Forward current	$I_{F(RMS)}$	±50		mA
	Forward current derating	$\Delta I_F / ^\circ\text{C}$	-0.7 ($T_a \geq 53^\circ\text{C}$)	-0.5 ($T_a \geq 25^\circ\text{C}$)	mA / $^\circ\text{C}$
	Pulse forward current	I_{FP}	±1 (100µs pulse, 100pps)		A
	Junction temperature	T_j	125		$^\circ\text{C}$
Detector	Collector-emitter voltage	V_{CEO}	80		V
	Emitter-collector voltage	V_{ECO}	7		V
	Collector current	I_C	50		mA
	Collector power dissipation (1 circuit)	P_C	150	100	mW
	Collector power dissipation derating ($T_a \geq 25^\circ\text{C}$) (1 circuit)	$\Delta P_C / ^\circ\text{C}$	-1.5	-1.0	mW / $^\circ\text{C}$
	Junction temperature	T_j	125		$^\circ\text{C}$
Storage temperature range		T_{stg}	-55~125		$^\circ\text{C}$
Operating temperature range		T_{opr}	-55~100		$^\circ\text{C}$
Lead soldering temperature		T_{sol}	260 (10s)		$^\circ\text{C}$
Total package power dissipation (1 circuit)		P_T	200	170	mW
Total package power dissipation derating ($T_a \geq 25^\circ\text{C}$) (1 circuit)		$\Delta P_T / ^\circ\text{C}$	-2.0	-1.7	mW / $^\circ\text{C}$
Isolation voltage (Note)		BV_S	2500 (AC, 1 minute, R.H. ≤ 60%)		Vrms

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

(Note): Device considered a two terminal device: LED side pins shorted together and detector side pins shorted together.

Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ	Max	Unit
LED	Forward voltage	V_F	$I_F = \pm 10 \text{ mA}$	1.0	1.15	1.3	V
	Capacitance	C_T	$V = 0, f = 1 \text{ MHz}$	—	60	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.5 \text{ mA}$	80	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	$I_E = 0.1 \text{ mA}$	7	—	—	V
	Collector dark current (Note 1)	I_{CEO}	$V_{CE} = 48 \text{ V}$	—	0.01	0.1	μA
			Ambient light below (100 lx)	—	2	10	
			$V_{CE} = 48 \text{ V}, T_a = 85^\circ\text{C}$	—	2	50	μA
Ambient light below (100 lx)	—	4	50				
Capacitance (collector to emitter)	C_{CE}	$V = 0, f = 1 \text{ MHz}$	—	10	—	pF	

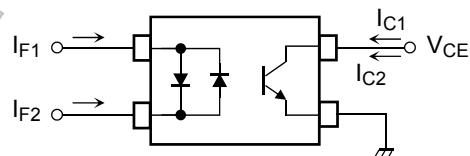
(Note 1): Because of the construction, leak current might be increased by ambient light. Please use photocoupler with less ambient light.

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_C / I_F	$I_F = \pm 5 \text{ mA}, V_{CE} = 5 \text{ V}$	50	—	600	%
		Rank GB	100	—	600	
Saturated CTR	$I_C / I_F (\text{sat})$	$I_F = \pm 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$	—	60	—	%
		Rank GB	30	—	—	
Collector-emitter saturation voltage	$V_{CE} (\text{sat})$	$I_C = 2.4 \text{ mA}, I_F = \pm 8 \text{ mA}$	—	—	0.4	V
		$I_C = 0.2 \text{ mA}, I_F = \pm 1 \text{ mA}$	—	0.2	—	
		Rank GB	—	—	0.4	
Off-state collector current	$I_{C(\text{off})}$	$V_F = \pm 0.7 \text{ V}, V_{CE} = 48 \text{ V}$	—	—	10	μA
CTR symmetry	$I_C (\text{ratio})$	$I_C (I_F = -5 \text{ mA}) / I_C (I_F = 5 \text{ mA})$ (Note 2)	0.33	—	3	—

(Note 2):

$$I_C (\text{ratio}) = \frac{I_{C2} (I_F = I_{F2}, V_{CE} = 5\text{V})}{I_{C1} (I_F = I_{F1}, V_{CE} = 5\text{V})}$$



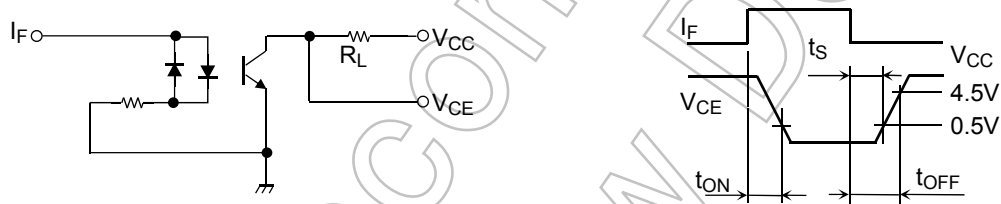
Isolation Characteristics (Ta = 25°C)

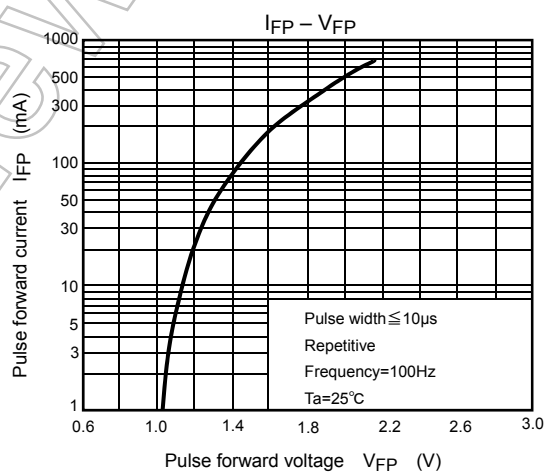
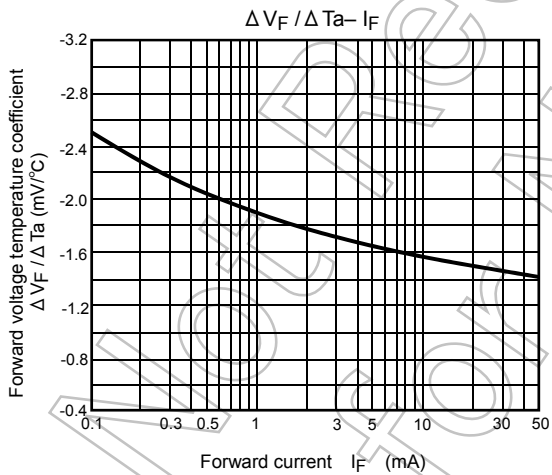
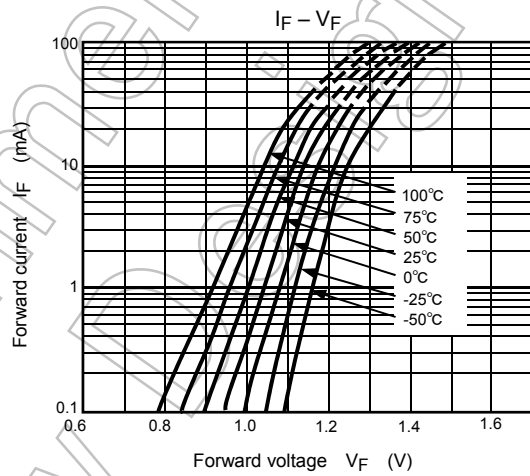
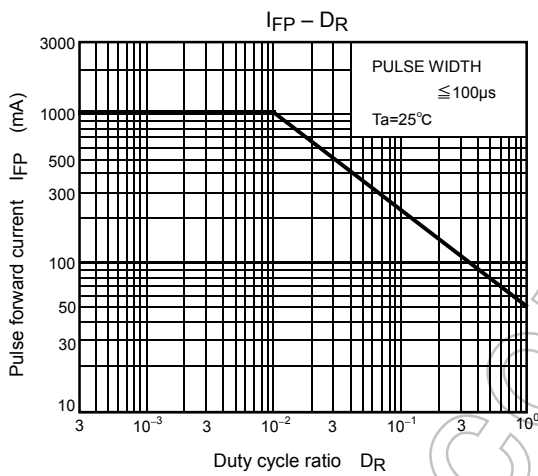
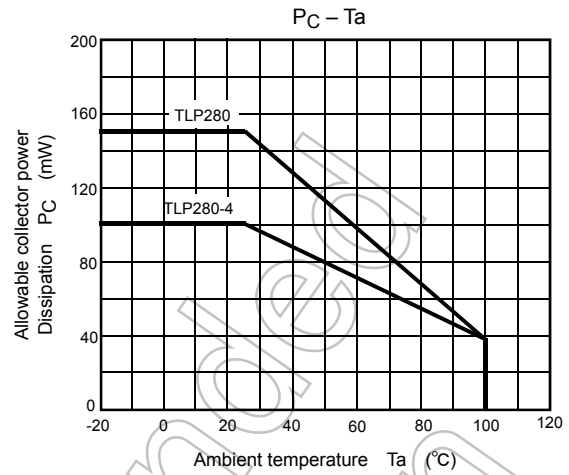
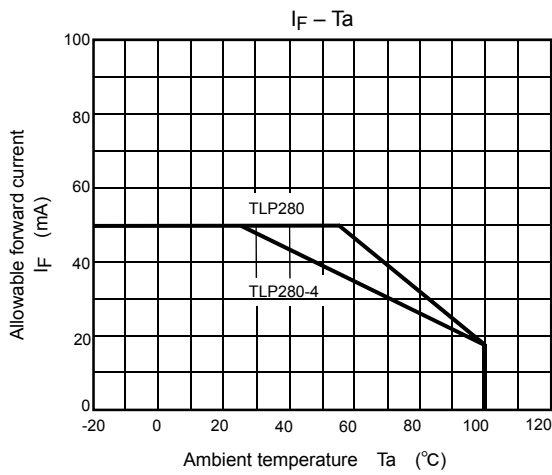
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C _S	V _S = 0V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R _S	V _S = 500 V, R.H. ≤ 60%	5 × 10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BV _S	AC, 1 minute	2500	—	—	V _{rms}
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	V _{dc}

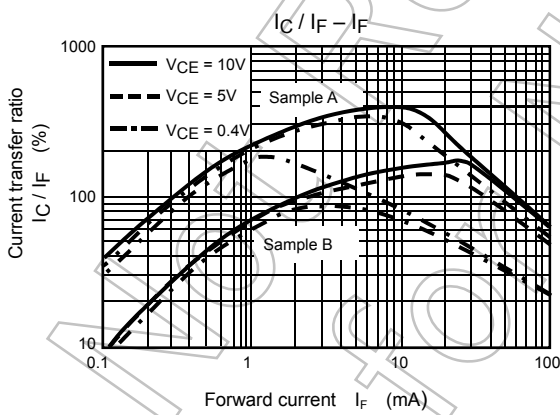
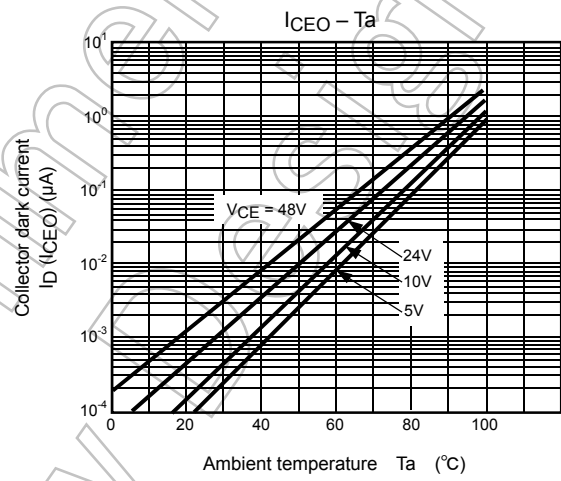
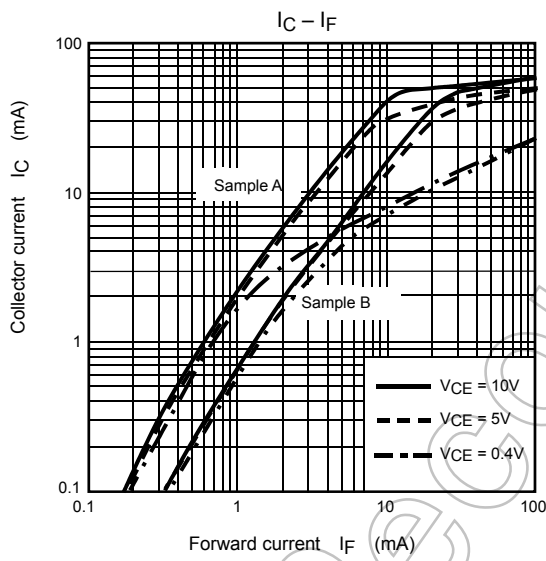
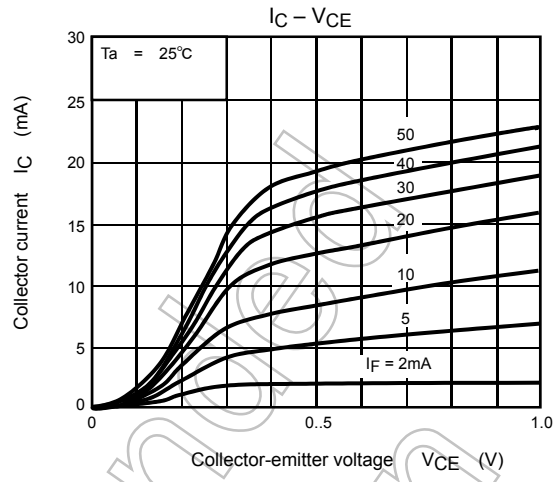
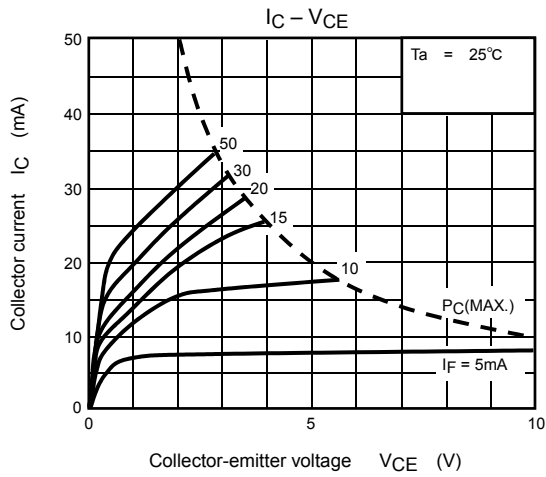
Switching Characteristics (Ta = 25°C)

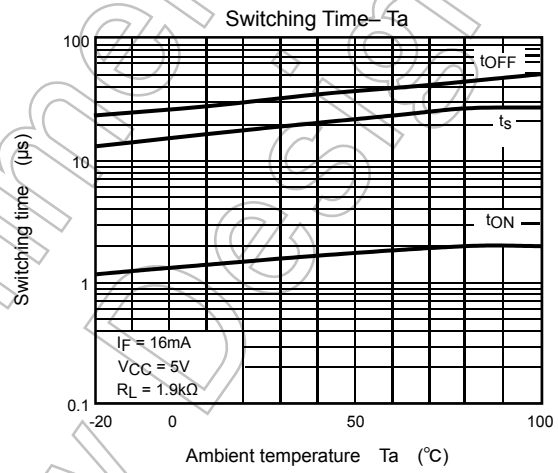
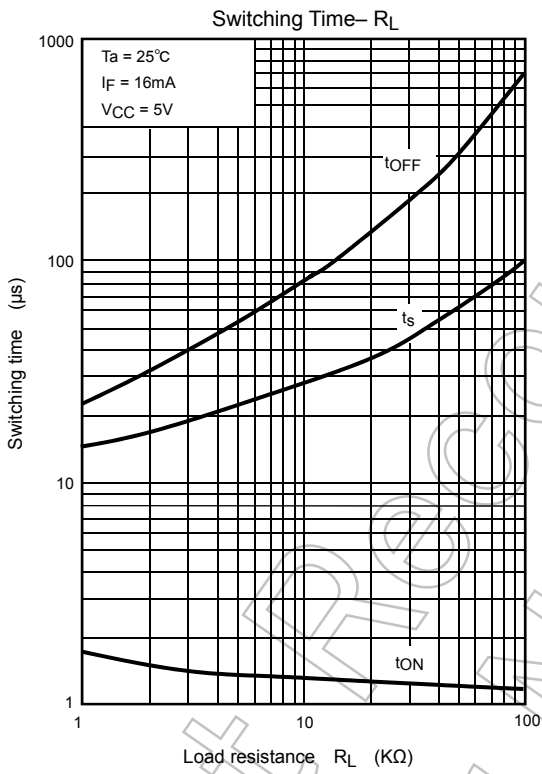
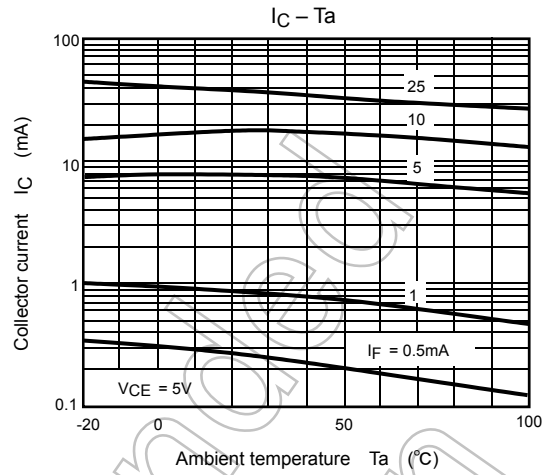
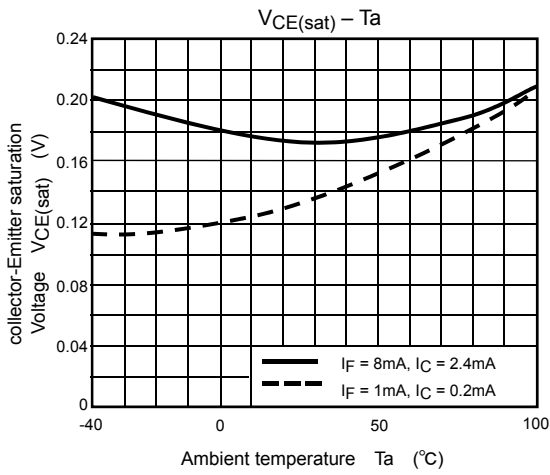
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t _r	V _{CC} = 10 V, I _C = 2 mA R _L = 100Ω	—	2	—	μs
Fall time	t _f		—	3	—	
Turn-on time	t _{on}		—	3	—	
Turn-off time	t _{off}		—	3	—	
Turn-on time	t _{ON}	R _L = 1.9 kΩ V _{CC} = 5 V, I _F = ±16 mA (Fig.1)	—	2	—	μs
Storage time	t _s		—	25	—	
Turn-off time	t _{OFF}		—	40	—	

(Fig. 1): Switching time test circuit









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