

OC-1 1X2, 1X3 SERIES

Unidirectional Optical MOS Relay

GENERAL DESCRIPTION

The OCM1X2 and OCM1X3 Series are unidirectional (DC) optical MOS relays, offering lower drive current than the OCM1X0/1X1 Series. The input portion is a GaAs infrared light emitting diode. The output portion uses a combination of silicon VDMOS (Vertical Diffusion MOS) FETs and silicon photovoltaic devices. An integrated optical coupler performs the isolated I/O switching action; a 5-mA or 10-mA low-level input can control the device's on/off function. The device is encased in an extremely small 6-pin plastic DIP or F-type (gull-wing) package.

The optical MOS relay switch may be used in applications that currently use mechanical relay switches, but offers smaller size, noise-free switching, and electronic circuit compatibility because of its non-mechanical operation. Optical MOS relay switches also dissipate less power than equivalent bipolar devices at lower switching frequencies.

FEATURES

- Low offset voltage
- Large range of current control
- Non-contact, optical operation
- Electronic circuit compatibility
- No chattering or switch bounces
- No mechanical switching noises
- Small size
- Low "on" resistance
- Low drive current (I_{FON} is 5 mA or less)
- High isolation voltage (4 kV for the OCM1X3)

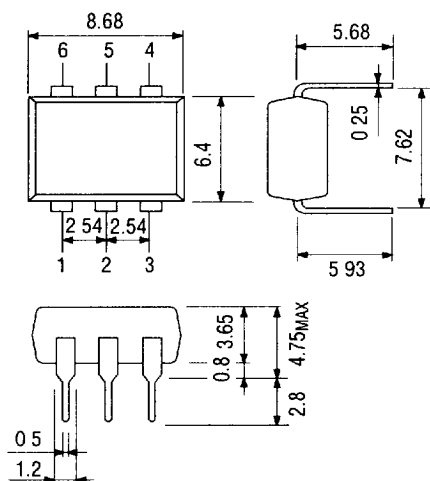
APPLICATIONS

- Telecommunications equipment
- Measurement equipment
- Home electronics
- Automatic meter reading equipment
- Other applications requiring small size or high performance
- Other applications requiring non-contact switches

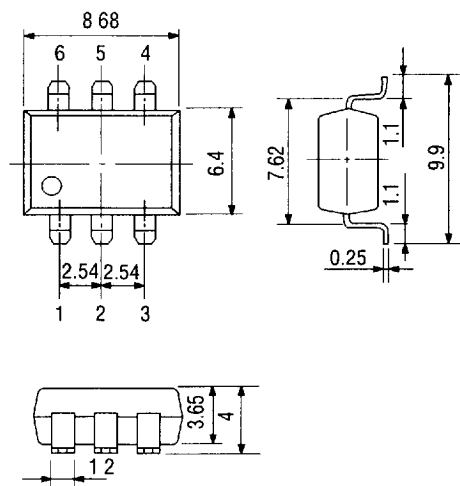
PIN CONFIGURATION

(Unit: mm)

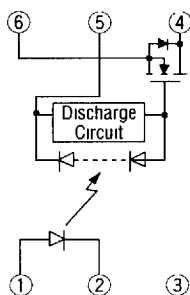
• DIP Type



• F Type (Gull Wing)



• Pin Connection Diagram



- 1: Anode (LED)
- 2: Cathode (LED)
- 3: NC
- 4: Drain (MOS FET)
- 5: Source (MOS FET)
- 6: Drain (MOS FET)

ABSOLUTE MAXIMUM RATINGS

(Ambient Temperature $T_a=25^{\circ}\text{C}$)

Parameter			Symbol	Rating	Unit
LED	Forward Current		I _F	50	mA
	Derating		—	See characteristics curve	mA/°C
	Peak Forward Current *1		I _{FM}	0.5	A
	Reverse Voltage		V _R	5	V
	Power Dissipation		P _{DL}	75	mW
FET	Load Voltage	OCM102, OCM103	V _D	60	V
		OCM112, OCM113		100	
		OCM122, OCM123		200	
		OCM142, OCM143		400	
	Continuous Load Current	OCM102, OCM103	I _D	500	mA
		OCM112, OCM113		450	
		OCM122, OCM123		350	
		OCM142, OCM143		200	
	Derating		—	See characteristics curve	mA/°C
	Surge Load Current *2	OCM102, OCM103	I _{SUG}	3.5	A
		OCM112, OCM113			
		OCM122, OCM123			
		OCM142, OCM143		1.5	
Power Dissipation		P _D	300	mW	
Total Power Dissipation			P _{ROT}	325	mW
Isolation Voltage	OCM102, OCM112	V _{I-O}	1500	V	
	OCM122, OCM142				
	OCM103, OCM113		4000	V	
	OCM123, OCM143				
Operating Temperature			T _{opr}	-40 to +85	°C
Storage Temperature			T _{stg}	-40 to +100	°C

*1 Pulse width 100 μs , cycle 10 ms

*2 Pulse width 1 ms, 1 shot

ELECTRICAL CHARACTERISTICS

(Ambient Temperature $T_a=25^{\circ}\text{C}$)

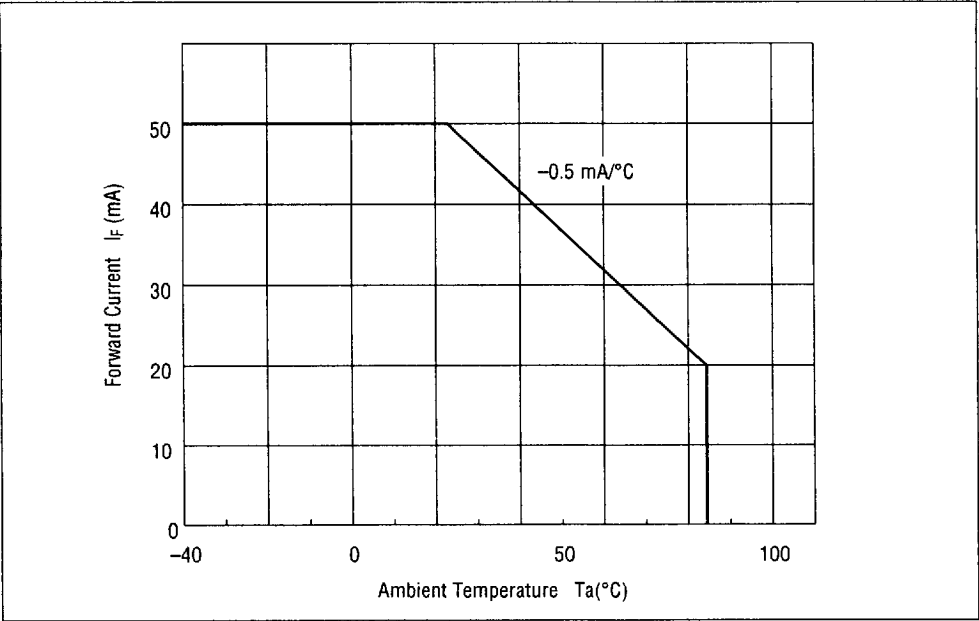
Parameter			Symbol	Test Condition	Min.	Typ.	Max.	Unit	Note
LED	Forward Voltage		V_F	$I_F=10\text{ mA}$	1.0	—	1.3	V	—
	Reverse Voltage		I_R	$V_R=5\text{ V}$	—	—	10	μA	—
FET	ON Resistance	OCM102, OCM103	R_{ON}	$I_F=10\text{ mA}$ $I_D=100\text{ mA}$	0.2	0.5	0.75	Ω	Time to flow current is within one second.
		OCM112, OCM113			0.3	0.7	1.0		
		OCM122, OCM123			1.0	1.5	2.0		
		OCM142, OCM143			3.0	4.5	6.2		
	Leakage Current *1	OCM102, OCM103	I_{LEAK}	$V_D=60\text{ V}$	—	—	1.0	μA	—
		OCM112, OCM113		$V_D=100\text{ V}$					
		OCM122, OCM123		$V_D=200\text{ V}$					
		OCM142, OCM143		$V_D=400\text{ V}$					
	Output Capacitance	OCM102, OCM103	C_{OUT}	$V_D=50\text{ V}$ $f=1\text{ MHz}$	—	70	—	pF	—
		OCM112, OCM113		—	50	—			
		OCM122, OCM123		—	35	—			
		OCM142, OCM143		—	25	—			
Coupled	Operating LED Current *2		$I_{F\text{ ON}}$	$I_D=100\text{ mA}$	—	—	5	mA	—
	Returning LED Current	OCM102, OCM103	$I_{F\text{ OFF}}$	$V_D=60\text{ V}$ $I_D=100\text{ }\mu\text{A}$	0.2	—	—	mA	—
		OCM112, OCM113		$V_D=100\text{ V}$ $I_D=100\text{ }\mu\text{A}$					
		OCM122, OCM123		$V_D=200\text{ V}$ $I_D=100\text{ }\mu\text{A}$					
		OCM142, OCM143		$V_D=400\text{ V}$ $I_D=100\text{ }\mu\text{A}$					
	I/O Capacitance		C_{I-O}	$f=1\text{ MHz}$	—	1.3	—	pF	—
	Turn ON Time *3		t_{ON}	$I_F=10\text{ mA}$ $I_D=100\text{ mA}$ $R_L=100\text{ }\Omega$	—	0.3	1.0	ms	—
Turn OFF Time *3		t_{OFF}		—	0.2	1.0	ms	—	

*1 Can correspond to special specification $I_{LEAK} < 1.0\text{ nA}$ *2 Can correspond to special specification $I_{F\text{ ON}} < 3.0\text{ mA}$ *3 Can correspond to special specification $t_{ON-OFF} < 0.5\text{ ms}$

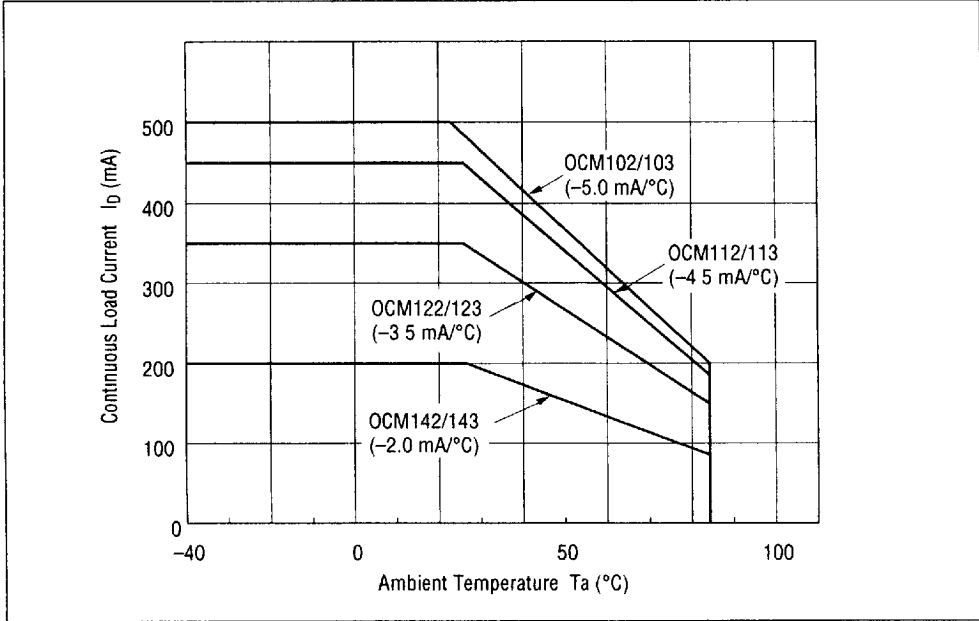
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TYPICAL CHARACTERISTICS

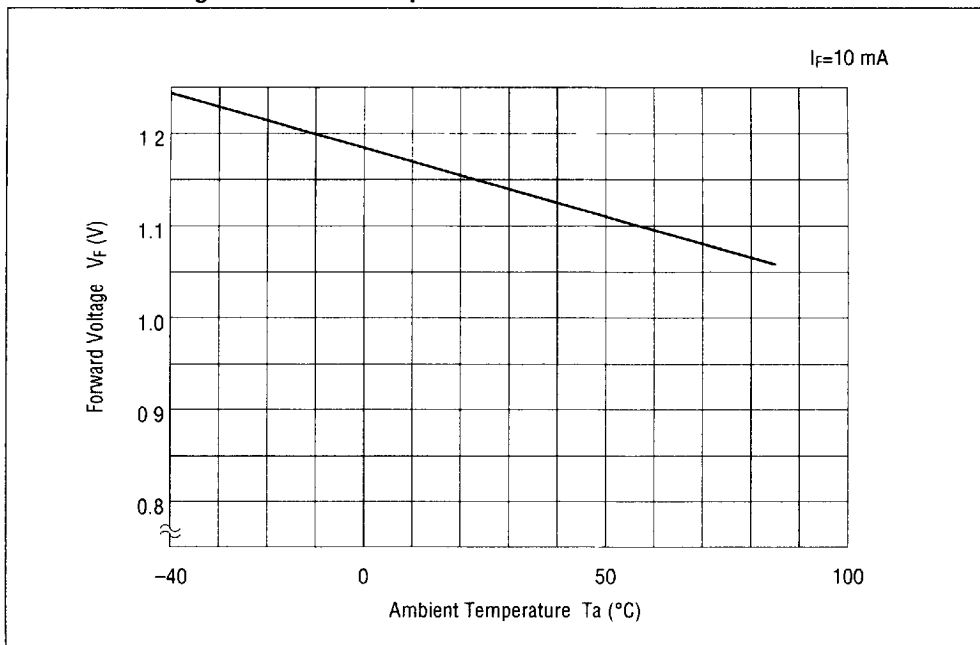
• Forward Current Derating Curve



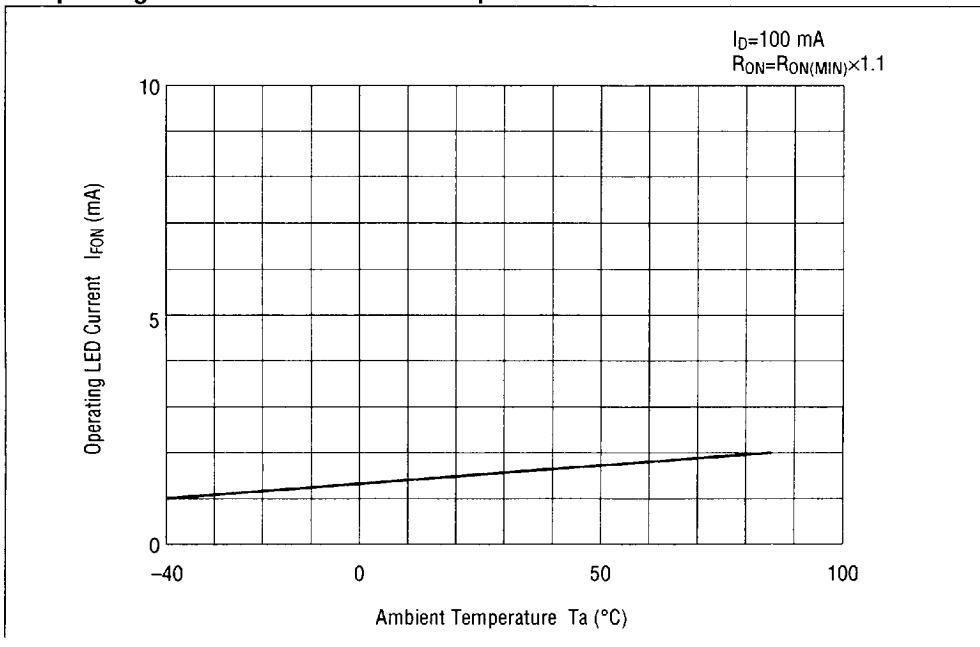
• Continuous Load Current Derating Curve



- Forward Voltage vs. Ambient Temperature

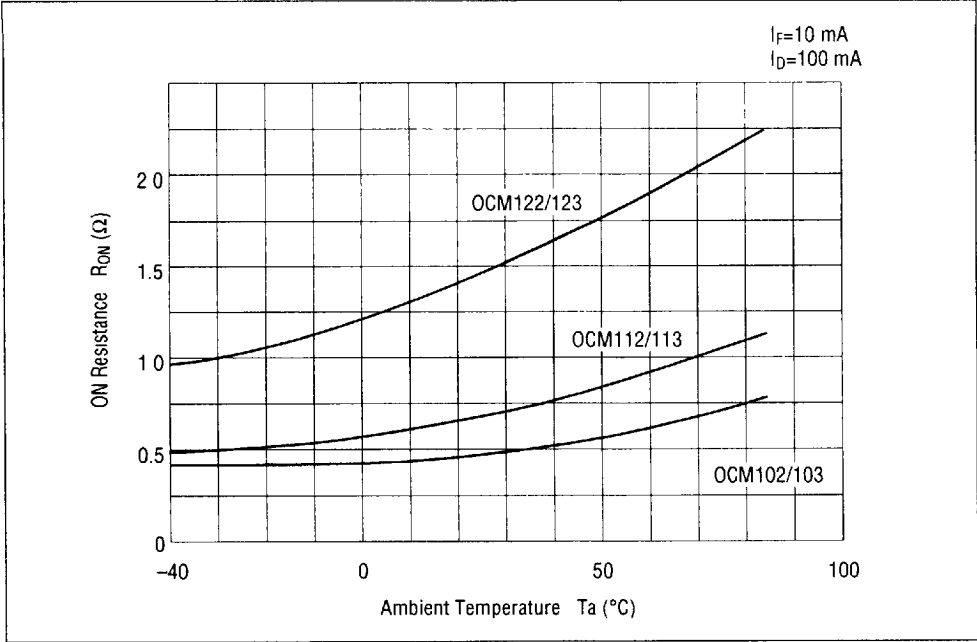


- Operating LED Current vs. Ambient Temperature

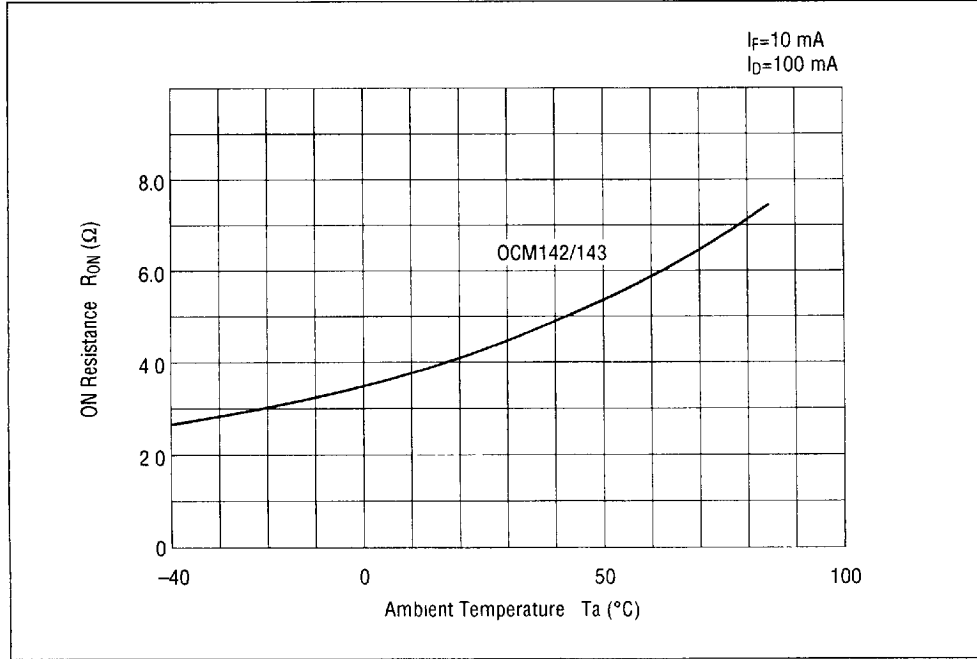


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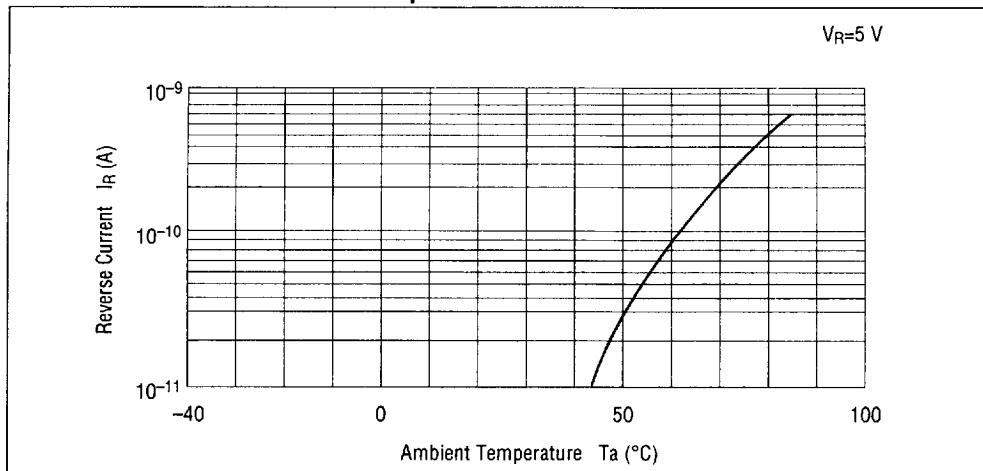
• ON Resistance vs. Ambient Temperature-1



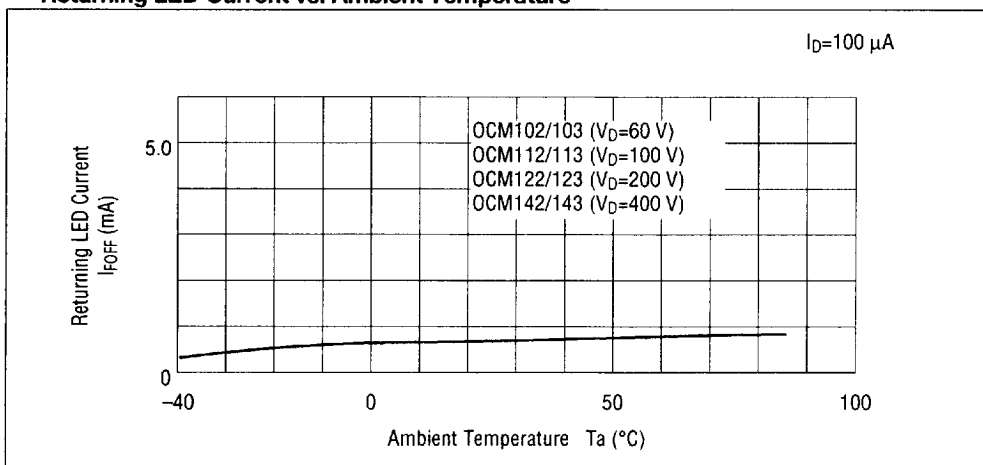
• ON Resistance vs. Ambient Temperature-2



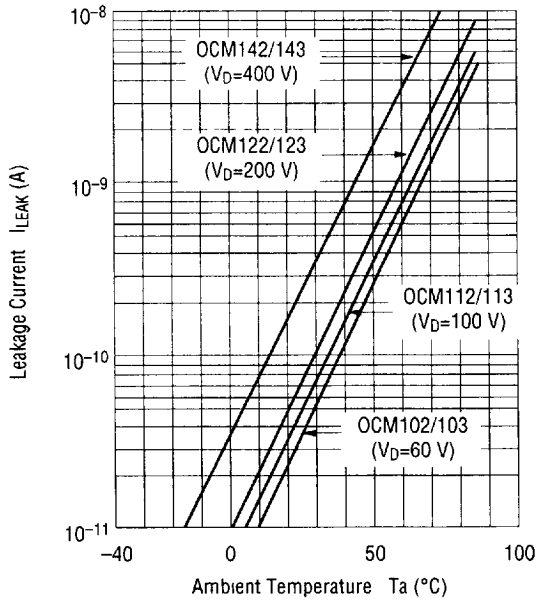
- Reverse Current vs. Ambient Temperature-1



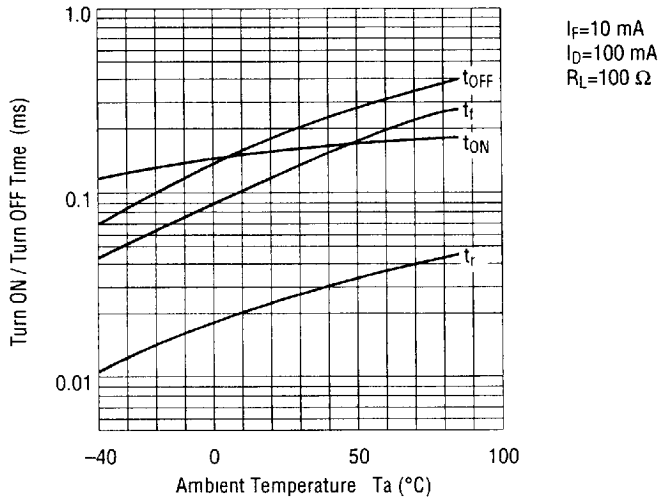
- Returning LED Current vs. Ambient Temperature



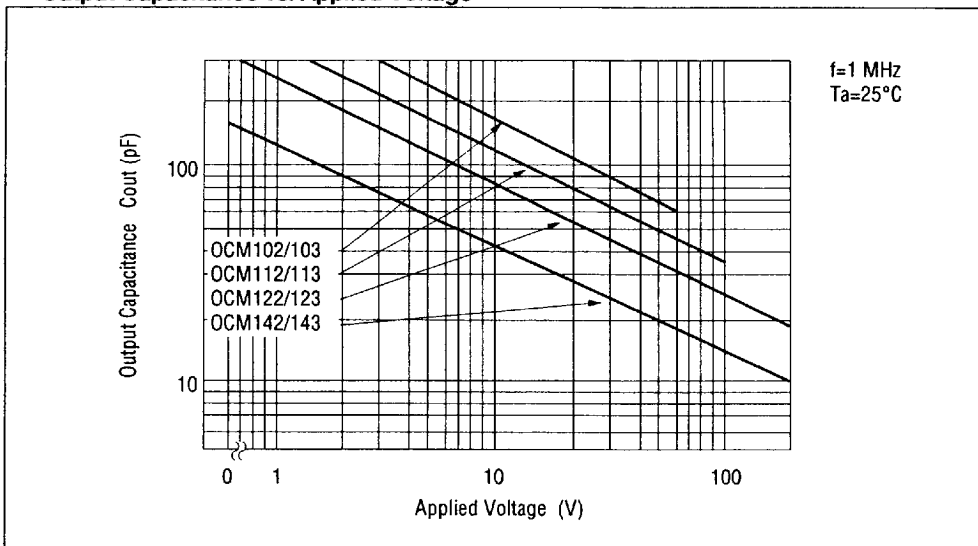
• Leakage Current vs. Ambient Temperature



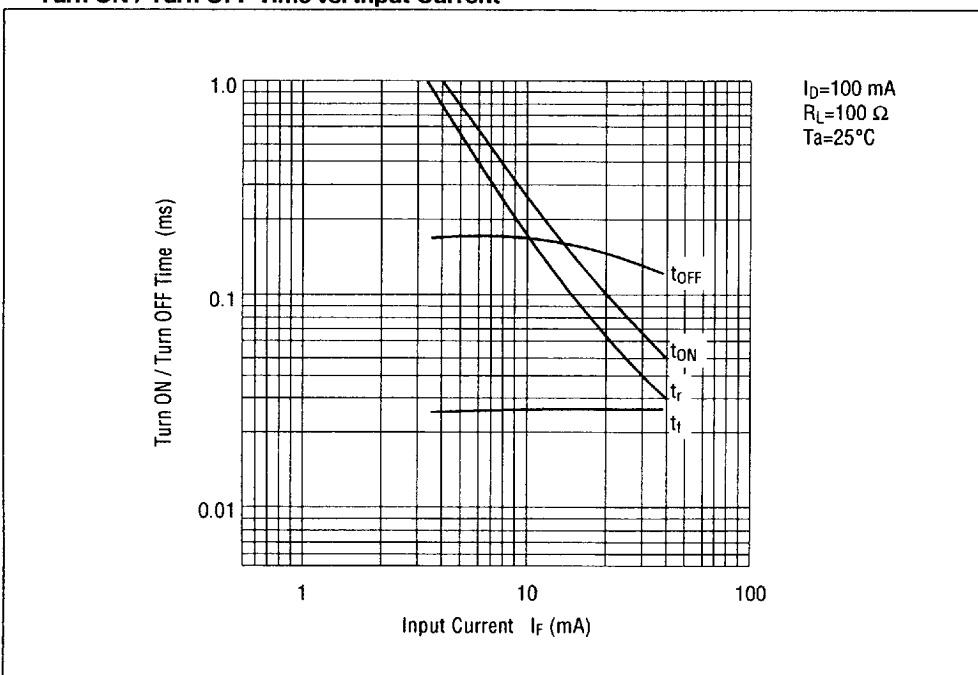
• Turn ON / Turn OFF Time vs. Ambient Temperature



- Output Capacitance vs. Applied Voltage

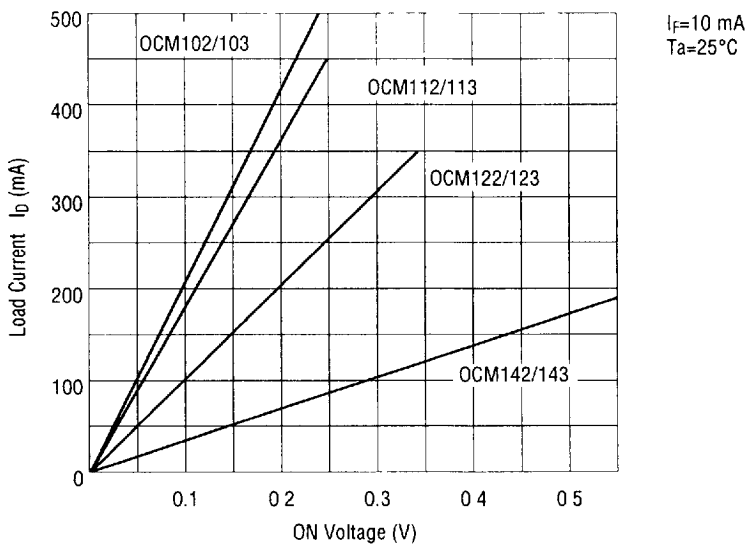


- Turn ON / Turn OFF Time vs. Input Current

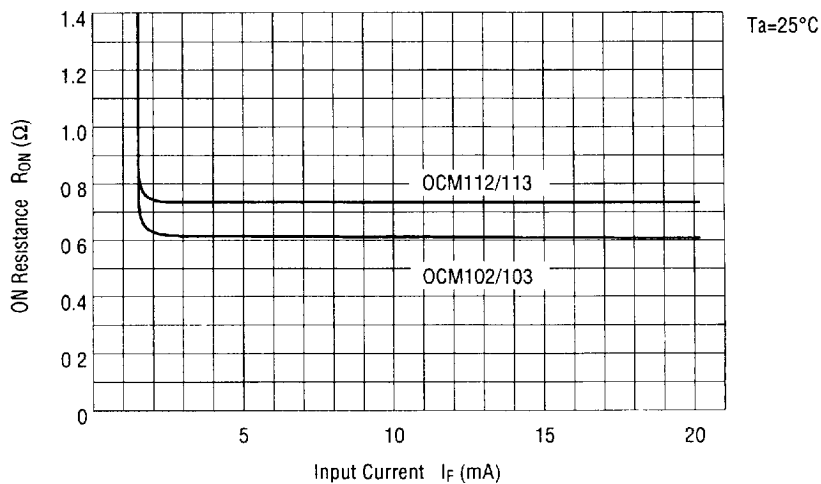


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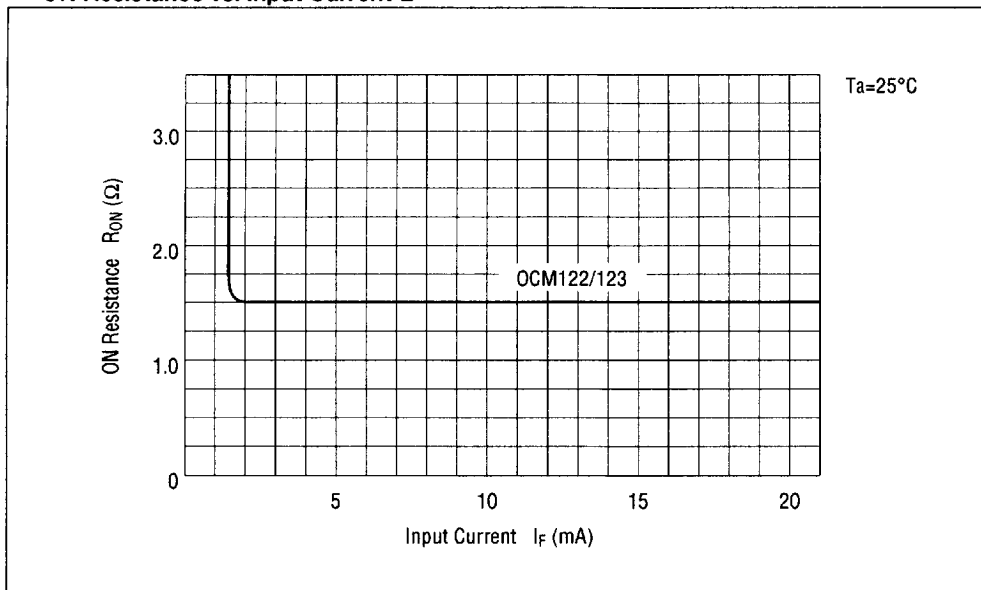
• Load Current vs. Voltage



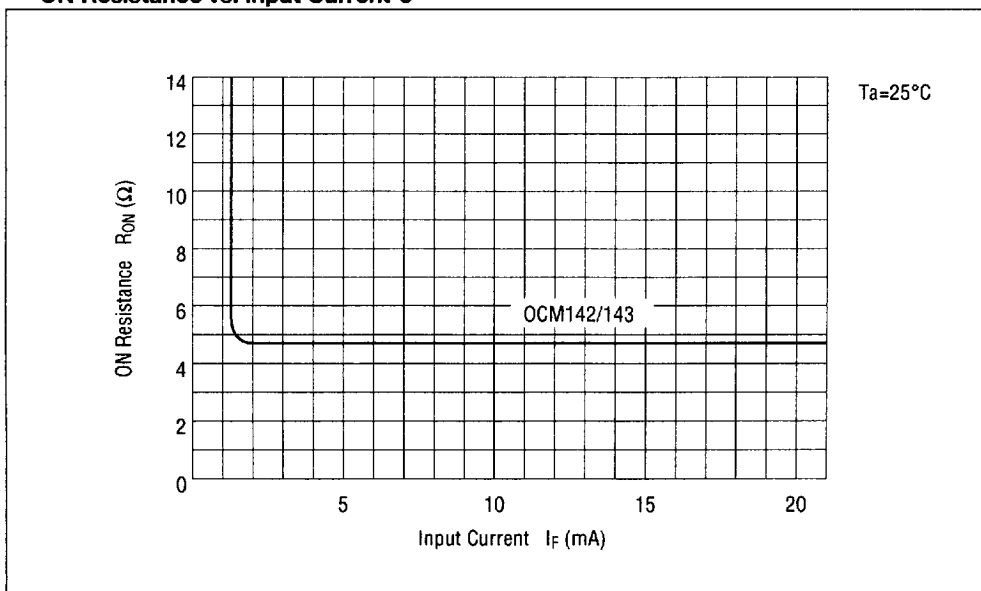
• ON Resistance vs. Input Current-1



• ON Resistance vs. Input Current-2



• ON Resistance vs. Input Current-3



- Circuit for Measuring Response Characteristics

