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)

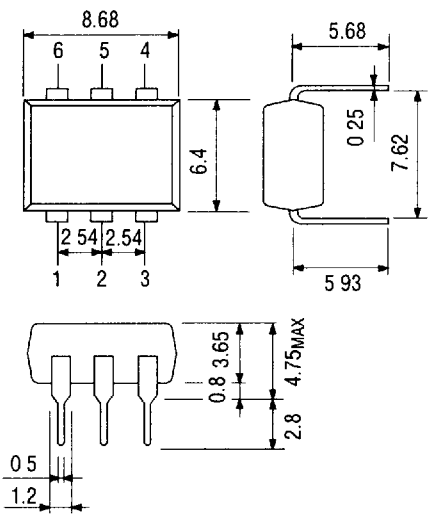
APPLICATIONS

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

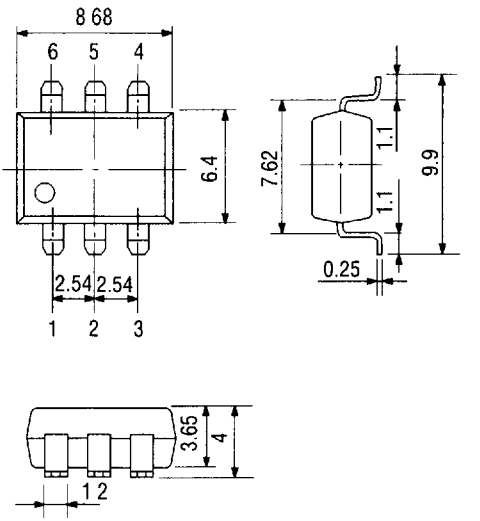
PIN CONFIGURATION

(Unit: mm)

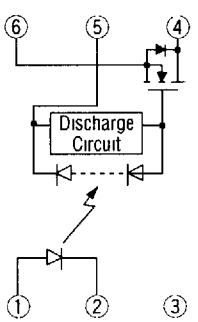
• DIP Type



• 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 Ta=25°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 OCM112, OCM113 OCM122, OCM123	I_{SUG}	3 5	A
		OCM142, OCM143		1 5	
	Power Dissipation		P_D	300	mW
Total Power Dissipation			P_{TOT}	325	mW
Isolation Voltage		OCM102, OCM112 OCM122, OCM142	V_{I-O}	1500	V
		OCM103, OCM113 OCM123, OCM143		4000	V
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

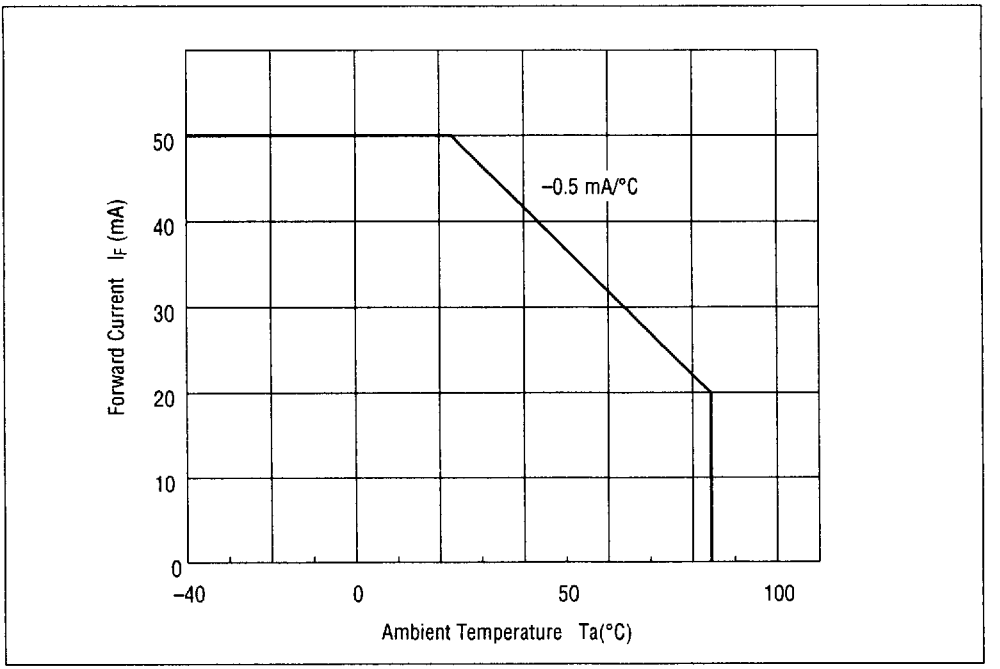
(Ambient Temperature Ta=25°C)

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

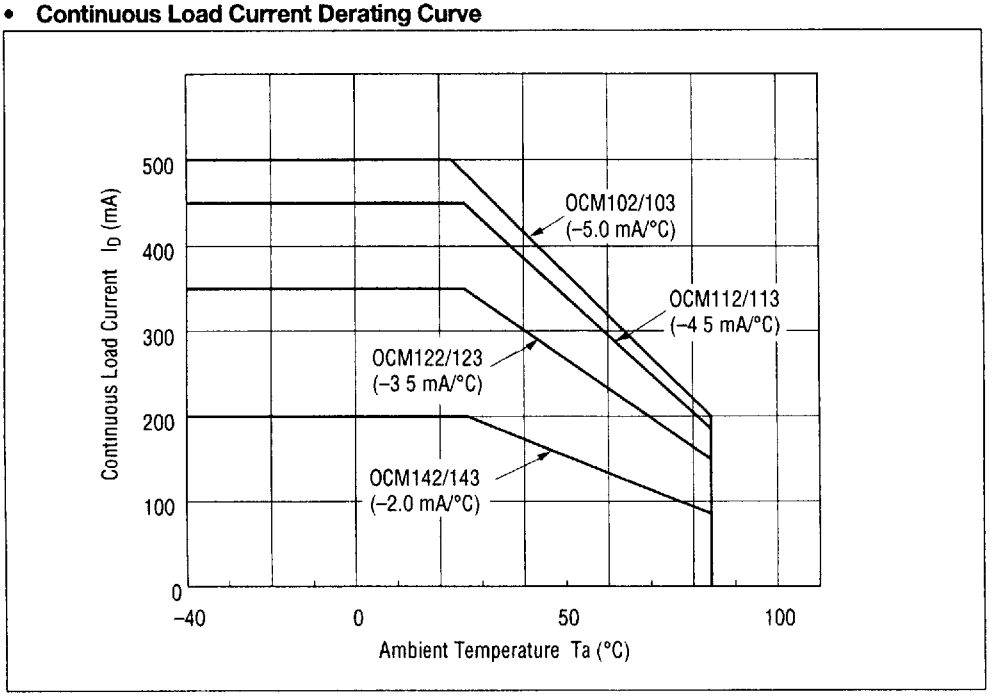
*1 Can correspond to special specification I_{LEAK} < 1.0 nA
*2 Can correspond to special specification $I_{F\,ON}$ < 3.0 mA
*3 Can correspond to special specification t_{ON-OFF} < 0.5 ms

TYPICAL CHARACTERISTICS

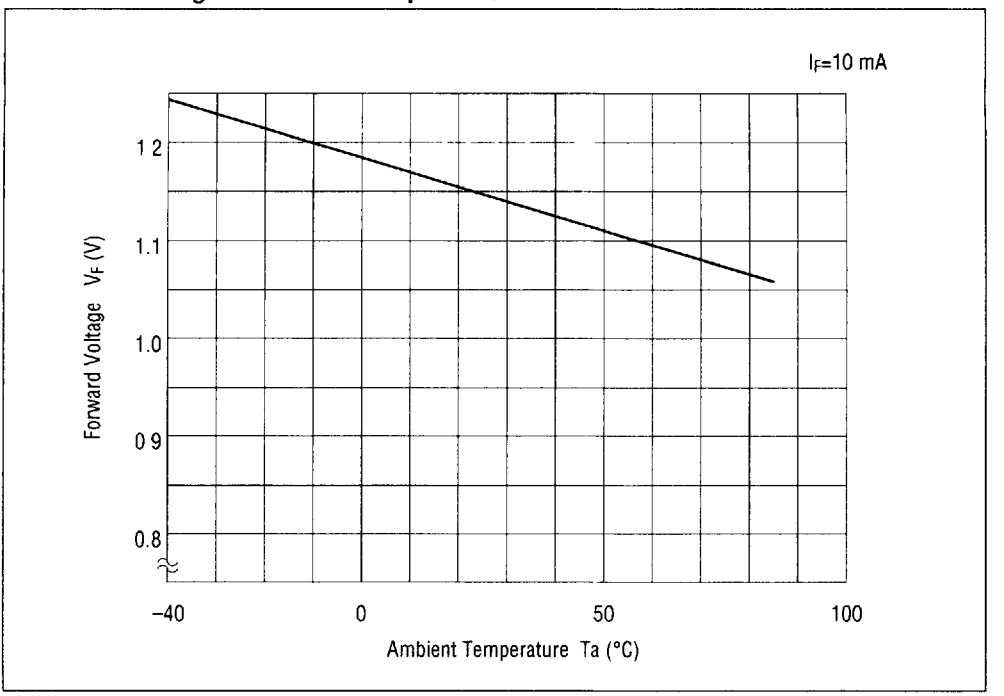
- **Forward Current Derating Curve**



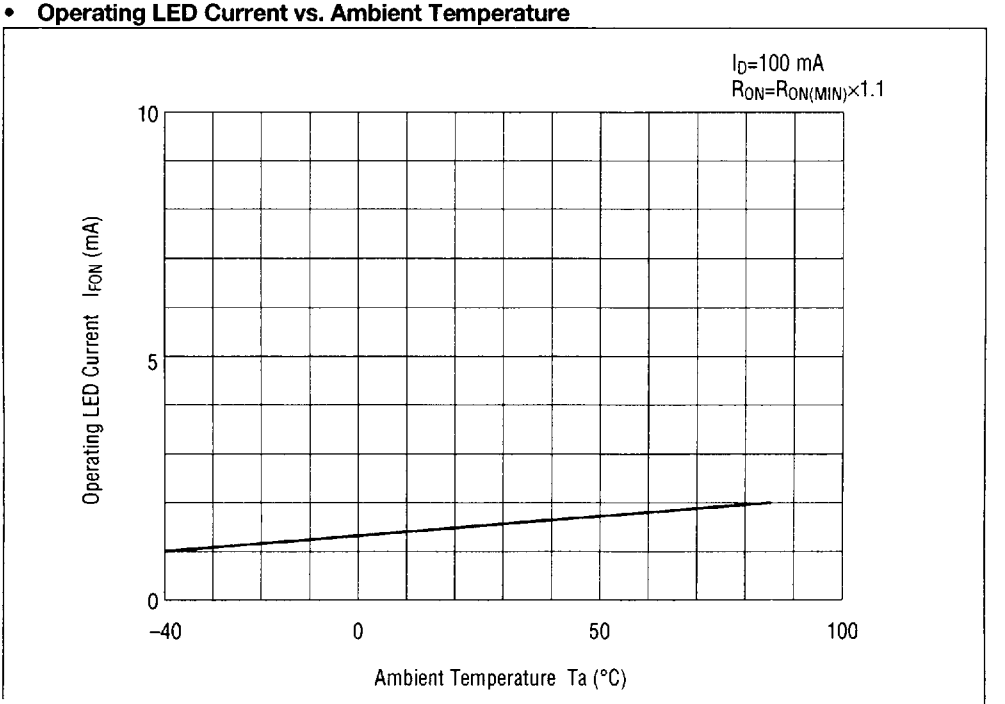
- **Continuous Load Current Derating Curve**



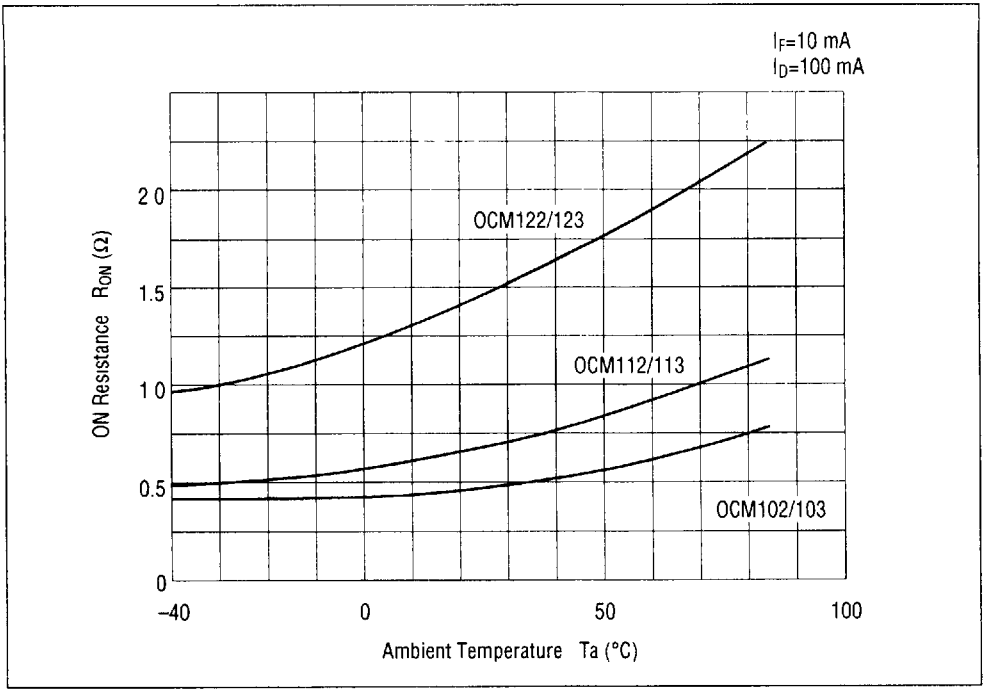
- **Forward Voltage vs. Ambient Temperature**



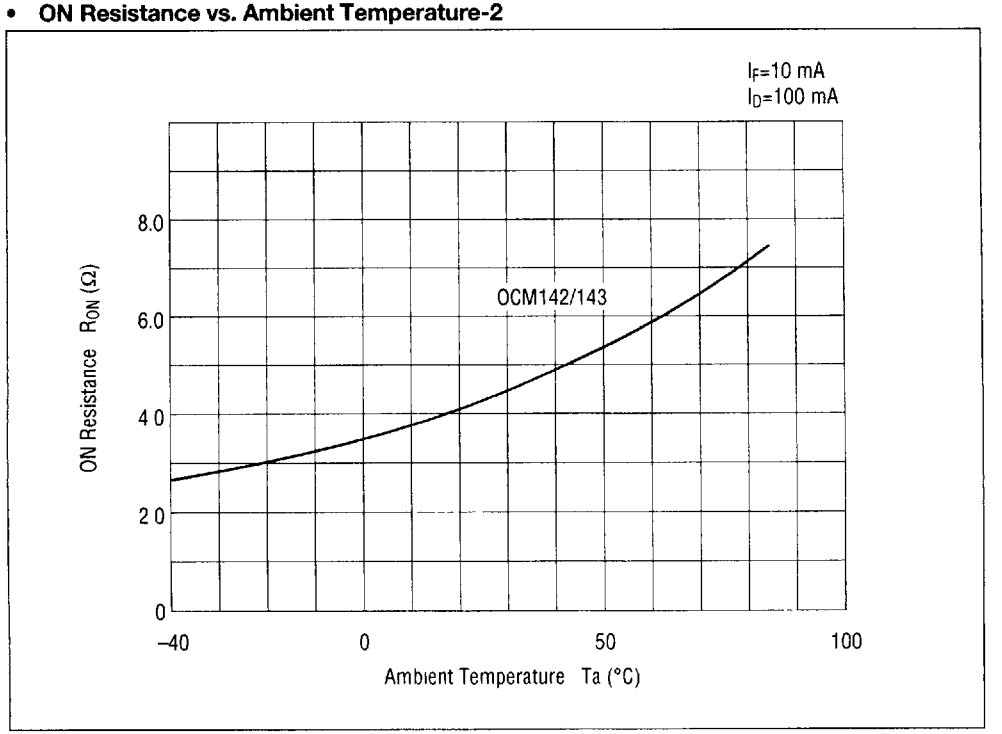
- **Operating LED Current vs. Ambient Temperature**



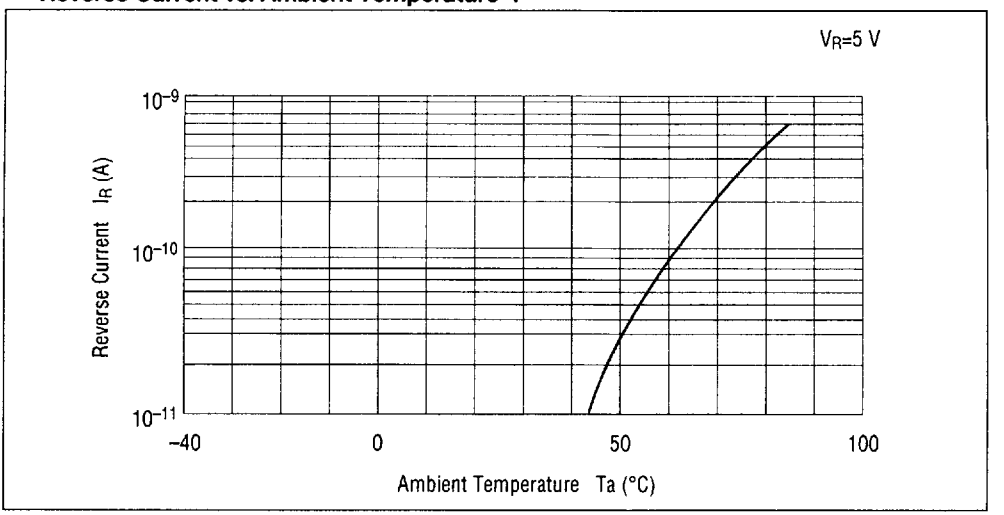
- **ON Resistance vs. Ambient Temperature-1**



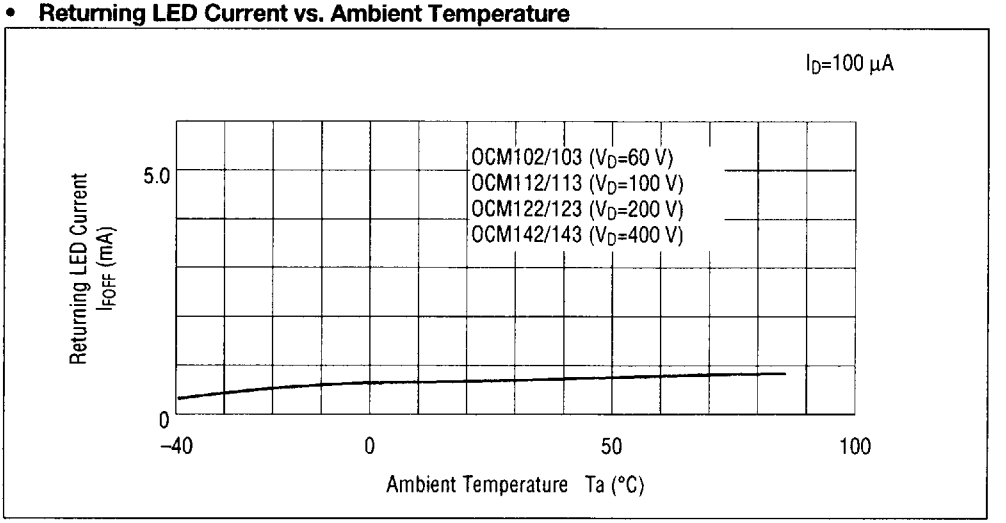
- **ON Resistance vs. Ambient Temperature-2**



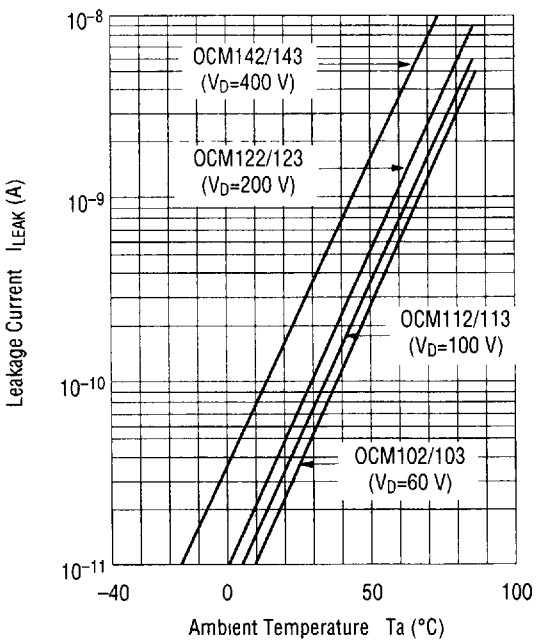
- **Reverse Current vs. Ambient Temperature-1**



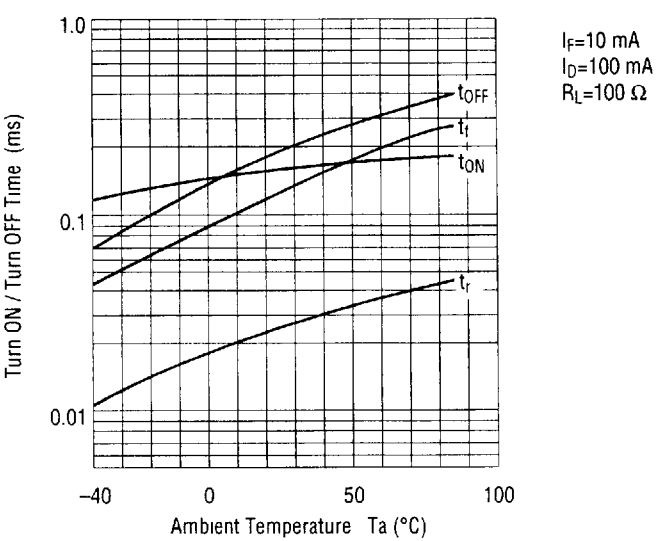
- **Returning LED Current vs. Ambient Temperature**



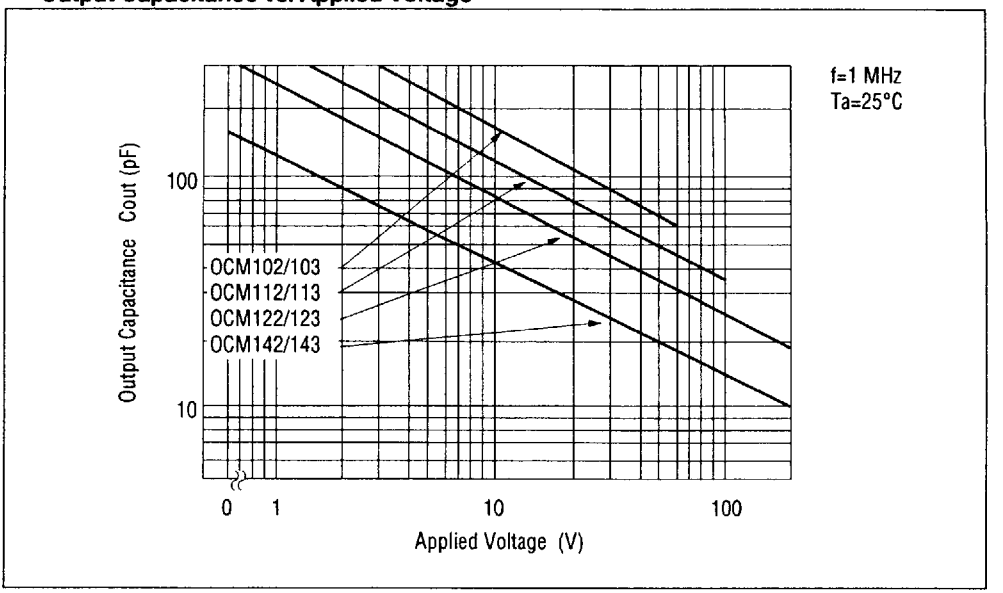
- **Leakage Current vs. Ambient Temperature**



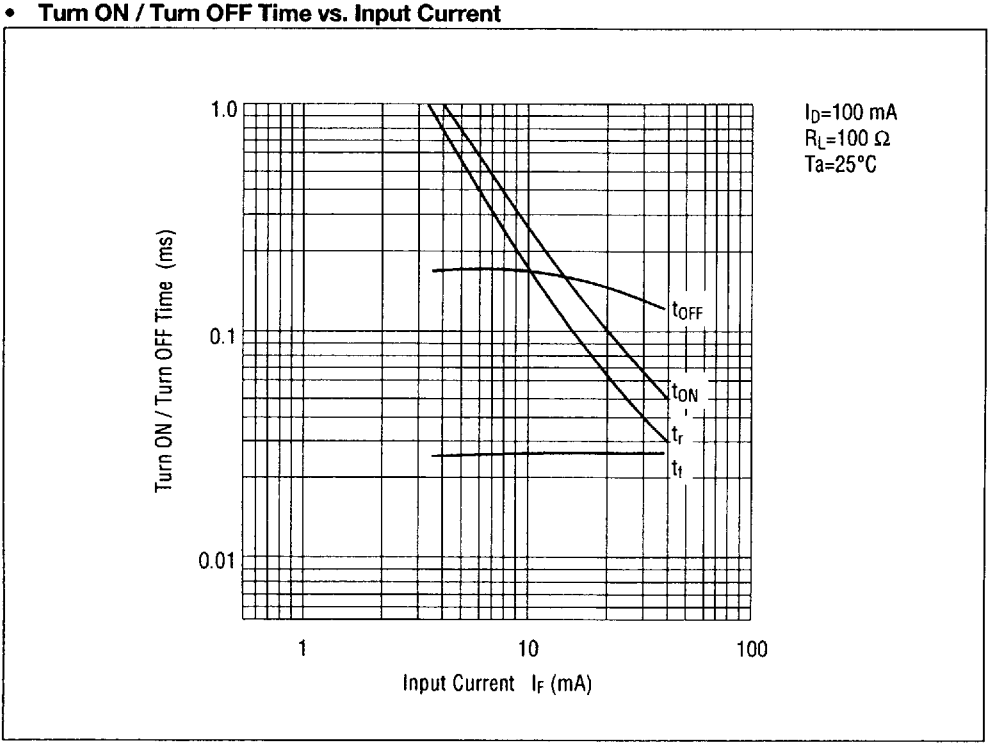
- **Turn ON / Turn OFF Time vs. Ambient Temperature**



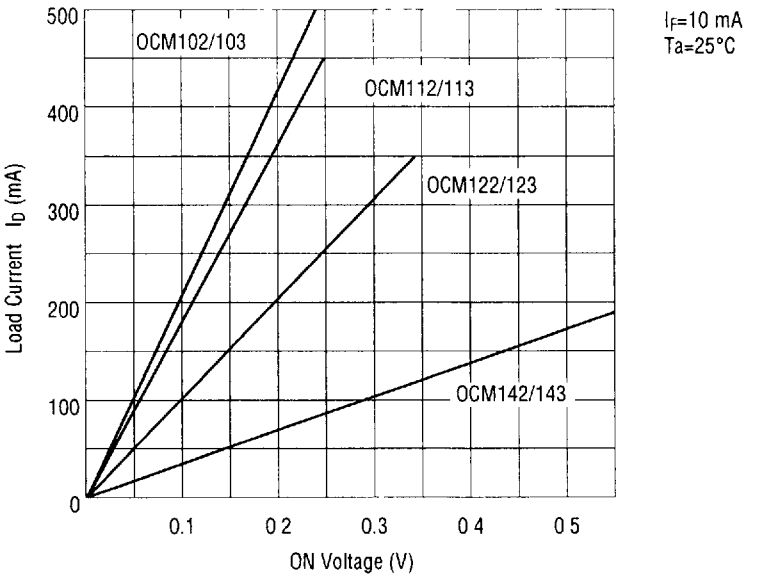
- **Output Capacitance vs. Applied Voltage**



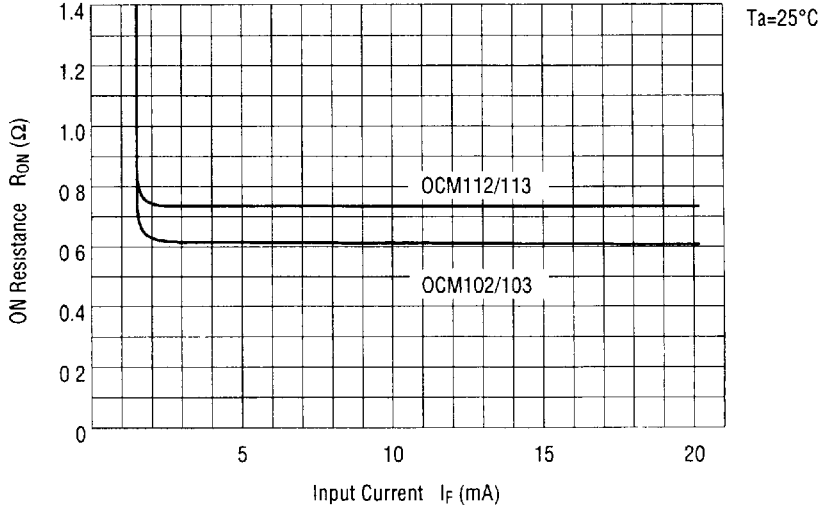
- **Turn ON / Turn OFF Time vs. Input Current**



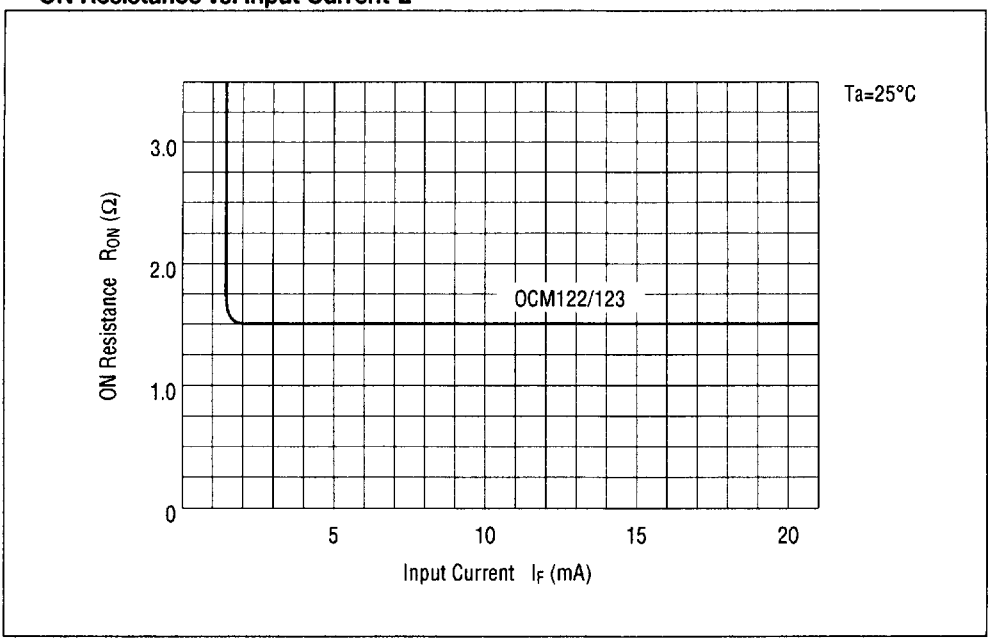
- **Load Current vs. Voltage**



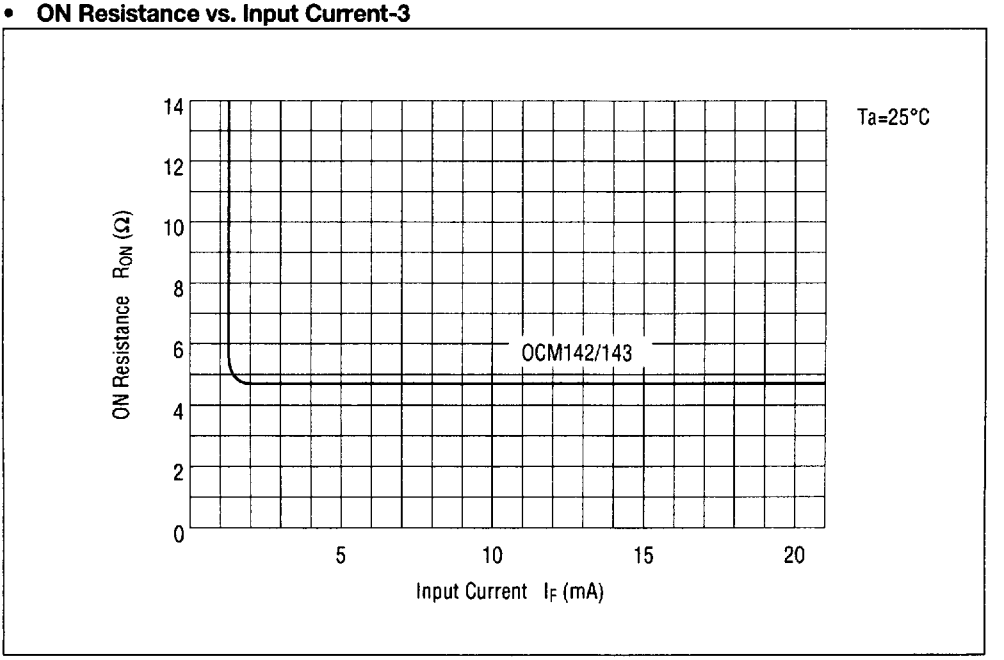
- **ON Resistance vs. Input Current-1**



- **ON Resistance vs. Input Current-2**



- **ON Resistance vs. Input Current-3**



- **Circuit for Measuring Response Characteristics**