

OCM 1X4, 1X5 SERIES

Unidirectional Optical MOS Relay

GENERAL DESCRIPTION

The OCM1X4 and OCM1X5 Series are unidirectional (DC) optical MOS relays that provide high-speed response and are capable of handling high-frequency signals. 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

- Infinitesimally small control voltage
- Excellent high-frequency characteristics (>30 dB isolation at 10 MHz)
- High-speed response (t_{ON} and t_{OFF} is 200 μ s or less)
- Low drive current (I_{FON} is 5 mA or less)
- Electronic circuit compatibility
- No mechanical switching noises
- Small size
- Low "on" resistance
- High isolation voltage (4 kV for the OCM1X5)

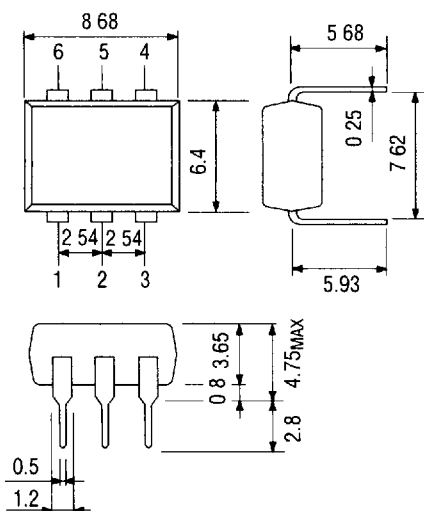
APPLICATIONS

- Computer cards and portable computing applications (such as PCMCIS cards)
- Telecommunications equipment
- Measurement equipment
- Home electronics
- Automatic meter reading equipment
- Other applications requiring small size or high performance
- Other applications requiring non-contact switches

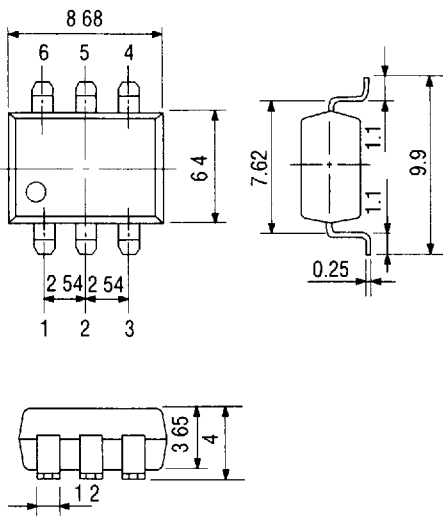
PIN CONFIGURATION

(Unit: mm)

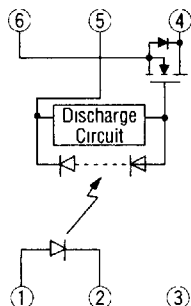
• DIP Type



• 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	OCM104, OCM105	V _D	60	V
		OCM114, OCM115		100	
		OCM124, OCM125		200	
		OCM144, OCM145		400	
	Continuous Load Current	OCM104, OCM105	I _D	100	mA
		OCM114, OCM115		70	
		OCM124, OCM125		50	
		OCM144, OCM145		20	
	Derating		—	See characteristics curve	mA/°C
	Surge Load Current *2	OCM104, OCM105	I _{SUG}	0.1	A
		OCM114, OCM115			
		OCM124, OCM125		0.07	
		OCM144, OCM145		0.025	
	Power Dissipation		P _D	300	mW
Total Power Dissipation			P _{TOT}	325	mW
Isolation Voltage		OCM104, OCM114 OCM124, OCM144	V _{I-O}	1500	V
		OCM105, OCM115 OCM125, OCM145		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

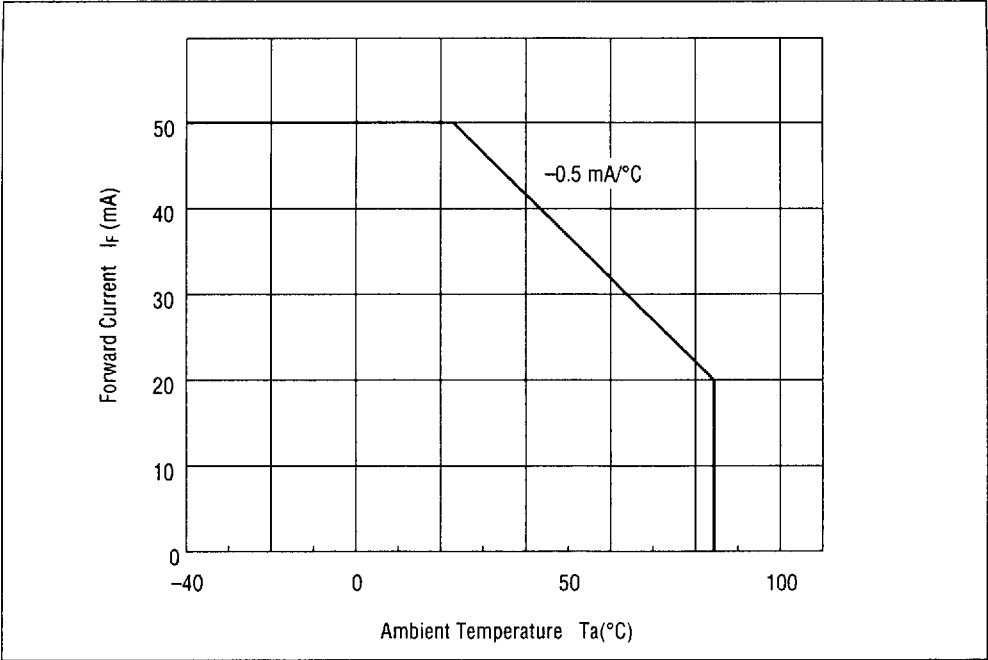
(Ambient Temperature Ta=25°C)

Parameter			Symbol	Test Condition	Min.	Typ.	Max.	Unit	Note
LED	Forward Voltage		V _F	I _F =10 mA	1.0	—	1.3	V	—
	Reverse Current		I _R	V _R =5 V	—	—	10	μA	—
FET	ON Resistance	OCM104, OCM105	R _{ON}	I _F =10 mA I _D =Rating	10	15	20	Ω	Time to flow current is within one second.
		OCM114, OCM115			20	32.5	45		
		OCM124, OCM125			50	75	100		
		OCM144, OCM145			150	300	450		
	Leakage Current *1	OCM104, OCM105	I _{LEAK}	V _D =60 V	—	—	1.0	nA	—
		OCM114, OCM115		V _D =100 V					
		OCM124, OCM125		V _D =200 V					
		OCM144, OCM145		V _D =400 V					
	Output Capacitance		C _{OUT}	V _D =50 V f=1 MHz	—	7	—	pF	—
	Coupled	Operating LED Current *2		I _{F ON}	I _D =Rating	—	—	5	mA
Returning LED Current		OCM104, OCM105	I _{F OFF}	V _D =60 V I _D =100 μA	0.2	—	—	mA	—
		OCM114, OCM115		V _D =100 V I _D =100 μA					
		OCM124, OCM125		V _D =200 V I _D =100 μA					
		OCM144, OCM145		V _D =400 V I _D =100 μA					
I/O Capacitance		C _{I-O}	f=1 MHz	—	13	—	pF	—	
Turn ON Time		t _{ON}	I _F =10 mA I _D =Rating	—	30	200	μs	—	
Turn OFF Time		t _{OFF}	R _L =5 kΩ	—	60	200	μs	—	

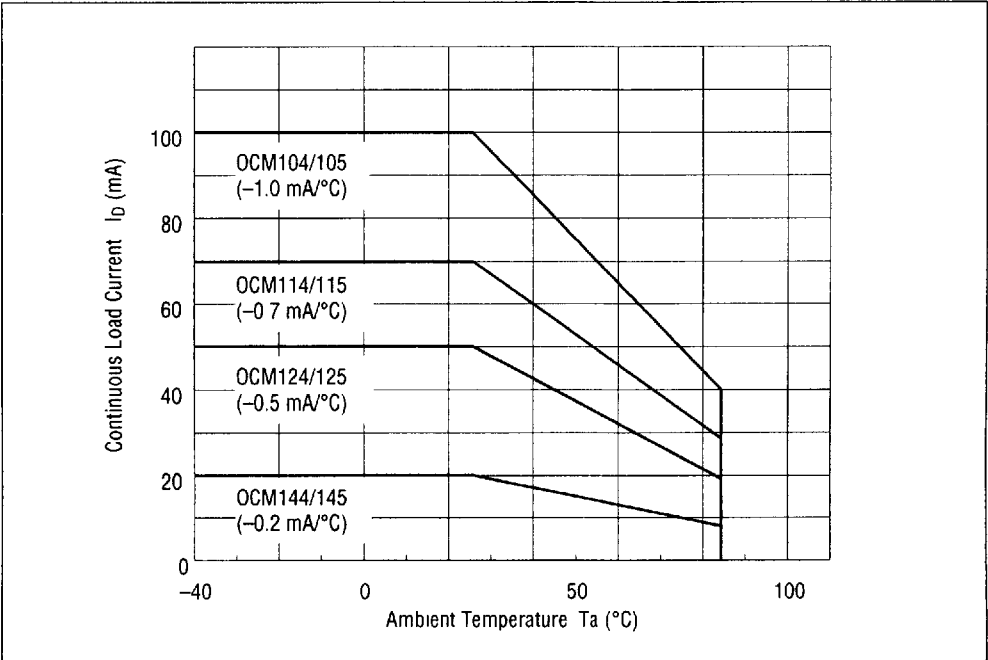
*1 Can correspond to special specification $I_{LEAK} < 0.1\text{ nA}$ *2 Can correspond to special specification $I_{FON} < 3.0\text{ mA}$

TYPICAL CHARACTERISTICS

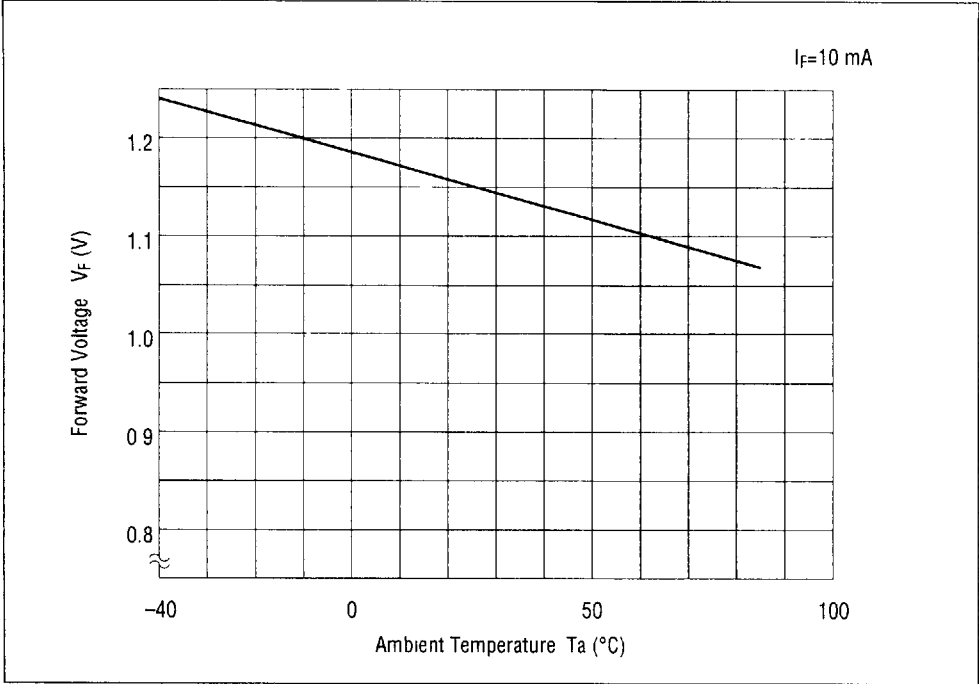
• Forward Current Derating Curve



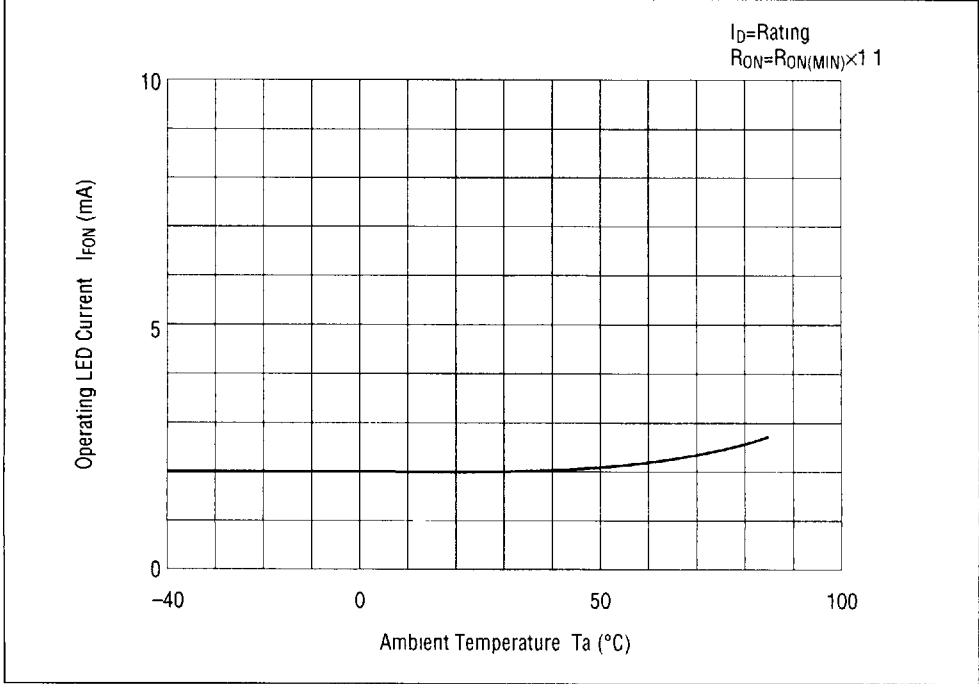
• Continuous Load Current Derating Curve



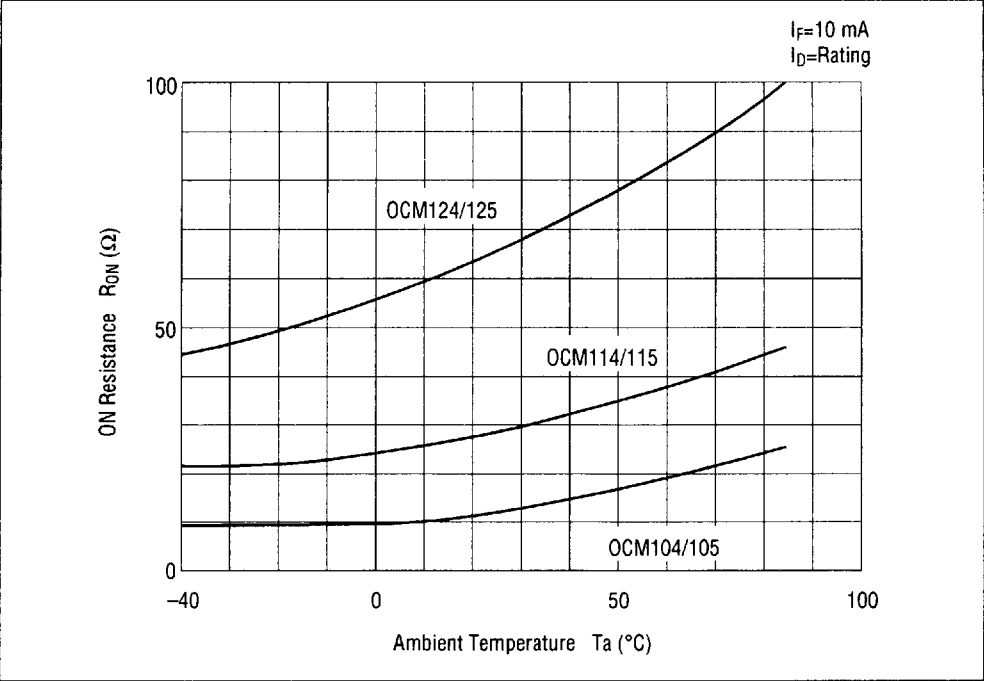
• Forward Voltage vs. Ambient Temperature



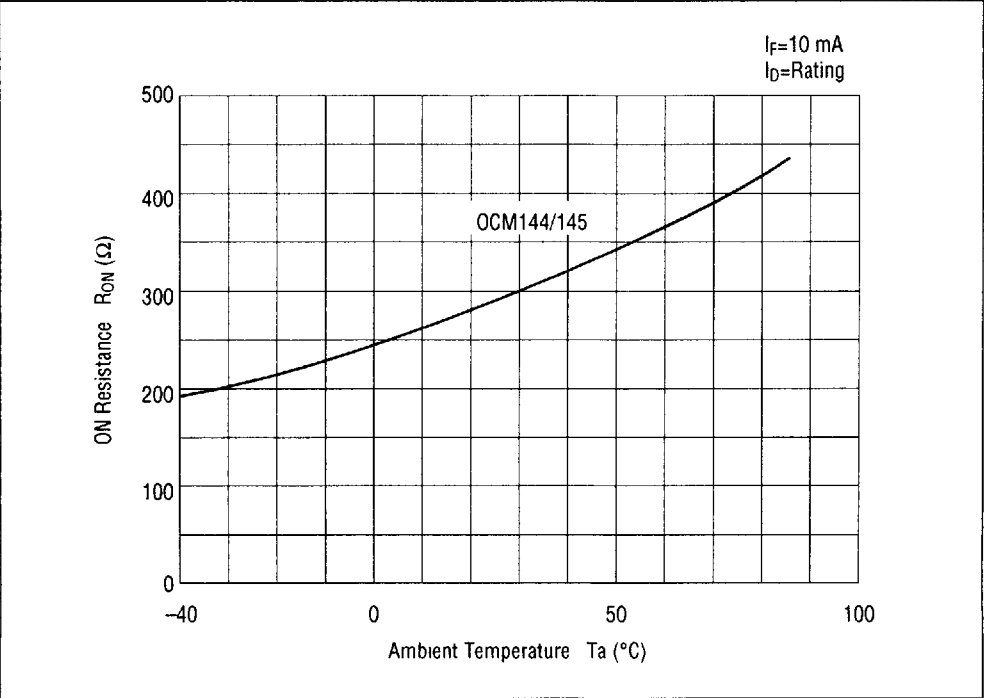
• Operating LED Current vs. Ambient Temperature



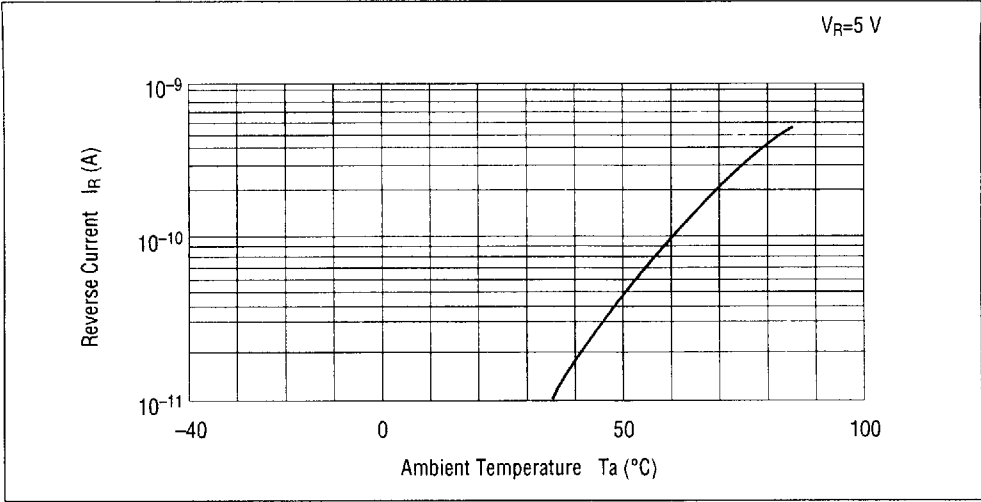
• ON Resistance vs. Ambient Temperature-1



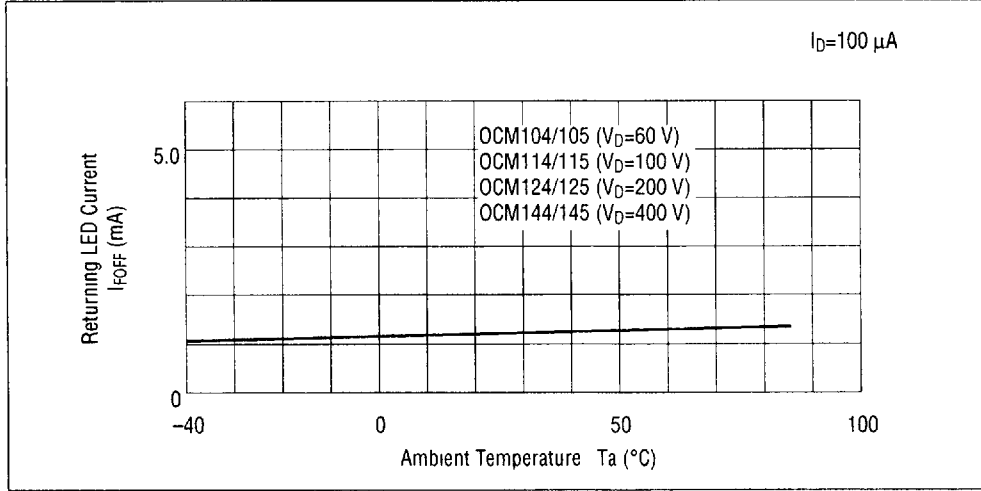
• ON Resistance vs. Ambient Temperature-2



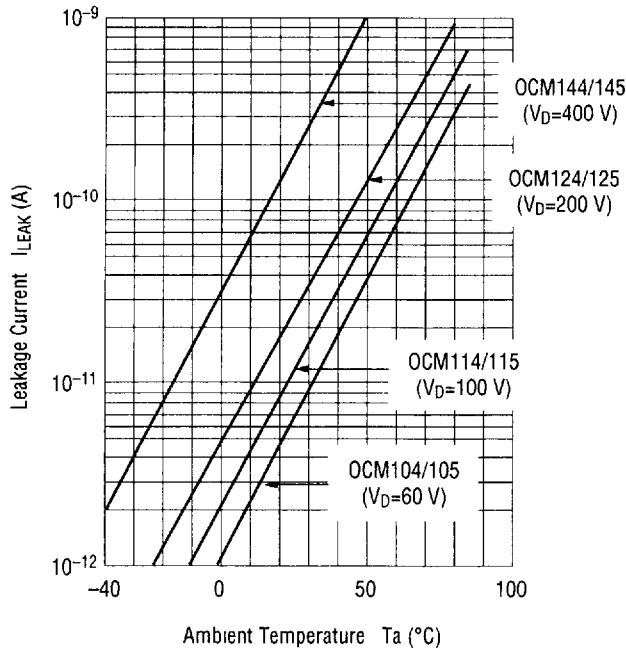
• Reverse Current vs. Ambient Temperature



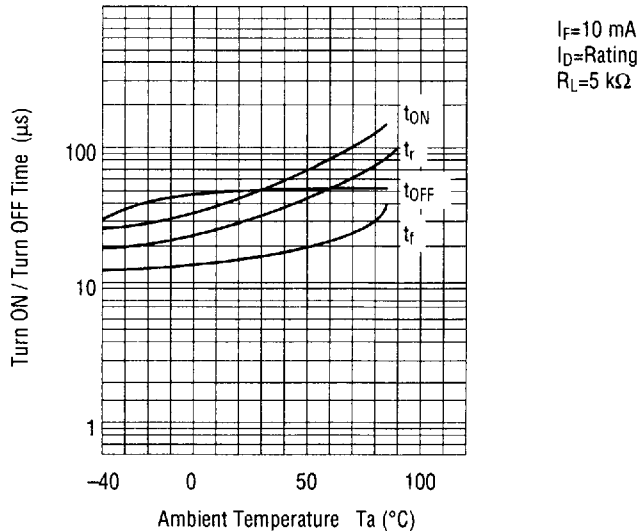
• Returning LED Current vs. Ambient Temperature



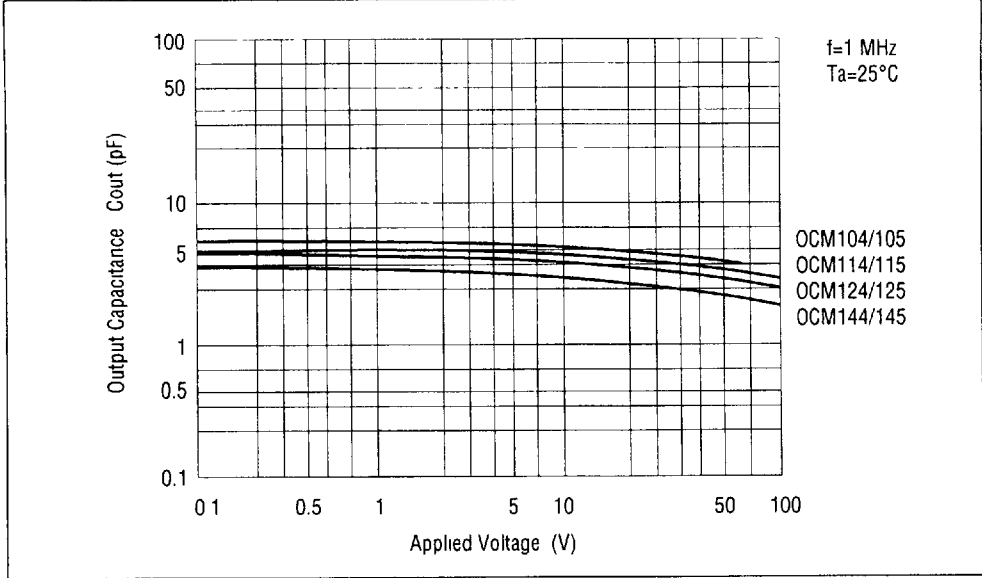
• Leakage Current vs. Ambient Temperature



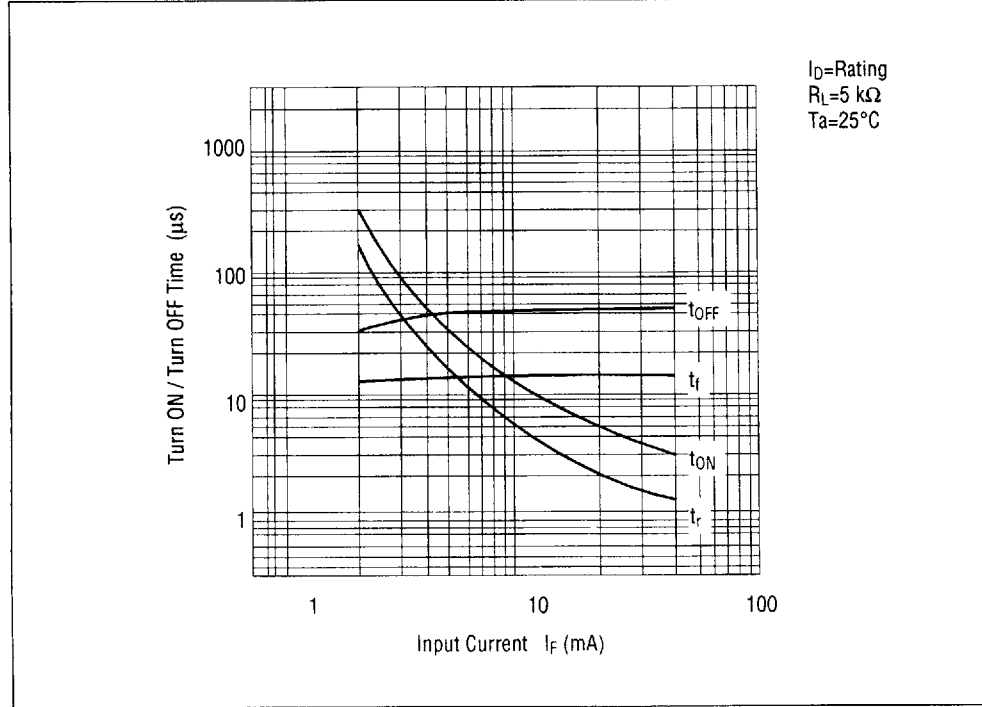
• Turn ON / Turn OFF Time vs. Ambient Temperature



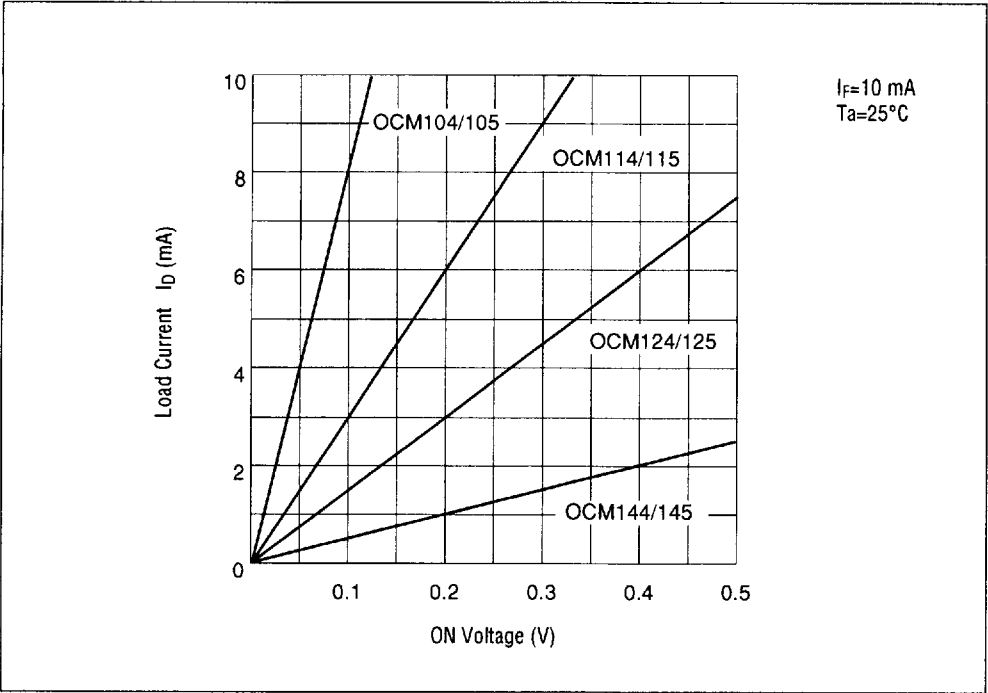
• Output Capacitance vs. Applied Voltage



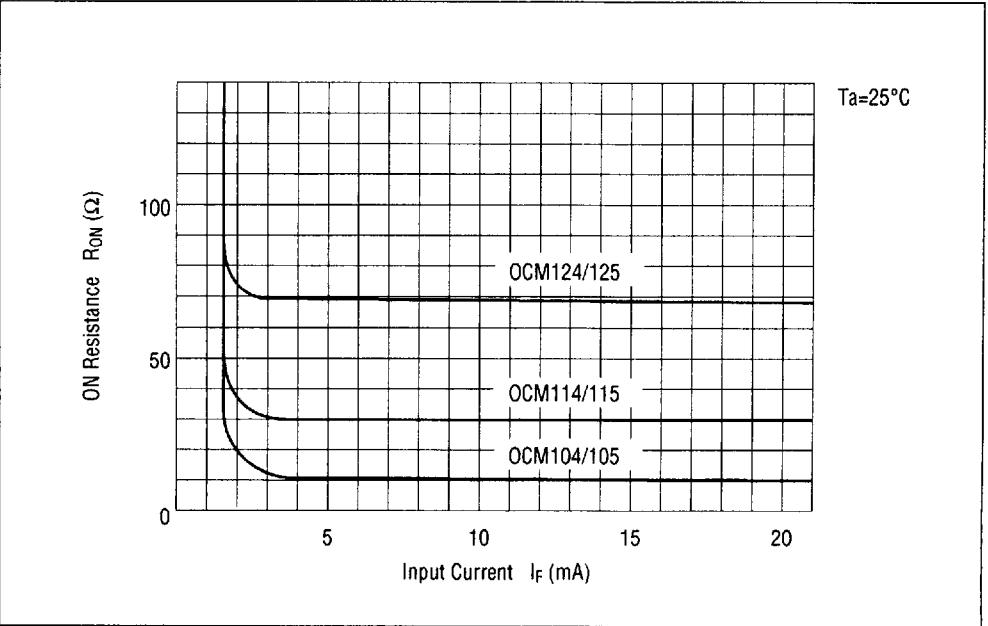
• Turn ON / Turn OFF Time vs. Input Current



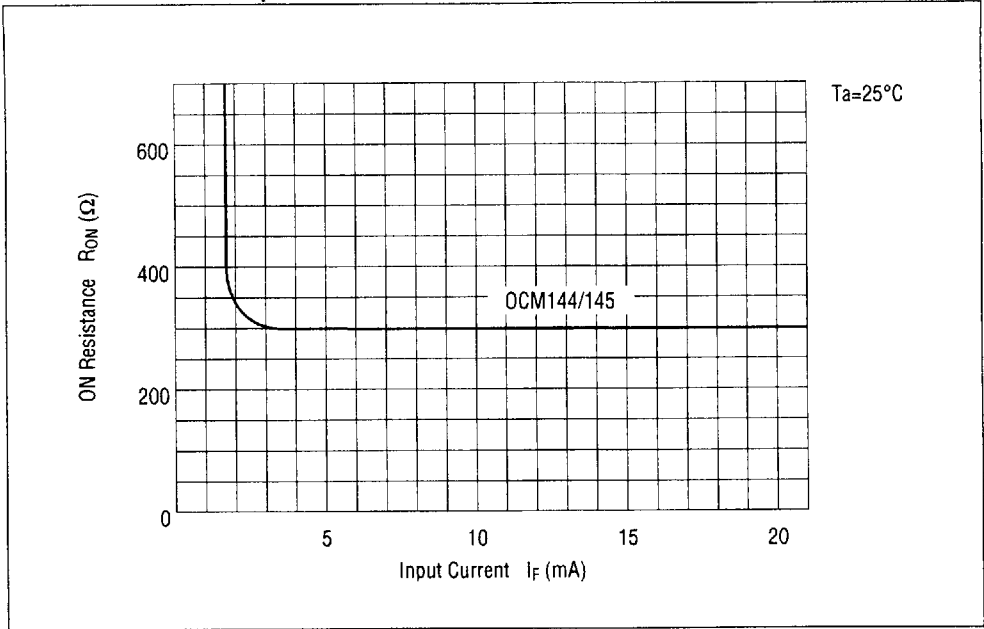
• Load Current vs. Voltage



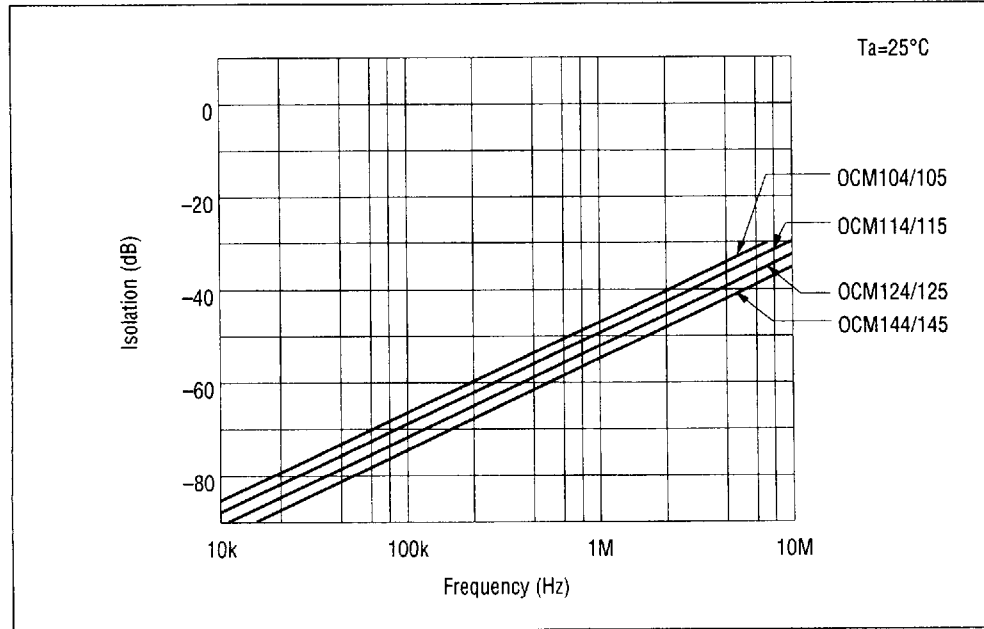
• ON Resistance vs. Input Current-1



• ON Resistance vs. Input Current-2



• Isolation



• Insertion Loss

