

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)

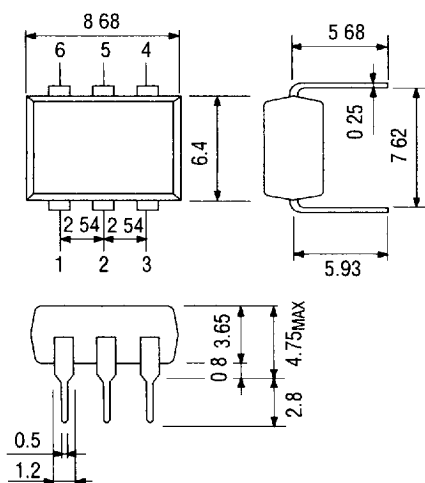
APPLICATIONS

- 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

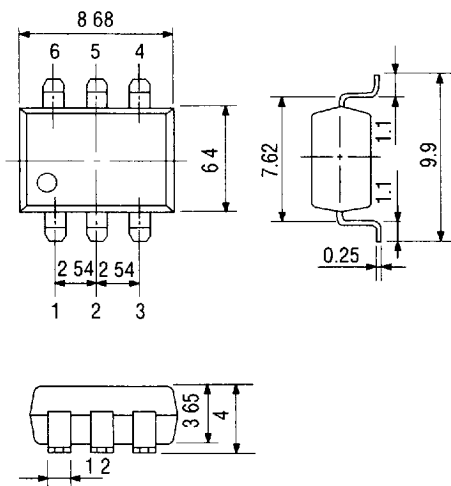
PIN CONFIGURATION

(Unit: mm)

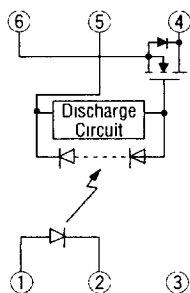
• DIP Type



• 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

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ELECTRICAL CHARACTERISTICS

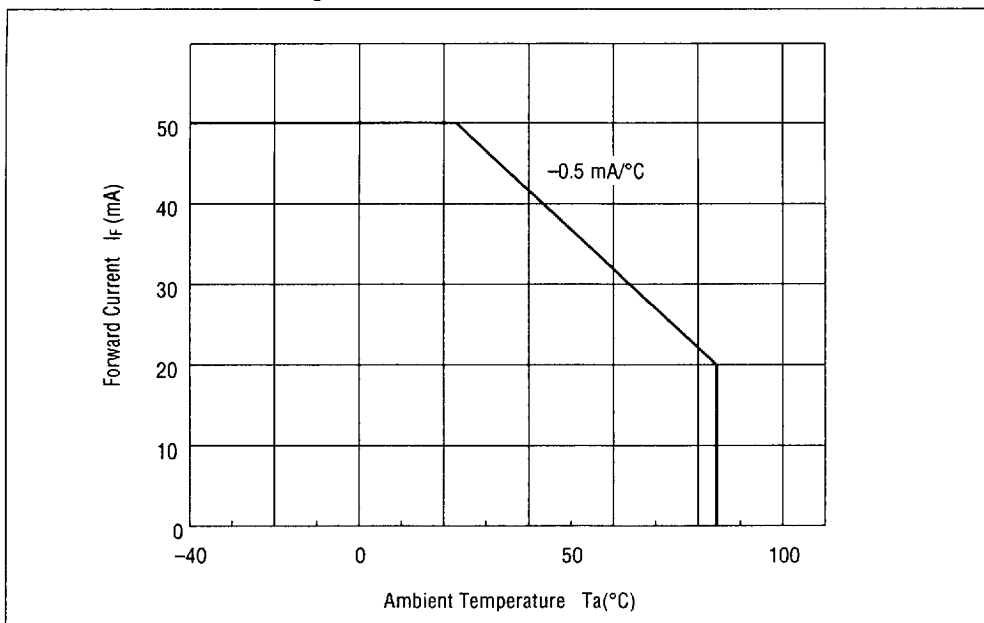
(Ambient Temperature Ta=25°C)

	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 Current		I_R	$V_R=5\text{ V}$	—	—	10	μA	—
FET	ON Resistance	OCM104, OCM105	R_{ON}	$I_F=10\text{ mA}$ $I_D=\text{Rating}$	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}	$V_D=60\text{ V}$	—	—	1.0	nA	—
		OCM114, OCM115		$V_D=100\text{ V}$					
		OCM124, OCM125		$V_D=200\text{ V}$					
		OCM144, OCM145		$V_D=400\text{ V}$					
	Output Capacitance		C_{OUT}	$V_D=50\text{ V}$ $f=1\text{ MHz}$	—	7	—	pF	—
Coupled	Operating LED Current *2		I_{FON}	$I_D=\text{Rating}$	—	—	5	mA	—
	Returning LED Current	OCM104, OCM105	I_{FOFF}	$V_D=60\text{ V}$ $I_D=100\text{ }\mu\text{A}$	0.2	—	—	mA	—
		OCM114, OCM115		$V_D=100\text{ V}$ $I_D=100\text{ }\mu\text{A}$					
		OCM124, OCM125		$V_D=200\text{ V}$ $I_D=100\text{ }\mu\text{A}$					
		OCM144, OCM145		$V_D=400\text{ V}$ $I_D=100\text{ }\mu\text{A}$					
	I/O Capacitance		C_{I-O}	$f=1\text{ MHz}$	—	13	—	pF	—
	Turn ON Time		t_{ON}	$I_F=10\text{ mA}$ $I_D=\text{Rating}$	—	30	200	μs	—
	Turn OFF Time		t_{OFF}	$R_L=5\text{ k}\Omega$	—	60	200	μs	—

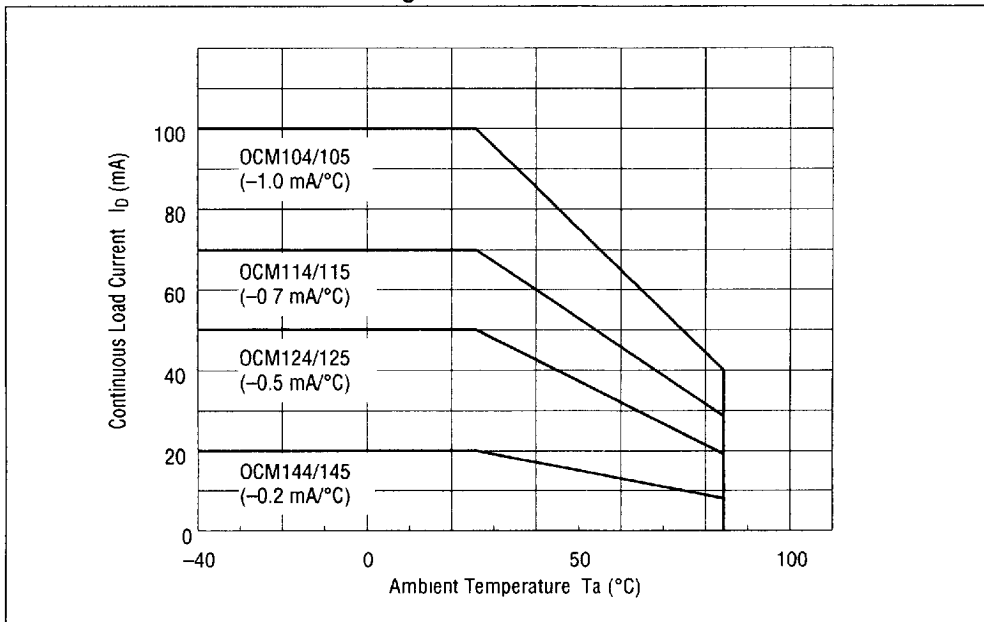
*1 Can correspond to special specification $I_{LEAK} < 0.1\text{ nA}$ *2 Can correspond to special specification $I_{FON} < 3.0\text{ mA}$

TYPICAL CHARACTERISTICS

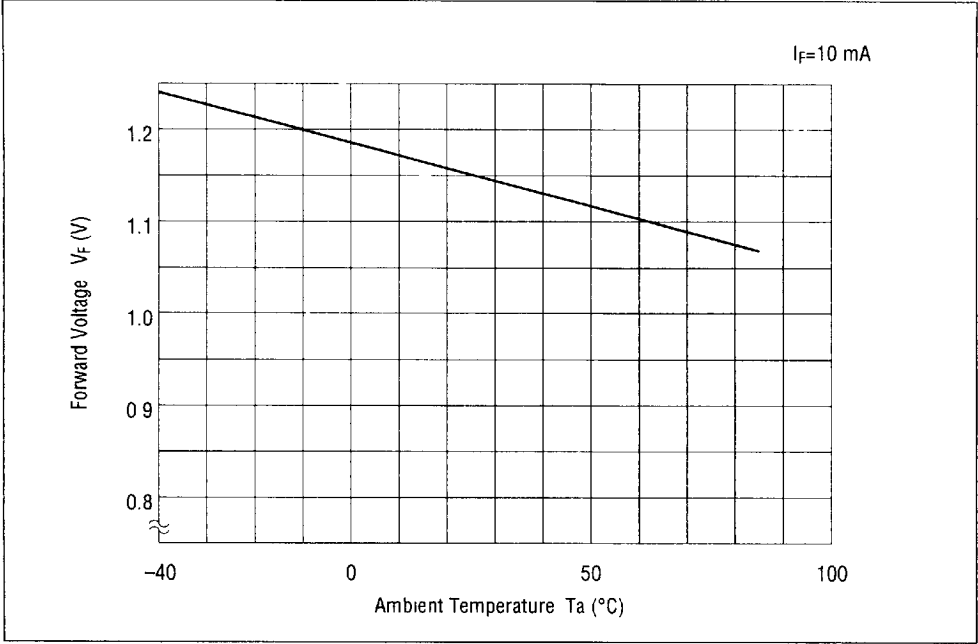
• Forward Current Derating Curve



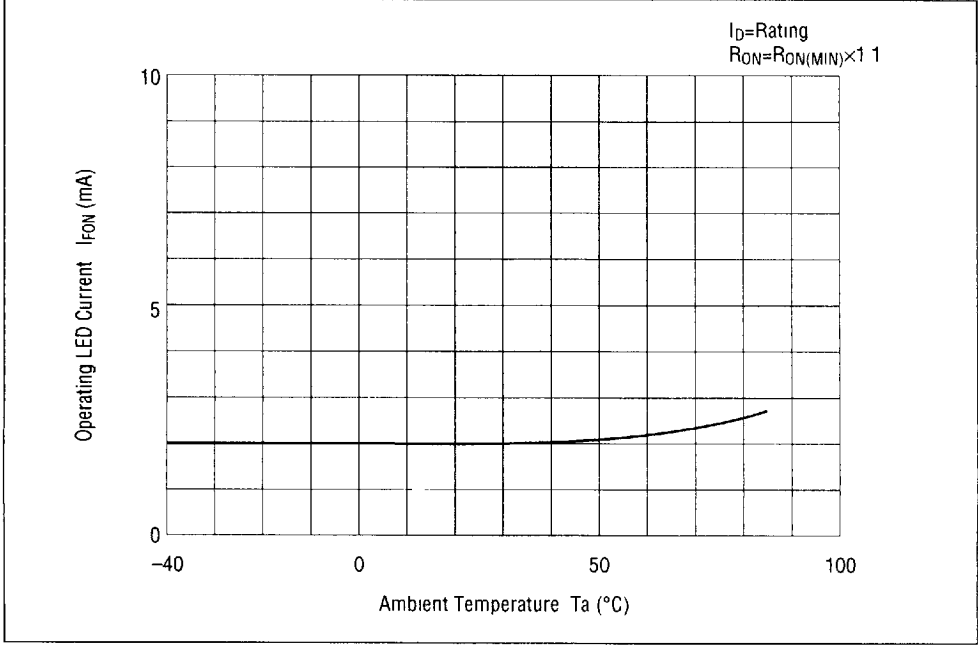
• Continuous Load Current Derating Curve



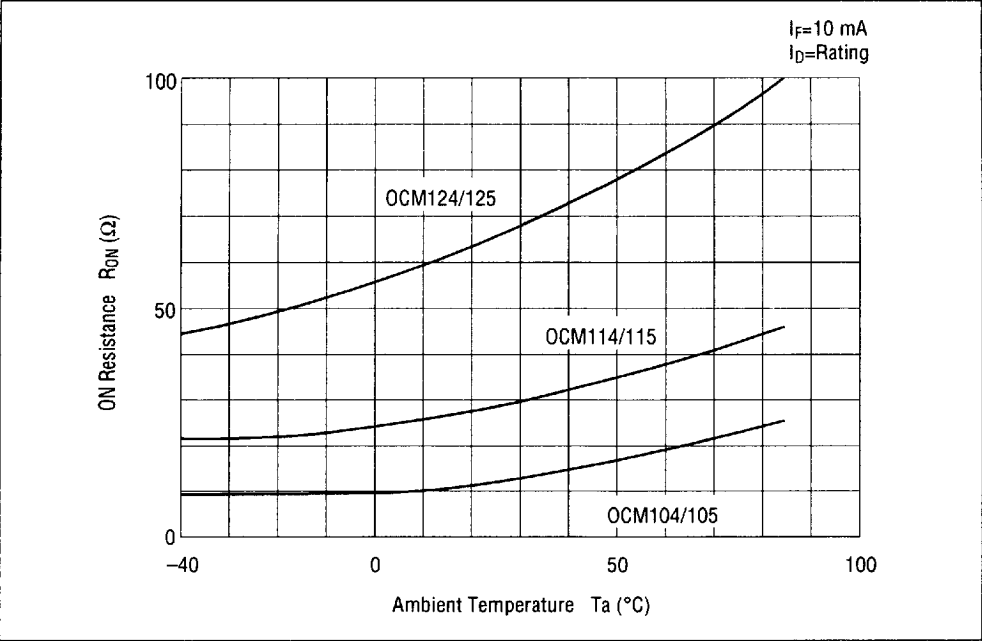
• Forward Voltage vs. Ambient Temperature



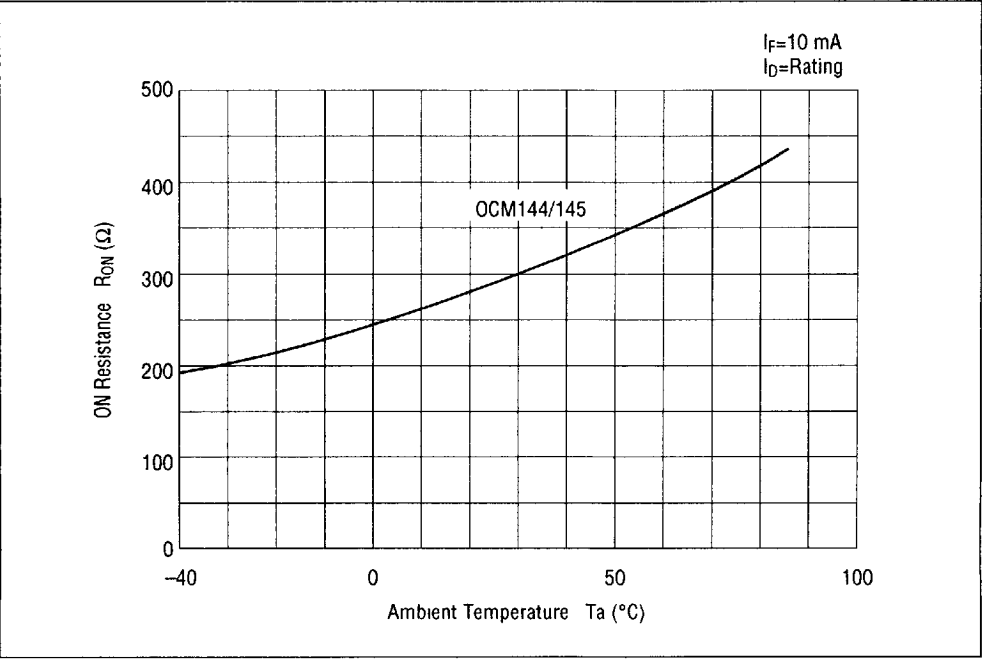
• Operating LED Current vs. Ambient Temperature



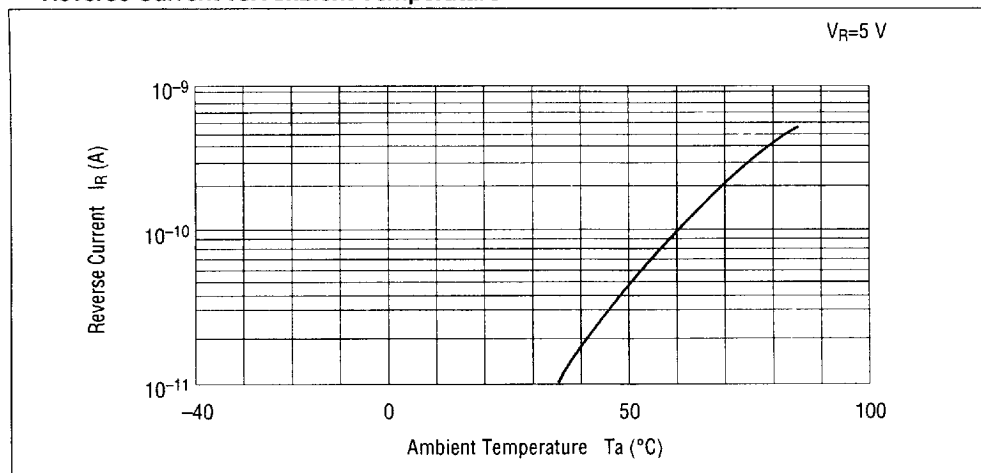
• ON Resistance vs. Ambient Temperature-1



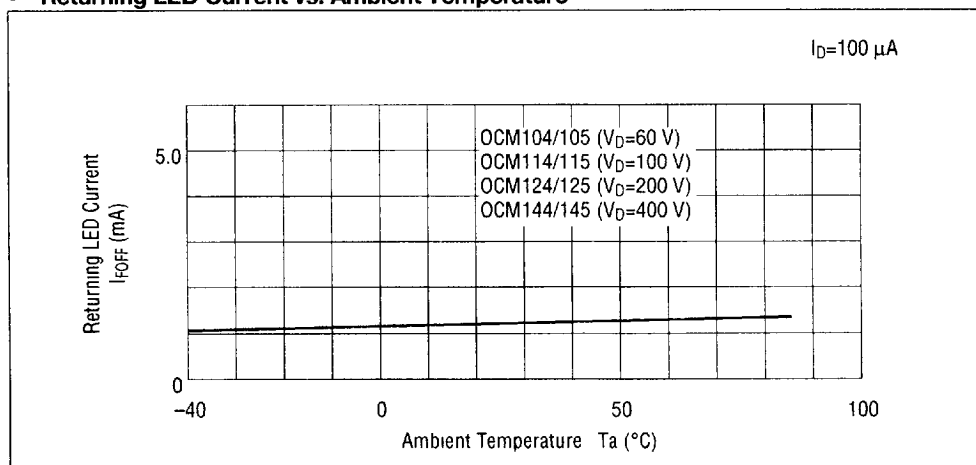
• ON Resistance vs. Ambient Temperature-2



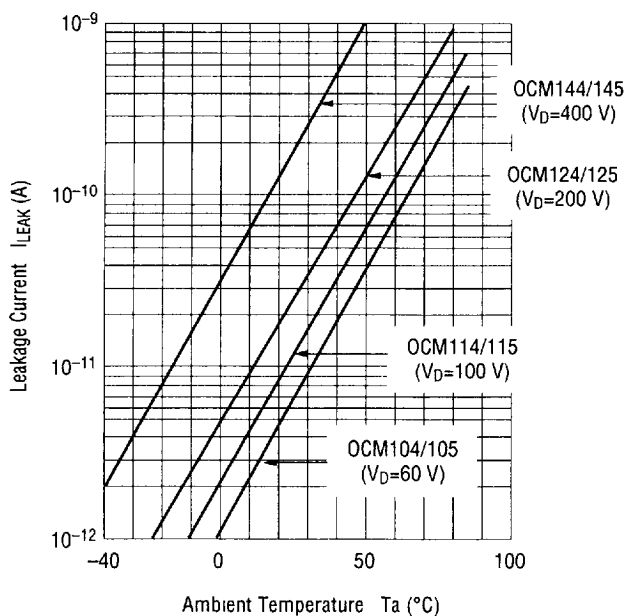
- Reverse Current vs. Ambient Temperature



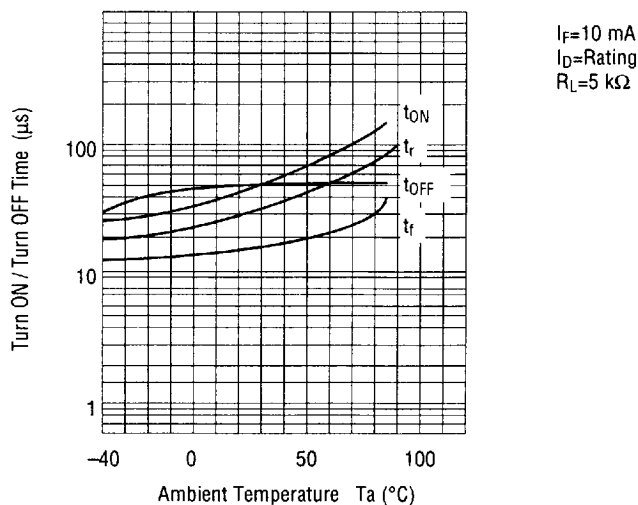
- Returning LED Current vs. Ambient Temperature



- Leakage Current vs. Ambient Temperature

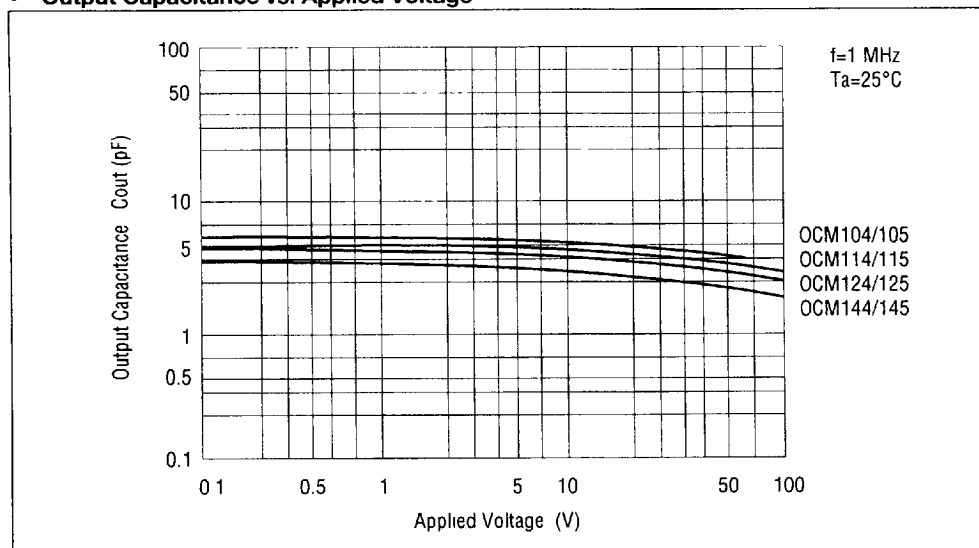


- Turn ON / Turn OFF Time vs. Ambient Temperature

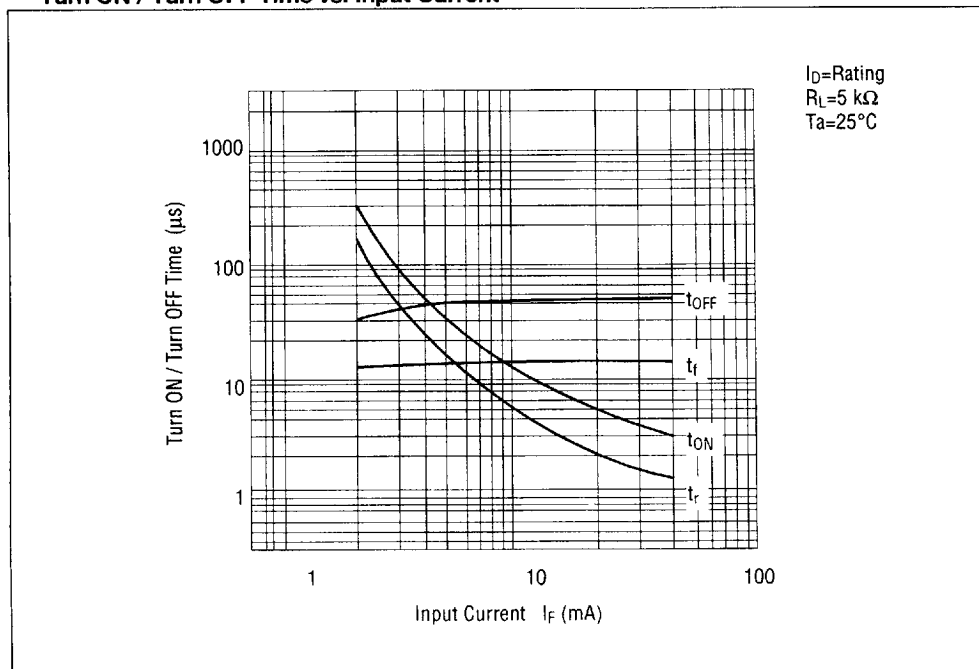


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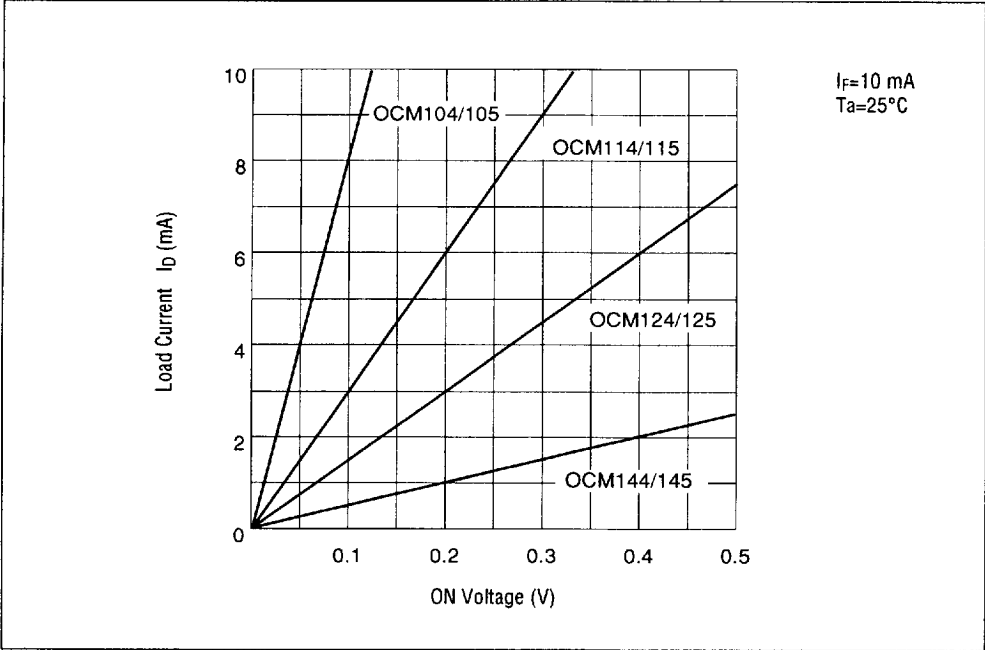
• Output Capacitance vs. Applied Voltage



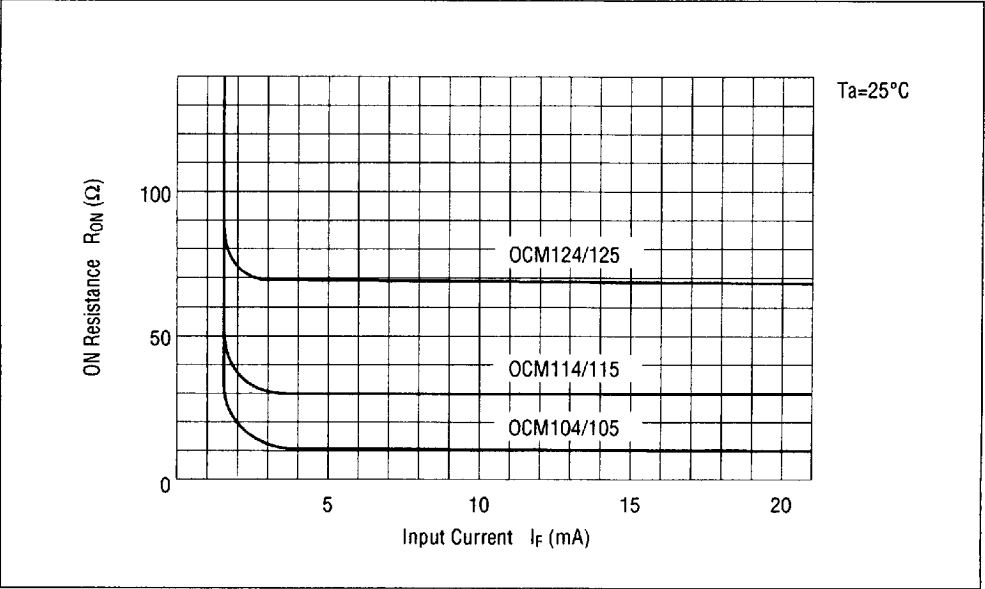
• Turn ON / Turn OFF Time vs. Input Current



• Load Current vs. Voltage

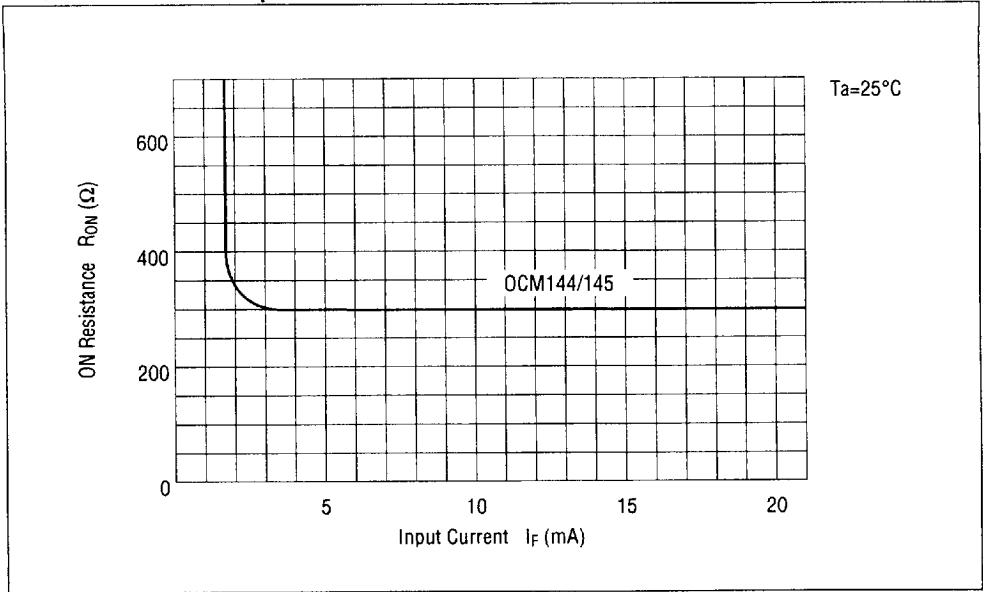


• ON Resistance vs. Input Current-1

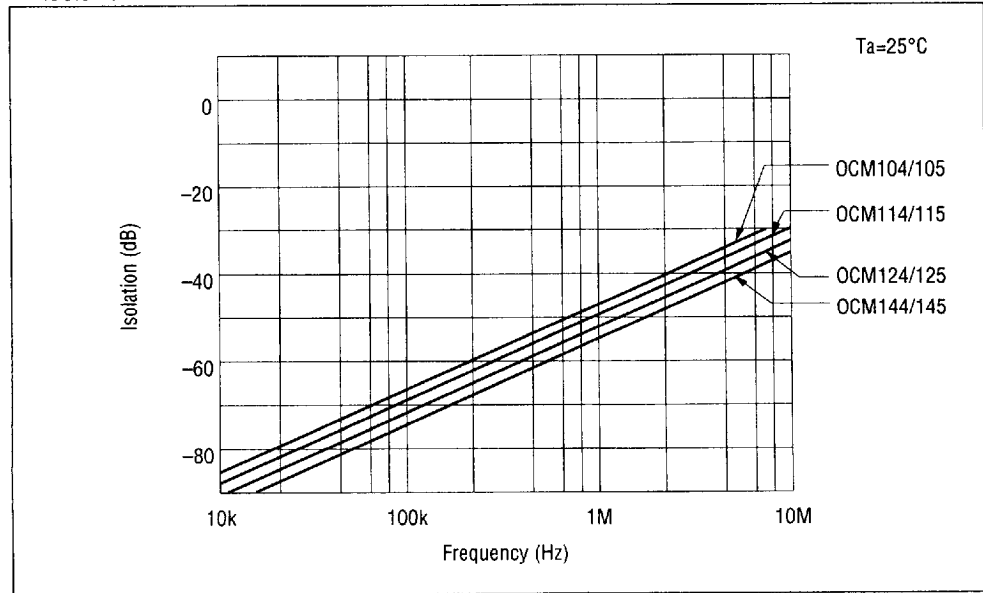


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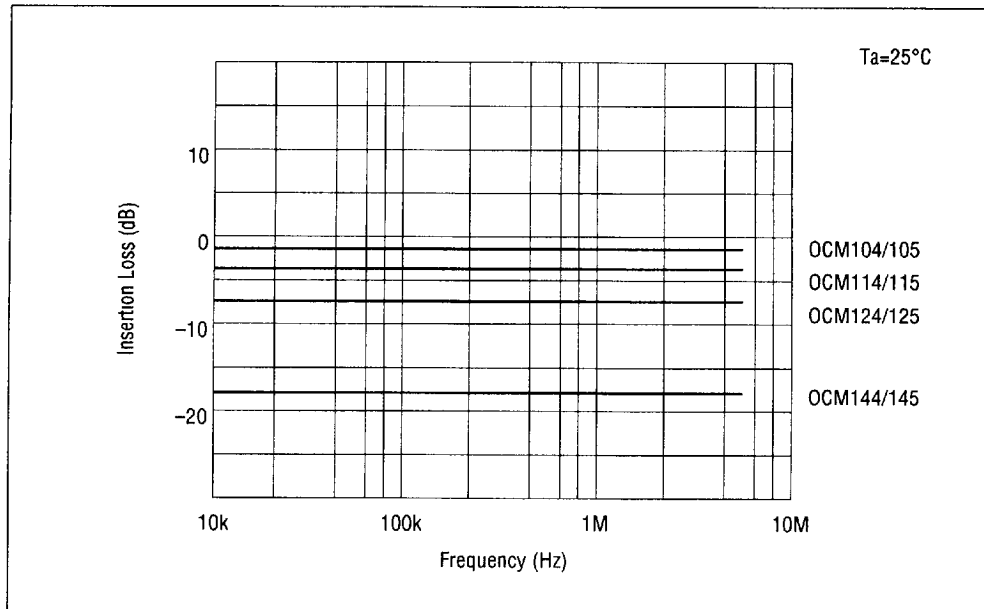
• ON Resistance vs. Input Current-2



• Isolation



• Insertion Loss



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