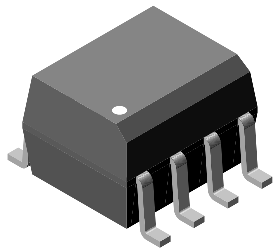
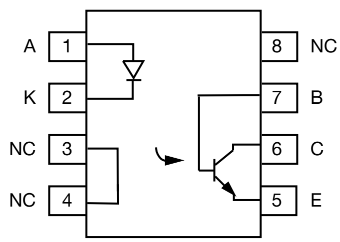
Optocoupler, Phototransistor Output, Low Input Current, With Base Connection





DESCRIPTION

The VO215AT, VO216AT, VO217AT are optically coupled pairs with a Gallium Arsenide infrared LED and a silicon NPN phototransistor. Signal information, including a DC level, can be transmitted by the device while maintaining a high degree of electrical isolation between input and output. The high CTR at low input current is designed for low power consumption requirements such as CMOS microprocessor interfaces.

FEATURES

- High current transfer ratio
- Isolation test voltage, 4000 V_{RMS}
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS COMPLIANT

AGENCY APPROVALS

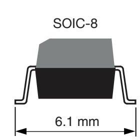
- UL
- cUL
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1

LINKS TO ADDITIONAL RESOURCES

Product Page

ORDERING INFORMATION

V	O	2	1	#	#	A	T
PART NUMBER							TAPE AND REEL



AGENCY CERTIFIED / PACKAGE	CTR (%)		
UL, cUL, VDE	**≥ 20**	**≥ 50**	**≥ 100**
SOIC-8	VO215AT	VO216AT	VO217AT

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Peak reverse voltage		V_R	6	V
Peak forward current	1 μs, 300 pps	I_{FM}	1	A
Forward continuous current		I_F	60	mA
Power dissipation		P_{diss}	90	mW
Derate linearly from 25 °C			1.2	mW/°C
OUTPUT				
Collector emitter breakdown voltage		BV_{CEO}	30	V
Emitter collector breakdown voltage		BV_{ECO}	7	V
Collector base breakdown voltage		BV_{CBO}	70	V
$I_{Cmax. DC}$		$I_{Cmax. DC}$	50	mA
$I_{Cmax.}$	t < 1 ms	$I_{Cmax.}$	100	mA
Power dissipation		P_{diss}	150	mW
Derate linearly from 25 °C			2	mW/°C
COUPLER				
Isolation test voltage	1 s	V_{ISO}	4000	V_{RMS}
Total package dissipation	LED and detector	P_{tot}	240	mW
Derate linearly from 25 °C			3.2	mW/°C
Storage temperature		T_{stg}	-40 to +150	°C
Operating temperature		T_{amb}	-40 to +100	°C
Soldering time	At 260 °C		10	s

Note

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 1 mA	V_F	-	1	1.5	V
Reverse current	V_R = 6 V	I_R	-	0.1	100	μA
Capacitance	V_R = 0 V	C_O	-	13	-	pF
OUTPUT						
Collector emitter breakdown voltage	I_C = 100 μA	BV_{CEO}	30	-	-	V
Emitter collector breakdown voltage	I_C = 10 μA	BV_{ECO}	7	-	-	V
Collector base breakdown voltage	I_C = 100 μA	BVCBO	100	-	-	V
Collector base current		ICBO	-	-	1	nA
Emitter base current		I_{EBO}	-	-	1	nA
Dark current collector emitter	V_{CE} = 10 V, I_F = 0 A	I_{CEO}	-	5	50	nA
Collector emitter capacitance	V_{CE} = 0	C_{CE}	-	10	-	pF
Saturation voltage, collector emitter	I_F =1 mA, I_C = 0.1 mA	V_{CEsat}	-		0.4	V
COUPLER						
Capacitance (input to output)		C_{IO}	-	0.5	-	pF

Note

- Minimum and maximum values were tested requierements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information only and are not part of the testing requirements.

CURRENT TRANSFER RATIO (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
DC current transfer ratio	I_F = 1 mA, V_{CE} = 5 V	VO215AT	CTR_{DC}	20	50	-	%
		VO216AT	CTR_{DC}	50	80	-	%
		VO217AT	CTR_{DC}	100	130	-	%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	I_C = 2 mA, R_L = 100 Ω, V_{CC} = 10 V	t_{on}	-	3	-	μs
Turn-off time	I_C = 2 mA, R_L = 100 Ω, V_{CC} = 10 V	t_{off}	-	3	-	μs
Rise time	I_C = 2 mA, R_L = 100 Ω, V_{CC} = 10 V	t_r	-	3	-	μs
Fall time	I_C = 2 mA, R_L = 100 Ω, V_{CC} = 10 V	t_f	-	2	-	μs

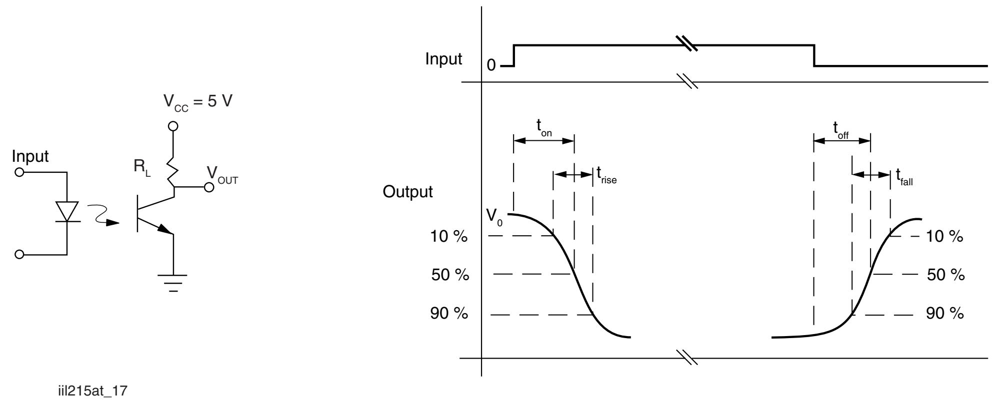


Fig. 1 - Switching Test Circuit

COMMON MODE TRANSIENT IMMUNITY						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Common mode transient immunity at logic high	V_{CM} = 1000 V_{P-P}, R_L = 1 kΩ, I_F = 0 mA	$\|C_{MH}\|$	-	5000	-	V/μs
Common mode transient immunity at logic low	V_{CM} = 1000 V_{P-P}, R_L = 1 kΩ, I_F = 10 mA	$\|C_{ML}\|$	-	5000	-	V/μs

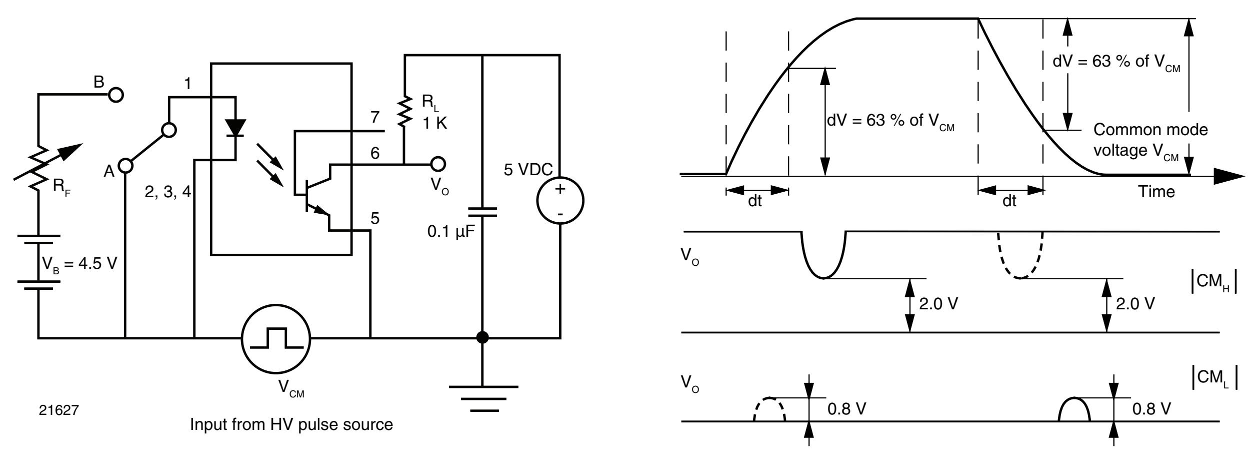


Fig. 2 - Test Circuit for Common Mode Transient Immunity

SAFETY AND INSULATION RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Climatic classification (according to IEC 68 part 1)			-	40 / 100 / 21	-	
Polution degree			-	2	-	
Comparative tracking index		CTI	175	-	399	
Isolation test voltage	1 s	V_{ISO}	4000	-	-	V_{RMS}
Peak transient overvoltage		V_{IOTM}	6000	-	-	V
Peak insulation voltage		V_{IORM}	560	-	-	V
Resistance (input to output)		R_{IO}	-	100	-	GΩ
Safety rating - power output		P_{SO}	-	-	350	mW
Safety rating - input current		I_{SI}	-	-	150	mA
Safety rating - temperature		T_{SI}	-	-	165	°C
External creepage distance			4	-	-	mm
External clearance distance			4	-	-	mm
Internal creepage distance			3.3	-	-	mm
Insulation thickness			0.2	-	-	mm

Note

- As per IEC 60747-5-2, §7.4.3.8.1, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

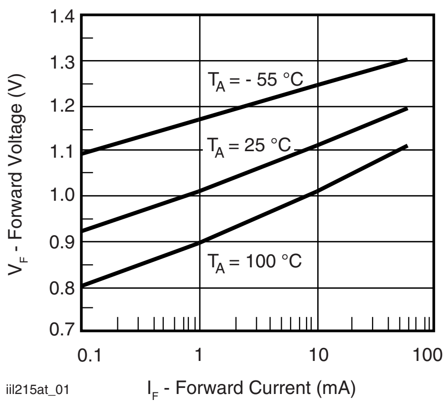


Fig. 3 - Forward Voltage vs. Forward Current

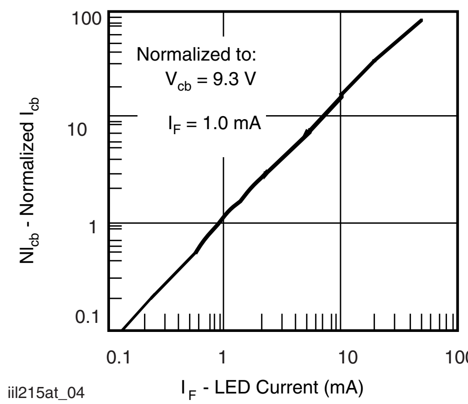


Fig. 6 - Normalized Collector Base Photocurrent vs. LED Current

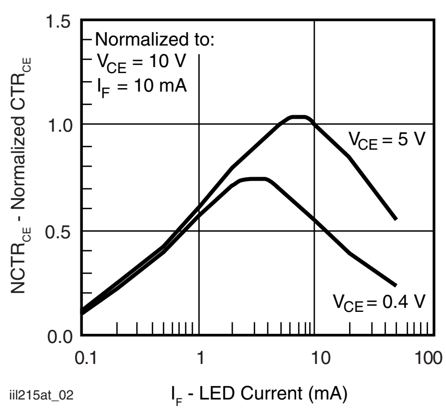


Fig. 4 - Normalized Non-Saturated and Saturated CTR_{CE} vs. LED Current

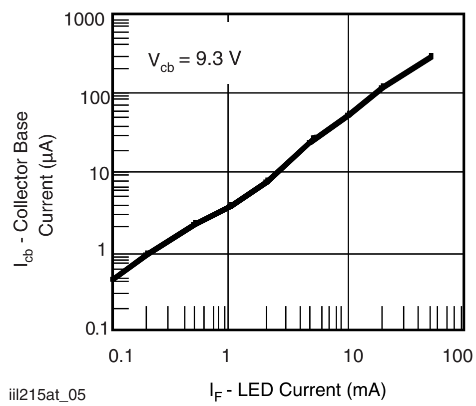


Fig. 7 - Collector Base Photocurrent vs. LED Current

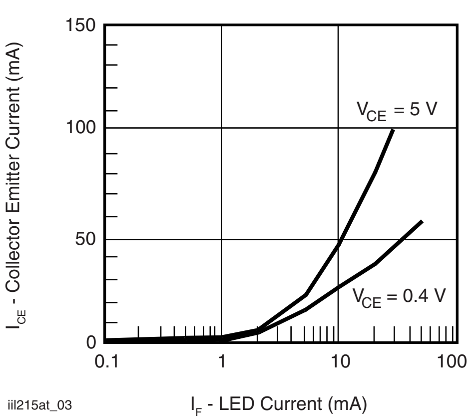


Fig. 5 - Collector Emitter Current vs. LED Current

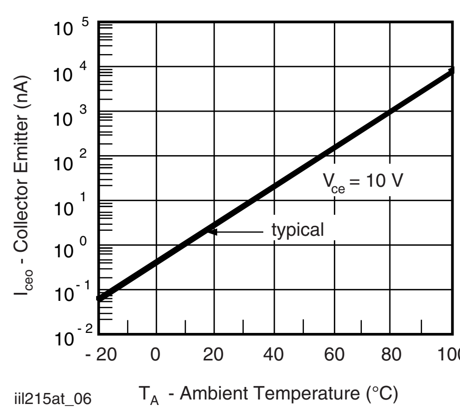


Fig. 8 - Collector Emitter Leakage Current vs.Temperature

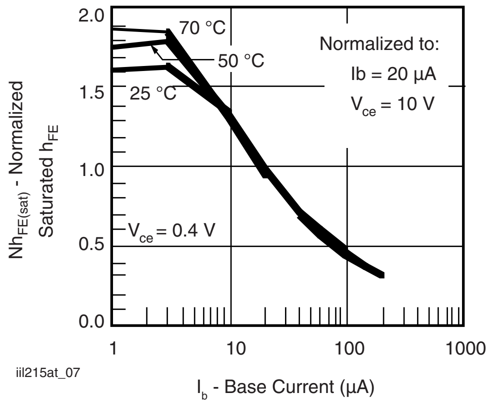


Fig. 9 - Normalized Saturated h_{FE} vs. Base Current and Temperature

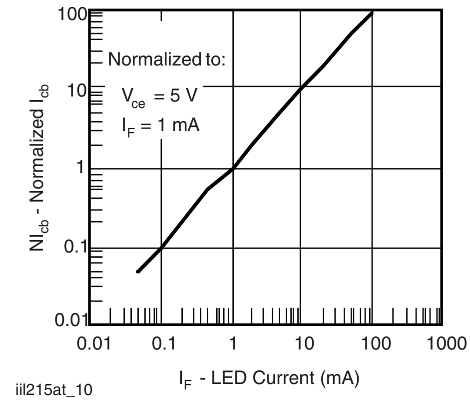


Fig. 12 - Normalized Collector Base Photocurrent vs. LED Current

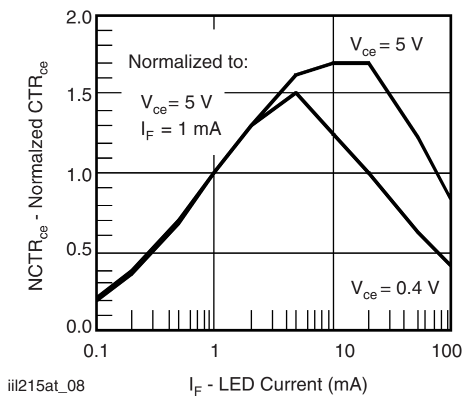


Fig. 10 - Normalized Non-Saturated and Saturated CTR_{CE} vs. LED Current

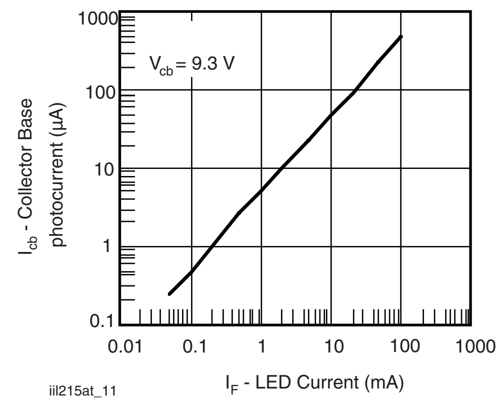


Fig. 13 - Collector Base Photocurrent vs. LED Current

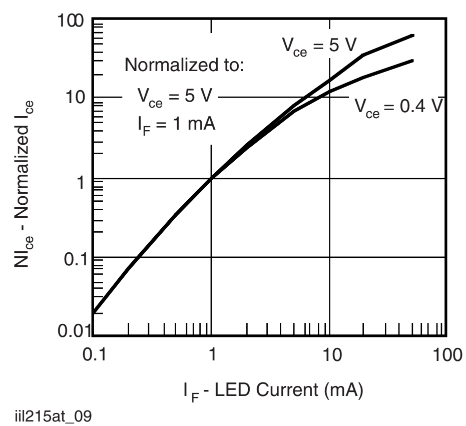


Fig. 11 - Normalized Non-Saturated and Saturated Collector Emitter Current vs. LED Current

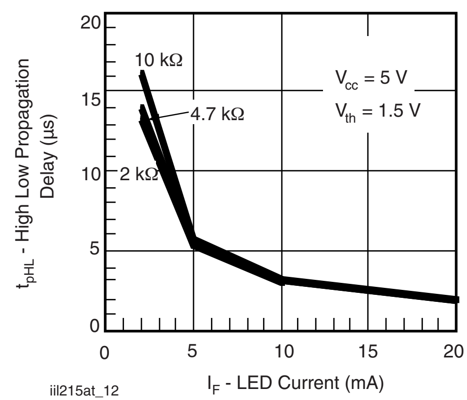


Fig. 14 - High to Low Propagation Delay vs. LED Current and Load Resistor

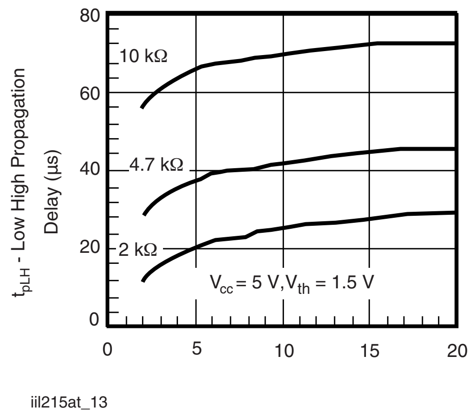


Fig. 15 - Low to High Propagation Delay vs. LED Current and Load Resistor

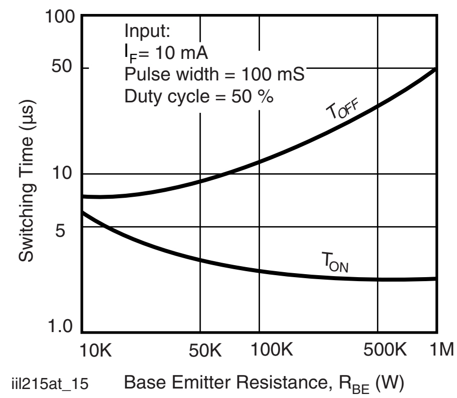


Fig. 17 - Typical Switching Characteristics vs. Base Resistance (Saturated Operation)

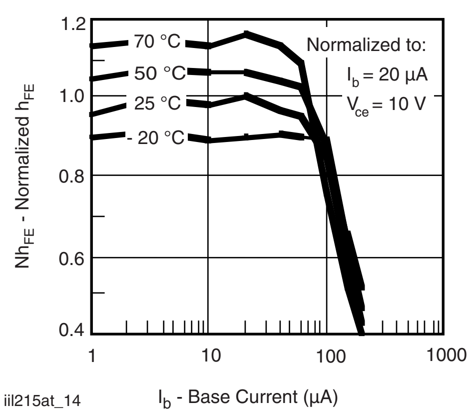


Fig. 16 - Normalized Non-Saturated h_{FE} vs. Base Current and Temperature

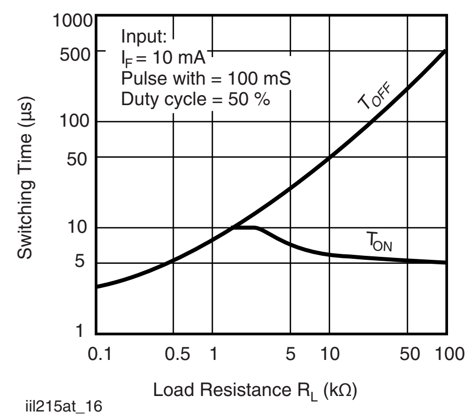
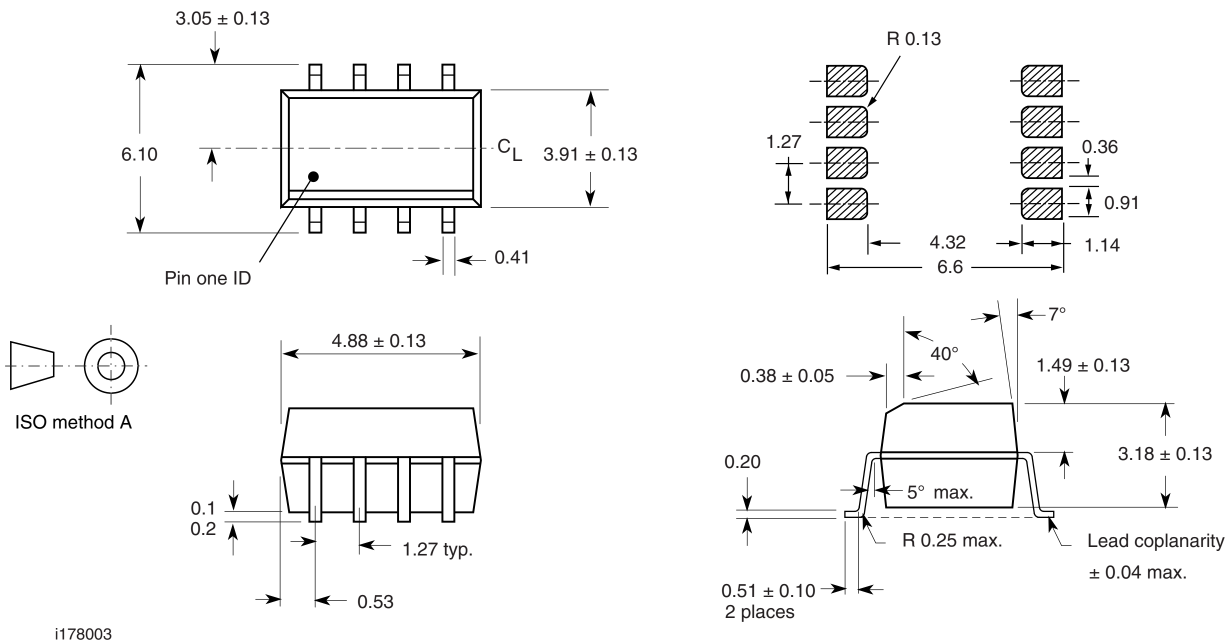


Fig. 18 - Typical Switching Times vs. Load Resistance

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (Example)

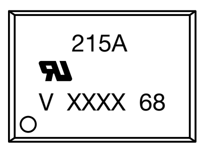


Fig. 19 - Example of VO215AT

Notes

- XXXX = LMC (lot marking code)
- Tape and reel suffix (T) is not part of the package marking

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