



**THE DATASHEET OF
4N38-X007**





ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Surge current	$t \leq 10\text{ }\mu\text{s}$	I_{FSM}	2.5	A
Power dissipation		P_{diss}	70	mW
OUTPUT				
Collector emitter breakdown voltage		V_{CEO}	70	V
Emitter base breakdown voltage		V_{EBO}	7	V
Collector current		I_C	50	mA
Collector peak current	$t_p/T = 0.5, t_p \leq 10\text{ ms}$	I_{CM}	100	mA
Output power dissipation		P_{diss}	150	mW
COUPLER				
Isolation test voltage	$t = 1\text{ s}$	V_{ISO}	5000	V_{RMS}
Creepage distance			≥ 7	mm
Clearance distance			≥ 7	mm
Isolation thickness between emitter and detector			≥ 0.4	mm
Comparative tracking index	DIN IEC 112/VDE 0303, part 1		≥ 175	
Isolation resistance	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^{\circ}\text{C}$	R_{IO}	$\geq 10^{12}$	Ω
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$	R_{IO}	$\geq 10^{11}$	Ω
Storage temperature		T_{stg}	- 55 to + 150	$^{\circ}\text{C}$
Operating temperature		T_{amb}	- 55 to + 100	$^{\circ}\text{C}$
Soldering temperature ⁽¹⁾	2 mm from case, $\leq 10\text{ s}$	T_{sld}	260	$^{\circ}\text{C}$

Notes

- 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.
- ⁽¹⁾ Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage ⁽¹⁾	$I_F = 10\text{ mA}$		V_F		1.2	1.5	V
	$I_F = 10\text{ mA}, T_{amb} = - 55\text{ }^{\circ}\text{C}$		V_F	0.9	1.3	1.7	V
Reverse current ⁽¹⁾	$V_R = 6\text{ V}$		I_R		0.1	10	μA
Capacitance	$V_R = 0\text{ V}, f = 1\text{ MHz}$		C_O		25		pF
OUTPUT							
Collector emitter breakdown voltage ⁽¹⁾	$I_C = 1\text{ mA}$	4N35	BV_{CEO}	30			V
		4N36	BV_{CEO}	30			V
		4N37	BV_{CEO}	30			V
		4N38	BV_{CEO}	80			V
Emitter collector breakdown voltage ⁽¹⁾	$I_E = 100\text{ }\mu\text{A}$		BV_{ECO}	7			V
Collector base breakdown voltage ⁽¹⁾	$I_C = 100\text{ }\mu\text{A}, I_B = 1\text{ }\mu\text{A}$	4N35	BV_{CBO}	70			V
		4N36	BV_{CBO}	70			V
		4N37	BV_{CBO}	70			V
		4N38	BV_{CBO}	80			V

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)								
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT	
OUTPUT								
Collector emitter leakage current ⁽¹⁾	$V_{CE} = 10\text{ V}, I_F = 0$	4N35	I_{CEO}		5	50	nA	
		4N36	I_{CEO}		5	50	nA	
	$V_{CE} = 10\text{ V}, I_F = 0$	4N37	I_{CEO}		5	50	nA	
	$V_{CE} = 60\text{ V}, I_F = 0$	4N38	I_{CEO}			50	nA	
	$V_{CE} = 30\text{ V}, I_F = 0,$ $T_{amb} = 100\text{ }^{\circ}\text{C}$		4N35	I_{CEO}			500	μA
			4N36	I_{CEO}			500	μA
		4N37	I_{CEO}			500	μA	
	$V_{CE} = 60\text{ V}, I_F = 0,$ $T_{amb} = 100\text{ }^{\circ}\text{C}$	4N38	I_{CEO}		6		μA	
Collector emitter capacitance	$V_{CE} = 0$		C_{CE}		6		pF	
coupler								
Resistance, input output ⁽¹⁾	$V_{IO} = 500\text{ V}$		R_{IO}	10^{11}			Ω	
Capacitance, input output	$f = 1\text{ MHz}$		C_{IO}		0.5		pF	

Notes

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.
- ⁽¹⁾ Indicates JEDEC registered value.

CURRENT TRANSFER RATIO ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)								
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT	
I_C/I_F ⁽¹⁾	$V_{CE} = 10\text{ V}, I_F = 10\text{ mA}$	4N35	CTR_{DC}	100			%	
		4N36	CTR_{DC}	100			%	
		4N37	CTR_{DC}	100			%	
	$V_{CE} = 10\text{ V}, I_F = 20\text{ mA}$	4N38	CTR_{DC}	20			%	
	$V_{CE} = 10\text{ V}, I_F = 10\text{ mA},$ $T_A = -55\text{ }^{\circ}\text{C to } +100\text{ }^{\circ}\text{C}$		4N35	CTR_{DC}	40	50		%
			4N36	CTR_{DC}	40	50		%
		4N37	CTR_{DC}	40	50		%	
		4N38	CTR_{DC}		30		%	

Note

- ⁽¹⁾ Indicates JEDEC registered values.

SWITCHING CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
Turn-on time ⁽¹⁾	$V_{CC} = 5\text{ V}, I_C = 2\text{ mA}, R_L = 100\text{ }\Omega$	t_{on}		10		μs	
Turn-off time ⁽¹⁾	$V_{CC} = 5\text{ V}, I_C = 2\text{ mA}, R_L = 100\text{ }\Omega$	t_{off}		10		μs	

Note

- ⁽¹⁾ Indicates JEDEC registered values.

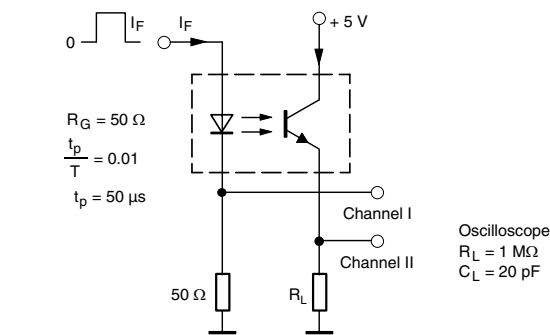


Fig. 1 - Test Circuit, Non-Saturated Operation

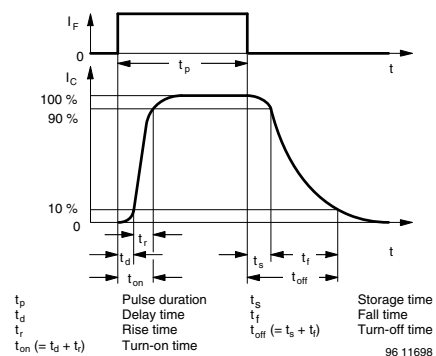


Fig. 2 - Switching Times

TYPICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

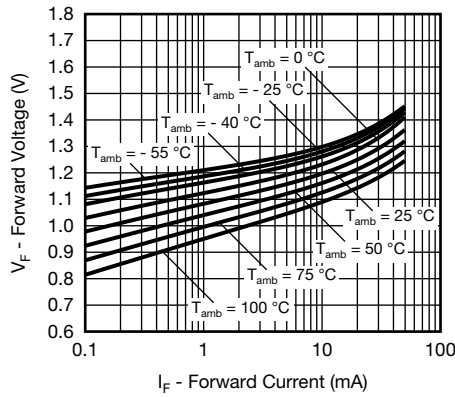


Fig. 3 - Forward Voltage vs. Forward Current

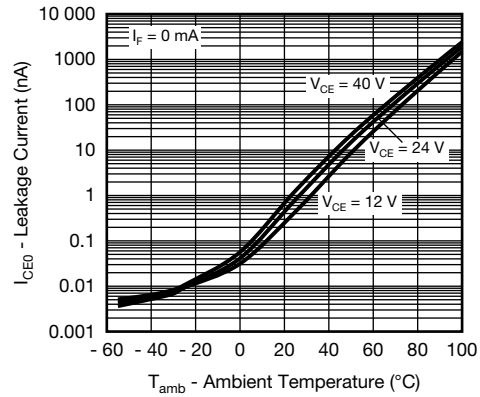


Fig. 6 - Leakage Current vs. Ambient Temperature

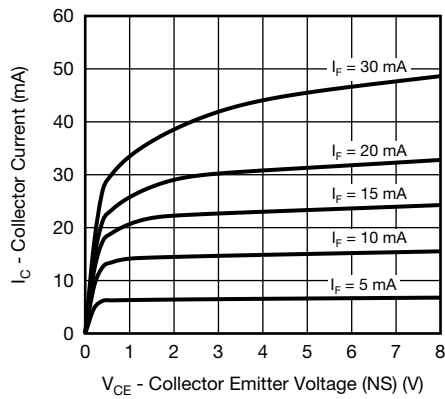


Fig. 4 - Collector Current vs. Collector Emitter Voltage (NS)

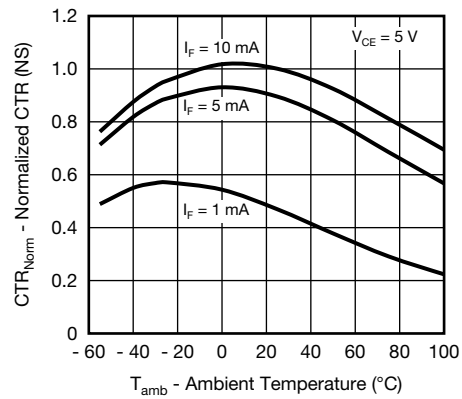


Fig. 7 - Normalized CTR (NS) vs. Ambient Temperature

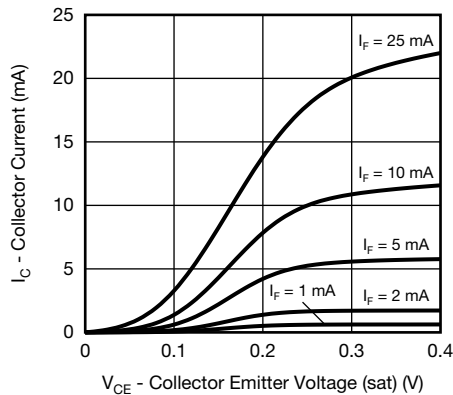


Fig. 5 - Collector Current vs. Collector Emitter Voltage (sat)

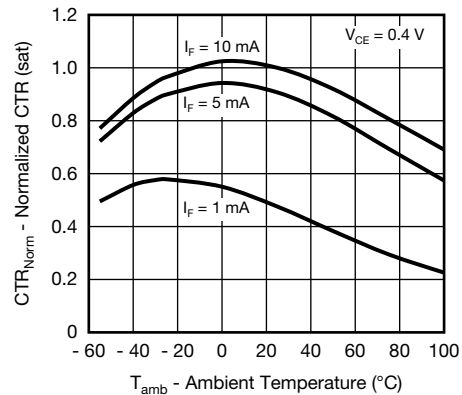


Fig. 8 - Normalized CTR (sat) vs. Ambient Temperature

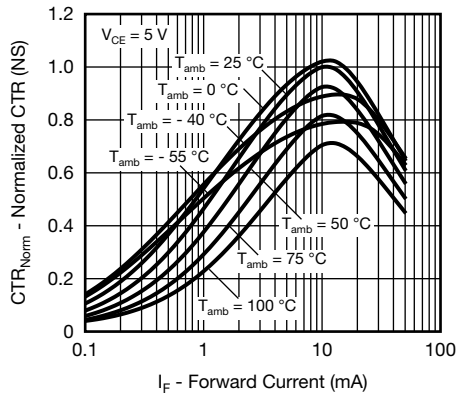


Fig. 9 - Normalized CTR (NS) vs. Forward Current

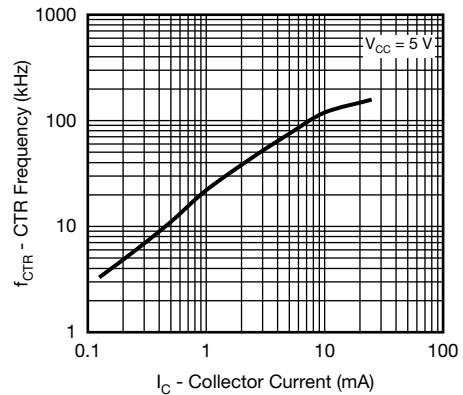


Fig. 12 - CTR Frequency vs. Collector Current

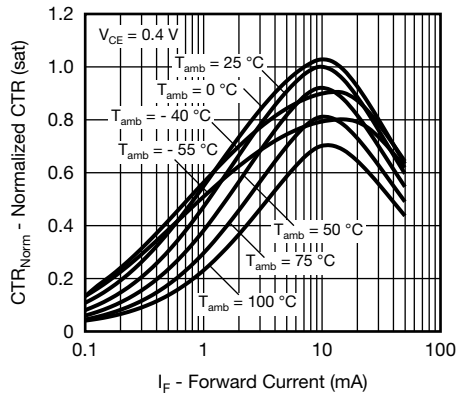


Fig. 10 - Normalized CTR (sat) vs. Forward Current

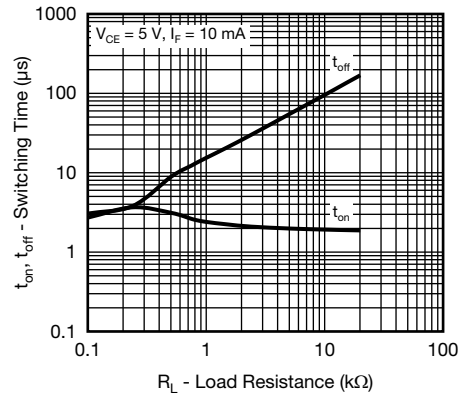


Fig. 13 - Switching Time vs. Load Resistance

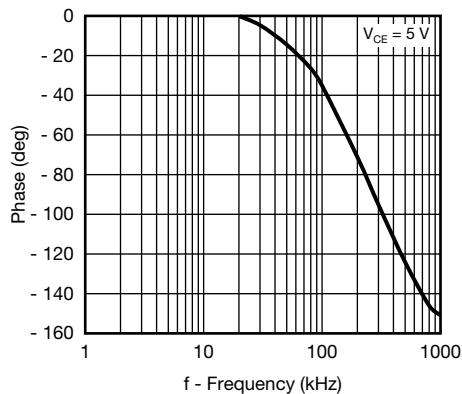
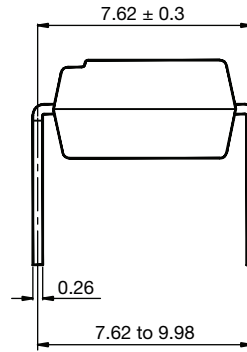
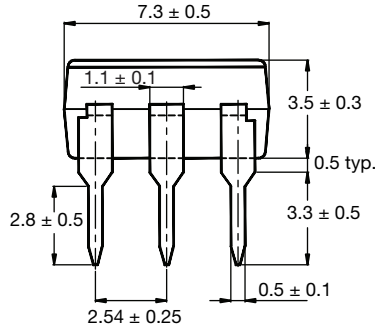
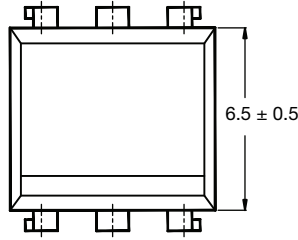


Fig. 11 - CTR Frequency vs. Phase Angle



PACKAGE DIMENSIONS in millimeters

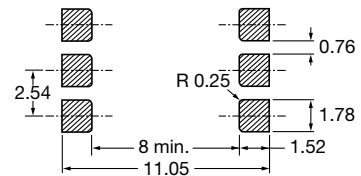
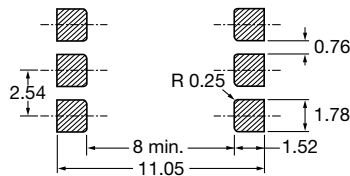
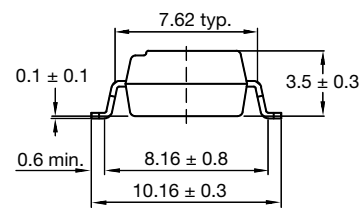
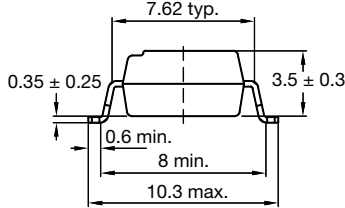
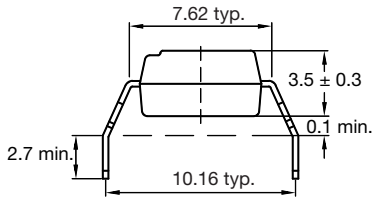


22530

Option 6

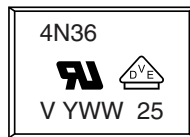
Option 7

Option 9



20802-34

PACKAGE MARKING



Notes

- VDE logo is only marked on option 1 parts. Option information is not marked on the part.
- Tape and reel suffix (T) is not part of the package marking.



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