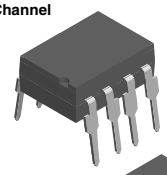
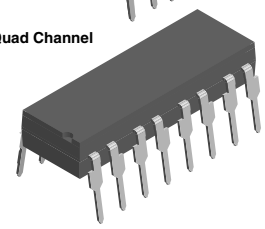
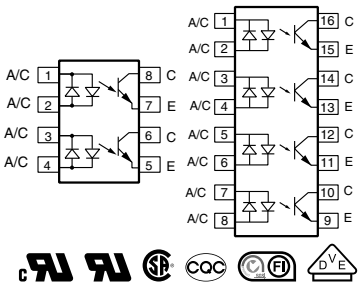
Optocoupler, Phototransistor Output, AC Input (Dual, Quad Channel)

Dual Channel



Quad Channel





FEATURES

- Identical channel to channel footprint
- ILD620 crosses to TLP620-2
- ILQ620 crosses to TLP620-4
- High collector emitter voltage, BV_{CEO} = 70 V
- Dual and quad packages feature:
  - Reduced board space
  - Lower pin and parts count
  - Better channel to channel CTR match
  - Improved common mode rejection
- Isolation rated voltage 4420 V_{RMS}
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

LINKS TO ADDITIONAL RESOURCES

Related Documents | Design Tools | 3D Models | Footprints | Schematics

SPICE Models

AGENCY APPROVALS

- UL 1577
- cUL 1577
- DIN EN 60747-5-5 (VDE 0884-5)
- CQC
  - ILD620x:
    - GB8898-2011
    - GB4943.1-2011
  - ILQ620x:
    - GB4943.1-2011
    - GB8898-2011
- FIMKO

DESCRIPTION

The ILD620, ILQ620, ILD620GB, and ILQ620GB are multi-channel input phototransistor optocouplers that use inverse parallel GaAs IRLED emitter and high gain NPN silicon phototransistors per channel. These devices are constructed using over/under leadframe optical coupling and double molded insulation resulting in a withstand test voltage of 5300 V_{RMS}.

The LED parameters and the linear CTR characteristics make these devices well suited for AC voltage detection. The ILD620GB and ILQ620GB with its low I_F guaranteed CTR_{CEsat} minimizes power dissipation of the A_C voltage detection network that is placed in series with the LEDs. Eliminating the phototransistor base connection provides added electrical noise immunity from the transients found in many industrial control environments.

ORDERING INFORMATION

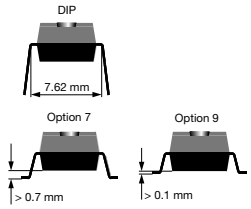
I	L	x	6	2	0	x	x	-	X	0	#	#	T

PART NUMBER

x = D (Dual) or Q (Quad)

PACKAGE OPTION

TAPE AND REEL



AGENCY CERTIFIED / PACKAGE	DUAL CHANNEL		QUAD CHANNEL	
	CTR (%)			
UL, cUL, FIMKO	**50 to 600**	**100 to 600**	**50 to 600**	**100 to 600**
DIP-8	ILD620	ILD620GB	-	-
SMD-8, option 7	ILD620-X007T	-	-	-
SMD-8, option 9	ILD620-X009T	ILD620GB-X009T	-	-
DIP-16	-	-	ILQ620	ILQ620GB
SMD-16, option 9	-	-	ILQ620-X009T (1)	ILQ620GB-X009T (1)

AGENCY CERTIFIED / PACKAGE	DUAL CHANNEL		QUAD CHANNEL	
	CTR (%)			
VDE, UL, cUL, FIMKO	50 to 600	100 to 600	50 to 600	100 to 600
DIP-16	-	-	ILQ620-X001	-
SMD-16, option 9	-	-	ILQ620-X019T (1)	-

Notes
- Additional options may be possible, please contact sales office

(1) Also available in tubes, do not put T on the end

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	1.5	A
LED power dissipation	at 25 °C	P_{diss}	100	mW
OUTPUT				
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Collector peak current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	100	mA
Output power dissipation	at 25 °C	P_{diss}	150	mW
COUPLER				
Operating ambient temperature range		T_{amb}	-55 to +110	°C
Storage temperature range		T_{stg}	-55 to +125	°C
Soldering temperature (1)	2 mm from case, ≤ 10 s	T_{sld}	260	°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

(2) Refer to reflow profile for soldering conditions for surface mounted parts (SMD), and wave profile for soldering conditions for through hole parts (DIP), please go to “Assembly Instructions” (www.vishay.com/doc?80054)

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage	I_F = ± 10 mA		V_F	1	1.15	1.3	V
Forward current	V_R = ± 0.7 V		I_F	-	2.5	20	µA
Capacitance	V_F = 0 V, f = 1 MHz		C_O	-	25	-	pF
Thermal resistance, junction to lead			R_{thJL}	-	750	-	K/W
OUTPUT							
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz		C_{CE}	-	6.8		pF
Collector emitter leakage current	V_{CE} = 24 V		I_{CEO}	-	10	100	nA
	T_A = 85 °C, V_{CE} = 24 V		I_{CEO}	-	2	50	µA
Thermal resistance, junction to lead			R_{thJL}	-	500	-	K/W
COUPLER							
Off-state collector current	V_F = ± 0.7 V, V_{CE} = 24 V		I_{CEoff}	-	1	10	µA
Collector emitter saturation voltage	I_F = ± 8 mA, I_{CE} = 2.4 mA	ILD620	V_{CEsat}	-	-	0.4	V
		ILQ620	V_{CEsat}	-	-	0.4	V
	I_F = ± 1 mA, I_{CE} = 0.2 mA	ILD620GB	V_{CEsat}	-	-	0.4	V
		ILQ620GB	V_{CEsat}	-	-	0.4	V

Note
- 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

CURRENT TRANSFER RATIO (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Channel/channel CTR match	I_F = ± 5 mA, V_{CE} = 5 V		CTRX/CTRY	1 to 1	-	3 to 1	
CTR symmetry	I_{CE} (I_F = - 5 mA)/I_{CE} (I_F = + 5 mA)		$I_{CE(RATIO)}$	0.5	-	2	
Current transfer ratio (collector emitter saturated)	I_F = ± 1 mA, V_{CE} = 0.4 V	ILD620	CTR_{CEsat}	-	60	-	%
		ILQ620	CTR_{CEsat}	-	60	-	%
Current transfer ratio (collector emitter)	I_F = ± 5 mA, V_{CE} = 5 V	ILD620	CTR_{CE}	50	80	600	%
		ILQ620	CTR_{CE}	50	80	600	%
Current transfer ratio (collector emitter saturated)	I_F = ± 1 mA, V_{CE} = 0.4 V	ILD620GB	CTR_{CEsat}	30	-	-	%
		ILQ620GB	CTR_{CEsat}	30	-	-	%
Current transfer ratio (collector emitter)	I_F = ± 5 mA, V_{CE} = 5 V	ILD620GB	CTR_{CEsat}	100	200	600	%
		ILQ620GB	CTR_{CEsat}	100	200	600	%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
NON-SATURATED						
On time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_{on}	-	3	-	µs
Rise time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_r	-	20	-	µs
Off time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	$t_o$ff	-	2.3	-	µs
Fall time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_f	-	2	-	µs
Propagation H to L	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_{PHL}	-	1.1	-	µs
Propagation L to H	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 75 Ω, 50 % of V_{PP}	t_{PLH}	-	2.5	-	µs
SATURATED						
On time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_{on}	-	4.3	-	µs
Rise time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_r	-	2.8	-	µs
Off time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	$t_o$ff	-	2.5	-	µs
Fall time	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_f	-	11	-	µs
Propagation H to L	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_{PHL}	-	2.6	-	µs
Propagation L to H	I_F = ± 10 mA, V_{CC} = 5 V, R_L = 1 kΩ, V_{TH} = 1.5 V,	t_{PLH}	-	7.2	-	µs

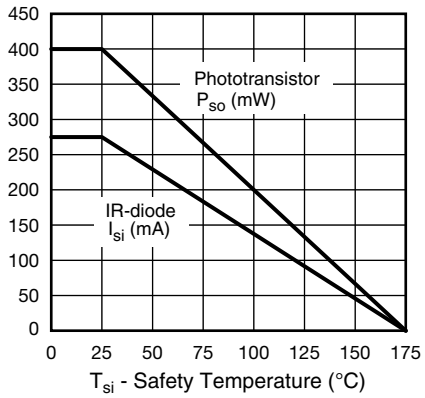


Fig. 1 - Derating Diagram

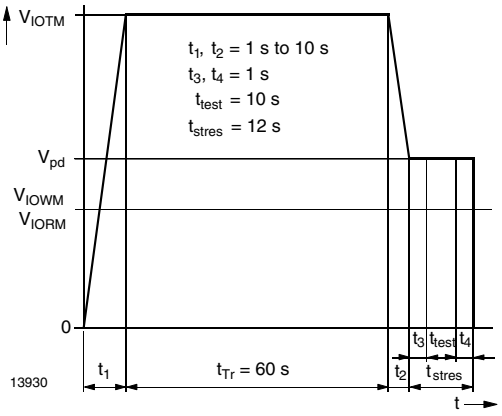


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		55 / 110 / 21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	t = 1 min	V_{ISO}	4420	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	10 000	V_{peak}
Maximum repetitive peak isolation voltage		V_{IORM}	890	V_{peak}
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω
	V_{IO} = 500 V, T_{amb} = 150 °C (construction test only)	R_{IO}	$\geq 10^{9}$	Ω
Output safety power		P_{SO}	400	mW
Input safety current		I_{SI}	275	mA
Safety temperature		T_{SI}	175	°C
Creepage distance			≥ 7	mm
Clearance distance			≥ 7	mm
Insulation thickness		DTI	≥ 0.4	mm
Partial discharge test voltage - routine test	100 %, t_{test} = 1 s	V_{pd}	1.669	kV_{peak}
Partial discharge test voltage - lot test (sample test)	t_{Tr} = 60 s, t_{test} = 10 s, (see Fig. 2)	V_{pd}	1.424	kV_{peak}

Note

- As per IEC 60747-5-5, § 7.4.3.8.2, 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)

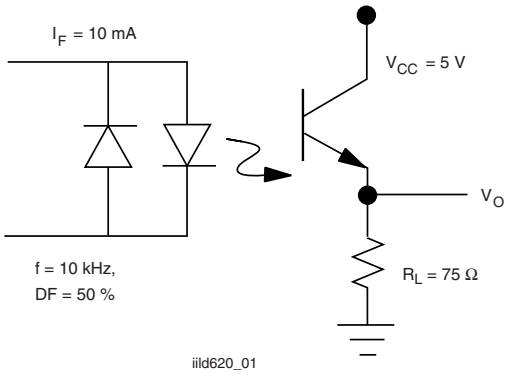


Fig. 3 - Non-Saturated Switching Timing

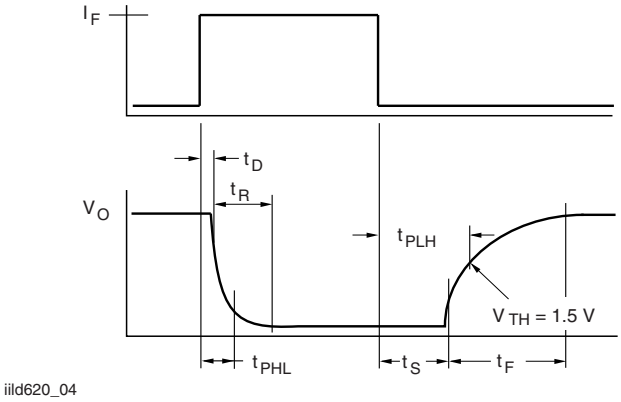


Fig. 6 - Saturated Switching Timing

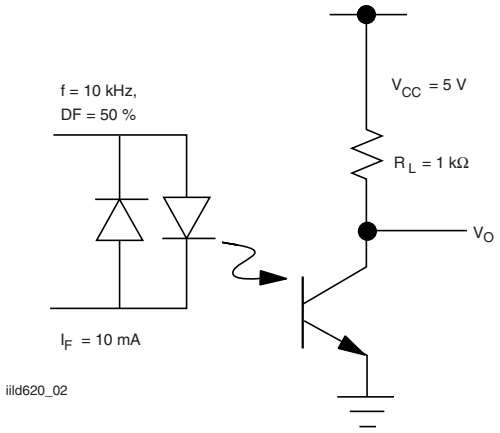


Fig. 4 - Saturated Switching Timing

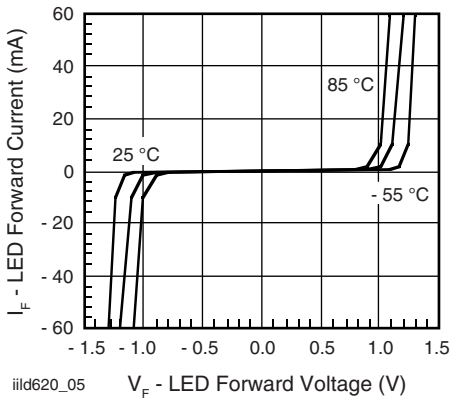


Fig. 7 - LED Forward Current vs.Forward Voltage

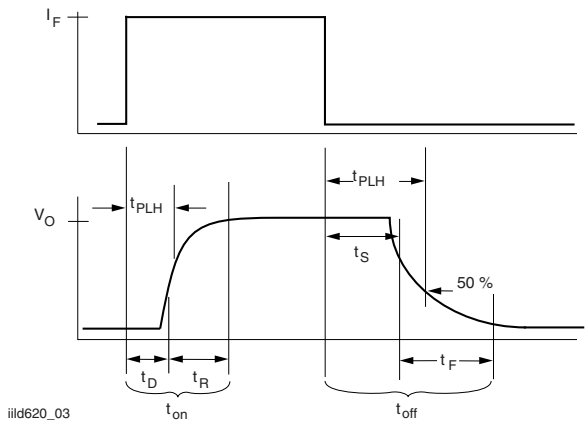


Fig. 5 - Non-Saturated Switching Timing

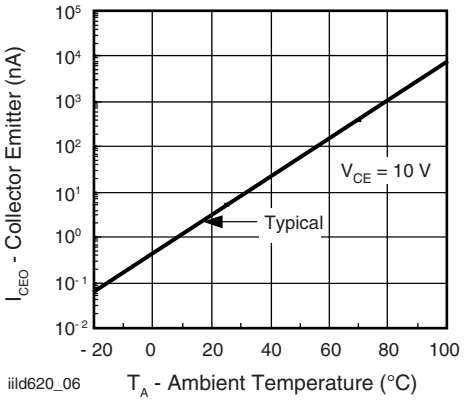


Fig. 8 - Collector Emitter Leakage vs. Temperature

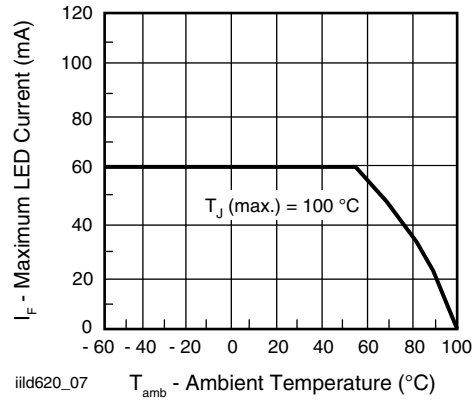


Fig. 9 - Maximum LED Current vs. Ambient Temperature

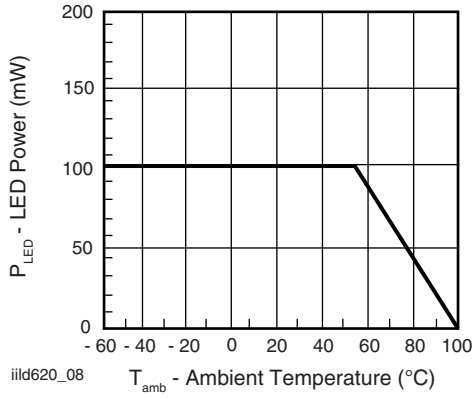


Fig. 10 - Maximum LED Power Dissipation

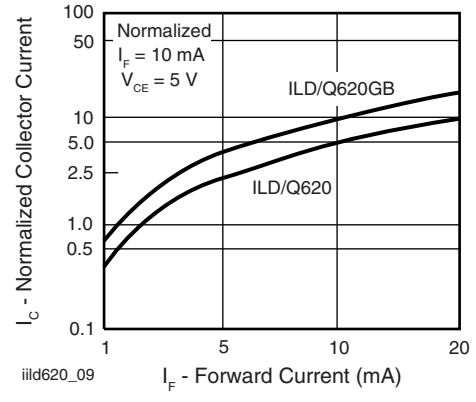


Fig. 11 - Collector Current vs. Diode Forward Current

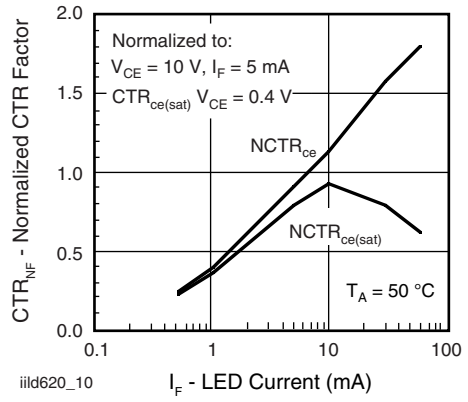


Fig. 12 - Normalization Factor for Non-Saturated and Saturated CTR vs. I_F

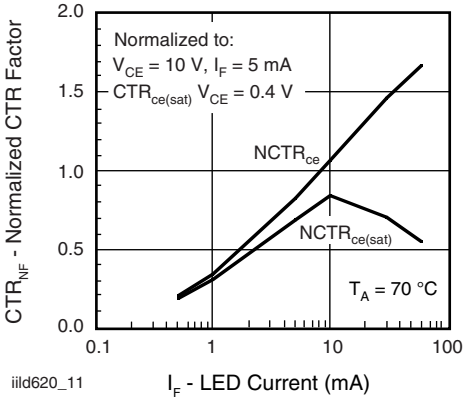


Fig. 13 - Normalization Factor for Non-Saturated and Saturated CTR vs. I_F

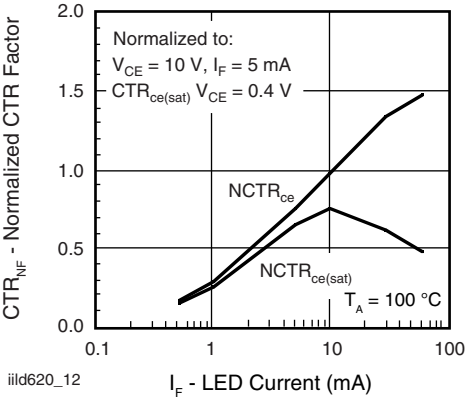


Fig. 14 - Normalization Factor for Non-Saturated and Saturated CTR vs. I_F

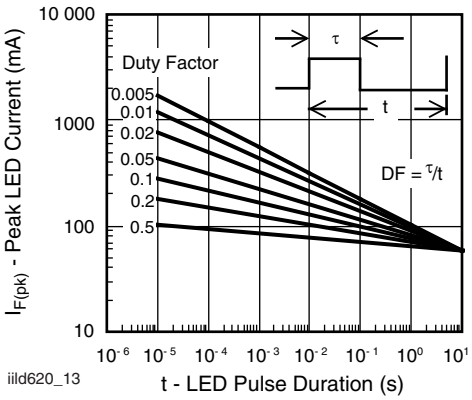


Fig. 15 - Peak LED Current vs. Pulse Duration, τ

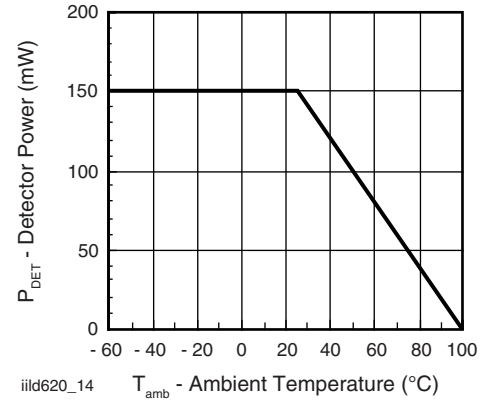


Fig. 16 - Maximum Detector Power Dissipation

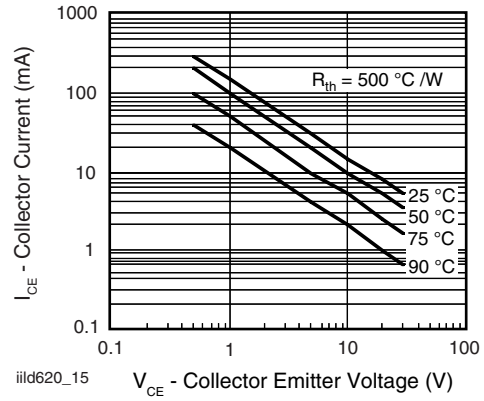
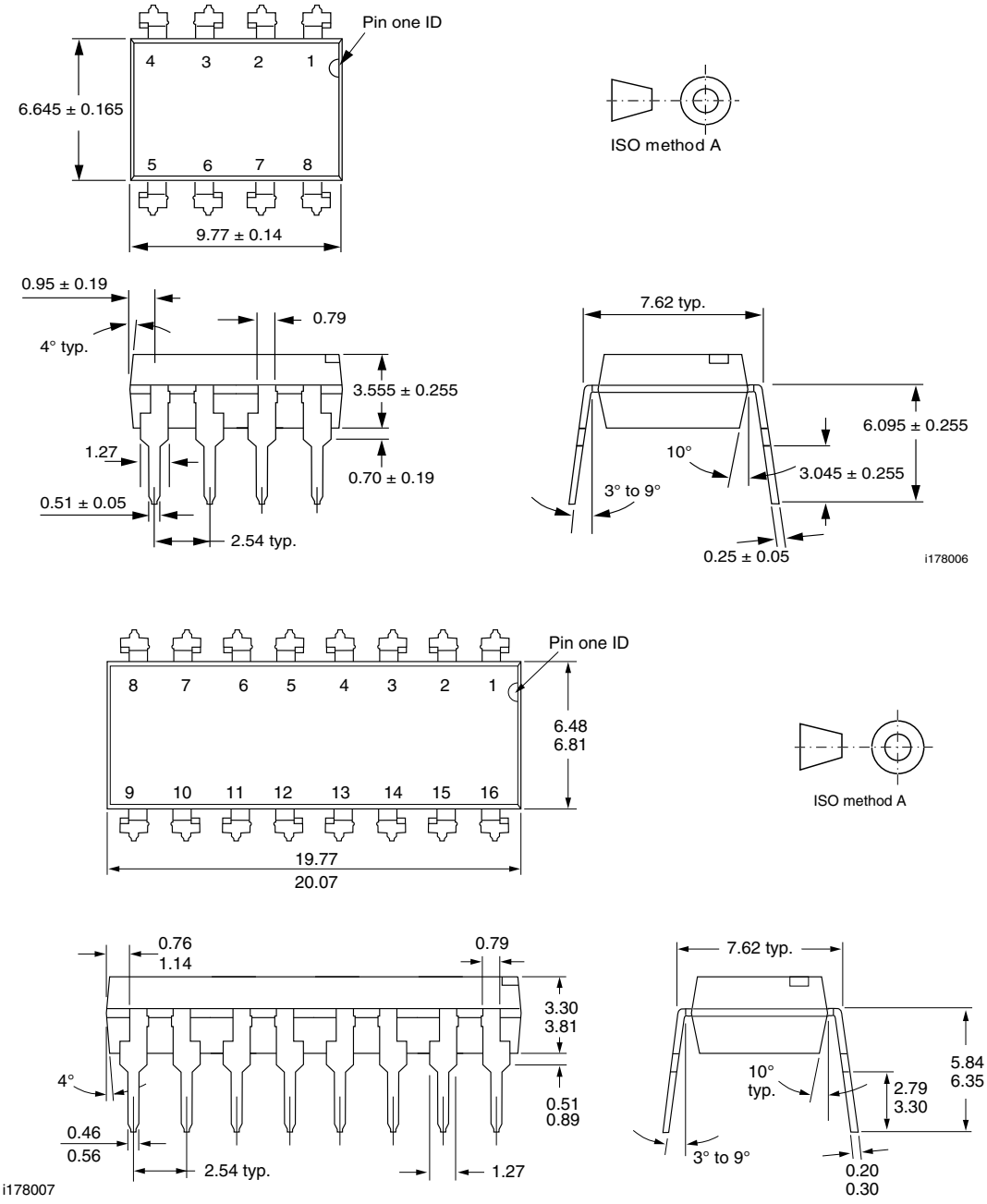
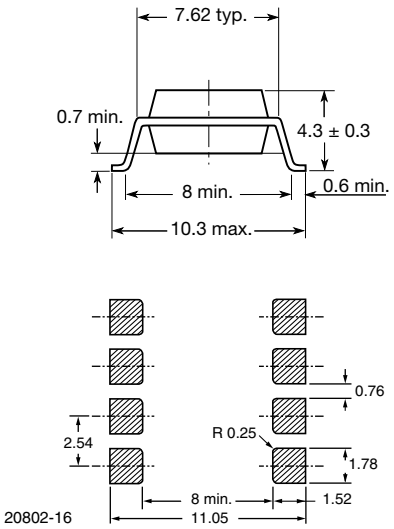


Fig. 17 - Maximum Collector Current vs. Collector Voltage

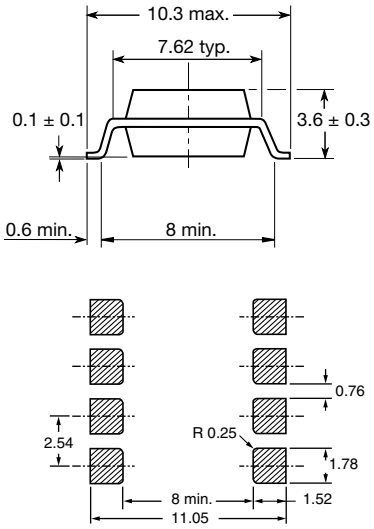
PACKAGE DIMENSIONS in millimeters



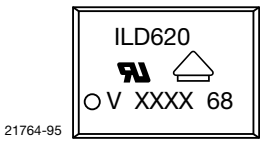
Option 7

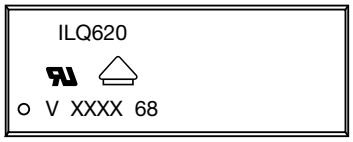


Option 9



PACKAGE MARKING (example)





Notes

- XXXX = LMC (lot marking code)
- Only option 1 and 7 reflected in the package marking
- The VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking

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