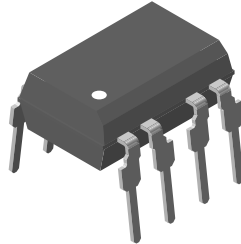


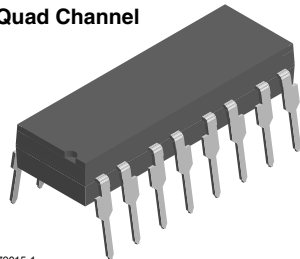


## Optocoupler, Phototransistor Output, (Dual, Quad Channel), 110 °C Rated

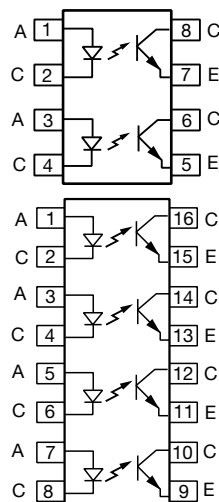
Dual Channel



Quad Channel



I179015-1



### DESCRIPTION

The ILD1615, ILQ1615 are multi-channel 110 °C rated phototransistor optocouplers that use GaAs IRLED emitters and high gain NPN phototransistors. These devices are constructed using over/under leadframe optical coupling and double molded insulation technology resulting a withstand test voltage of 7500 V<sub>AC</sub> PEAK and a working voltage of 1700 V<sub>RMS</sub>.

The binned min. / max. and linear CTR characteristics make these devices well suited for DC or AC voltage detection. Eliminating the phototransistor base connection provides added electrical noise immunity from the transients found in many industrial control environments.

Because of guaranteed maximum non-saturated and saturated switching characteristics, the ILD1615, ILQ1615 can be used in medium speed data I/O and control systems. The binned min. / max. CTR specification allow easy worst case interface calculations for both level detection and switching applications. Interfacing with a CMOS logic is enhanced by the guaranteed CTR at I<sub>F</sub> = 1.0 mA.

### FEATURES

- Operating temperature from -55 °C to +110 °C
- Identical channel to channel footprint
- Dual and quad packages feature:
  - Reduced board space
  - Lower pin and parts count
  - Better channel to channel CTR match
  - Improved common mode rejection
- Isolation test voltage, 5300 V<sub>RMS</sub>
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### AGENCY APPROVALS

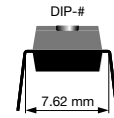
- [UL 1577](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884\)](#), available with option 1
- [FIMKO](#)

### LINKS TO ADDITIONAL RESOURCES


[Product Page](#)

**ORDERING INFORMATION**

I	L	x	1	6	1	5	-	4
PART NUMBER x = D (Dual) or Q (Quad)							CTR BIN	



AGENCY CERTIFIED / PACKAGE	DUAL CHANNEL	QUAD CHANNEL
	CTR (%)	
UL, cUL, FIMKO	160 to 320	160 to 320
DIP-8	ILD1615-4	-
DIP-16	-	ILQ1615-4

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Peak reverse voltage		$V_R$	6.0	V
Forward current		$I_F$	60	mA
Surge current		$I_{FSM}$	1.5	A
Power dissipation		$P_{diss}$	100	mW
Derate linearly from 25 °C			1.0	mW/°C
<b>OUTPUT</b>				
Collector emitter breakdown voltage		$BV_{CEO}$	70	V
Emitter collector breakdown voltage		$BV_{ECO}$	7.0	V
Collector current		$I_C$	50	mA
	$t < 1.0\text{ ms}$	$I_C$	100	mA
Power dissipation		$P_{diss}$	150	mW
Derate linearly from 25 °C			1.5	mW/°C
<b>COUPLER</b>				
Storage temperature		$T_{stg}$	-55 to +150	°C
Operating temperature		$T_{amb}$	-55 to +110	°C
Soldering temperature <sup>(1)</sup>	2.0 mm distance from case bottom	$T_{sld}$	260	°C
Package power dissipation ILD1615			400	mW
Derate linearly from 25 °C			5.33	mW/°C
Package power dissipation ILQ1615			500	mW
Derate linearly from 25 °C			6.67	mW/°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.

<sup>(1)</sup> Refer to wave profile for soldering conditions for through hole devices



<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 10\text{ mA}$	$V_F$	1.0	1.15	1.3	V
Breakdown voltage	$I_R = 10\text{ }\mu\text{A}$	$V_{BR}$	6.0	30	-	V
Reverse current	$V_R = 6.0\text{ V}$	$I_R$	-	0.01	10	$\mu\text{A}$
Capacitance	$V_R = 0\text{ V}$ , $f = 1.0\text{ MHz}$	$C_O$	-	25	-	pF
<b>OUTPUT</b>						
Collector emitter capacitance	$V_{CE} = 5.0\text{ V}$ , $f = 1.0\text{ MHz}$	$C_{CE}$	-	6.8	-	pF
Collector emitter leakage current	$V_{CE} = 10\text{ V}$	$I_{CEO}$	-	5.0	100	nA
Collector emitter breakdown voltage	$I_{CE} = 0.5\text{ mA}$	$BV_{CEO}$	70	-	-	V
Emitter collector breakdown voltage	$I_E = 0.1\text{ mA}$	$BV_{ECO}$	7.0	-	-	V
<b>PACKAGE TRANSFER CHARACTERISTICS</b>						
Channel/channel CTR match	$I_F = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$	CTR/CTRY	1 to 1	-	2 to 1	
<b>COUPLER</b>						
Capacitance (input to output)	$V_{IO} = 0\text{ V}$ , $f = 1.0\text{ MHz}$	$C_{IO}$	-	0.8	-	pF
Insulation resistance	$V_{IO} = 500\text{ V}$ , $T_A = 25\text{ }^{\circ}\text{C}$	$R_S$	$10^{12}$	$10^{14}$	-	$\Omega$
Channel to channel isolation			500	-	-	$V_{AC}$

**Note**

- Minimum and maximum values are tested requirements. 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.

<b>CURRENT TRANSFER RATIO</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio (collector emitter saturated)	$I_F = 1.0\text{ mA}$ , $V_{CE} = 0.4\text{ V}$	ILD1615-4	$CTR_{CEsat}$	-	100	-	%
		ILQ1615-4					
Current transfer ratio (collector emitter)	$I_F = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$	ILD1615-4	$CTR_{CE}$	160	200	320	%
		ILQ1615-4					
	$I_F = 1.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$	ILD1615-4	$CTR_{CE}$	56	90	-	%
		ILQ1615-4					

SWITCHING CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
NON-SATURATED						
Turn-on time	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 75 Ω, 50 % of V <sub>PP</sub>	t <sub>on</sub>	-	3.0	-	μs
Rise time	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 75 Ω, 50 % of V <sub>PP</sub>	t <sub>r</sub>	-	2.0	-	μs
Turn-off time	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 75 Ω, 50 % of V <sub>PP</sub>	t <sub>off</sub>	-	2.3	-	μs
Fall time	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 75 Ω, 50 % of V <sub>PP</sub>	t <sub>f</sub>	-	2.0	-	μs
Propagation H to L	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 75 Ω, 50 % of V <sub>PP</sub>	t <sub>PHL</sub>	-	1.1	-	μs
Propagation L to H	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 75 Ω, 50 % of V <sub>PP</sub>	t <sub>PLH</sub>	-	2.5	-	μs
SATURATED						
Turn-on time	I <sub>F</sub> = 5.0 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 1.0 kΩ, V <sub>HT</sub> = 1.5 V	t <sub>on</sub>	-	6.0	-	μs
Rise time	I <sub>F</sub> = 5.0 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 1.0 kΩ, V <sub>HT</sub> = 1.5 V	t <sub>r</sub>	-	4.6	-	μs
Turn-off time	I <sub>F</sub> = 5.0 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 1.0 kΩ, V <sub>HT</sub> = 1.5 V	t <sub>off</sub>	-	25	-	μs
Fall time	I <sub>F</sub> = 5.0 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 1.0 kΩ, V <sub>HT</sub> = 1.5 V	t <sub>f</sub>	-	15	-	μs
Propagation H to L	I <sub>F</sub> = 5.0 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 1.0 kΩ, V <sub>HT</sub> = 1.5 V	t <sub>PHL</sub>	-	5.4	-	μs
Propagation L to H	I <sub>F</sub> = 5.0 mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 1.0 kΩ, V <sub>HT</sub> = 1.5 V	t <sub>PLH</sub>	-	7.4	-	μs

**COMMON MODE TRANSIENT IMMUNITY** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Common mode rejection output high	$V_{CM} = 50\text{ V}_{P-P}$ , $R_L = 1.0\text{ k}\Omega$ , $I_F = 0\text{ mA}$	$CM_H$	-	5000	-	$\text{V}/\mu\text{s}$
Common mode rejection output low	$V_{CM} = 50\text{ V}_{P-P}$ , $R_L = 1.0\text{ k}\Omega$ , $I_F = 10\text{ mA}$	$CM_L$	-	5000	-	$\text{V}/\mu\text{s}$
Common mode coupling capacitance		$C_{CM}$	-	0.01	-	$\text{pF}$

**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	$t = 1\text{ min}$	$V_{ISO}$	4420	$\text{V}_{RMS}$
Maximum transient isolation voltage		$V_{IOTM}$	10 000	$\text{V}_{peak}$
Maximum repetitive peak isolation voltage		$V_{IORM}$	890	$\text{V}_{peak}$
Isolation resistance	$V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Output safety power		$P_{SO}$	400	$\text{mW}$
Input safety current		$I_{SI}$	275	$\text{mA}$
Safety temperature		$T_S$	175	$^{\circ}\text{C}$
Creepage distance			$\geq 7$	$\text{mm}$
Clearance distance			$\geq 7$	$\text{mm}$
Insulation thickness		DTI	$\geq 0.4$	$\text{mm}$

**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.

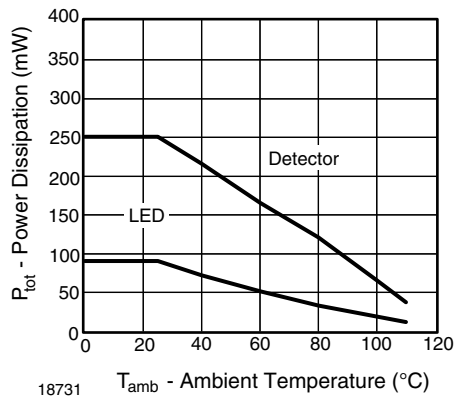
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

Fig. 1 - Permissible Power Dissipation vs. Temperature Non-Saturation Operation

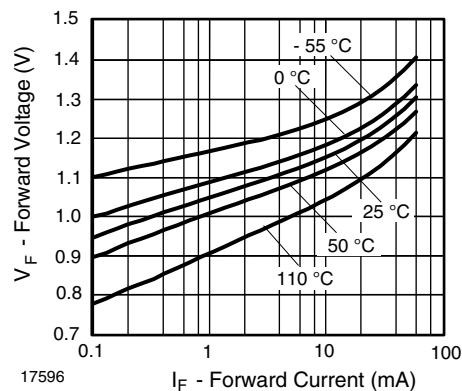


Fig. 2 - Forward Voltage vs. Forward Current

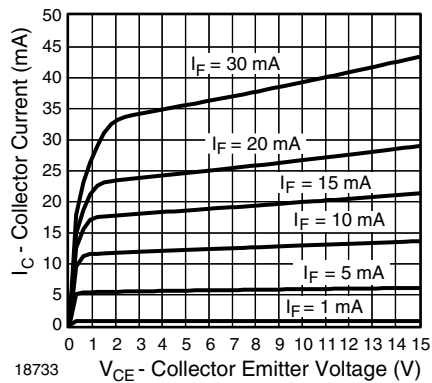


Fig. 3 - Collector Current vs. Collector Emitter Voltage

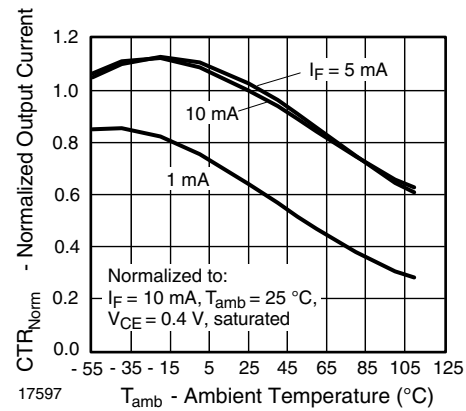


Fig. 6 - Normalized Current Transfer Ratio vs. Ambient Temperature

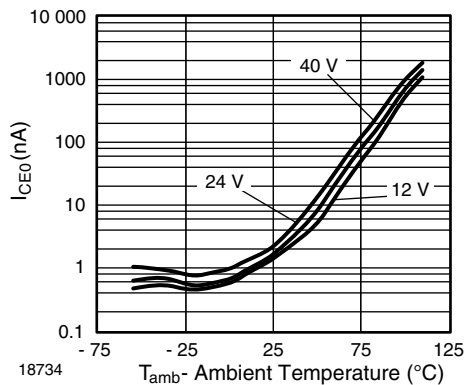


Fig. 4 - Collector to Emitter Dark Current vs. Ambient Temperature

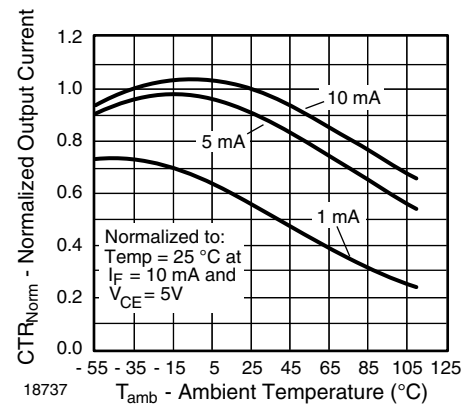


Fig. 7 - Normalized CTR vs. Temperature

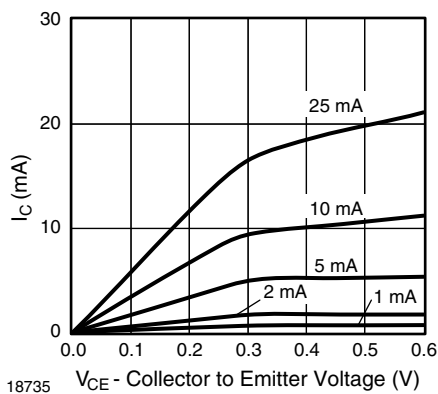


Fig. 5 - Normalized Current vs. Collector Emitter Saturation Voltage

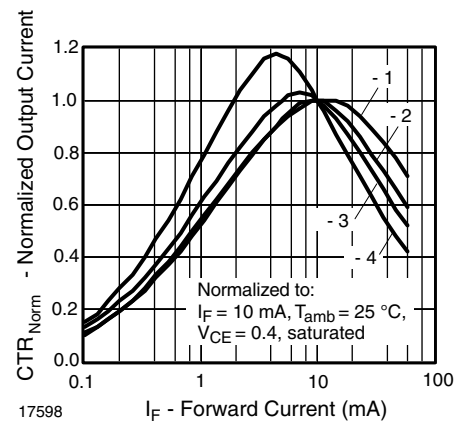


Fig. 8 - Normalized CTR vs. Forward Current

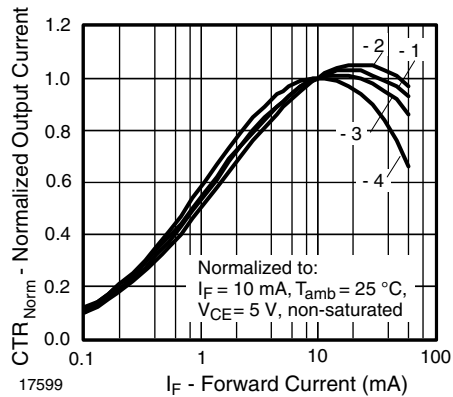


Fig. 9 - Normalized CTR vs. Forward Current

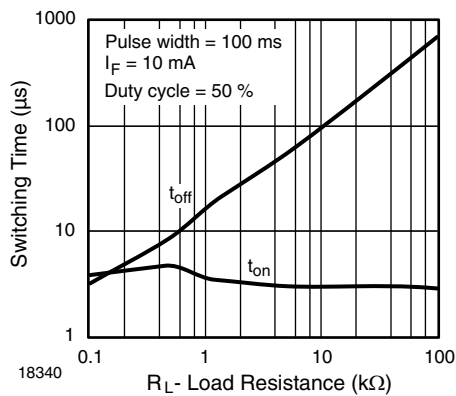


Fig. 10 - Forward Resistance vs. Forward Current

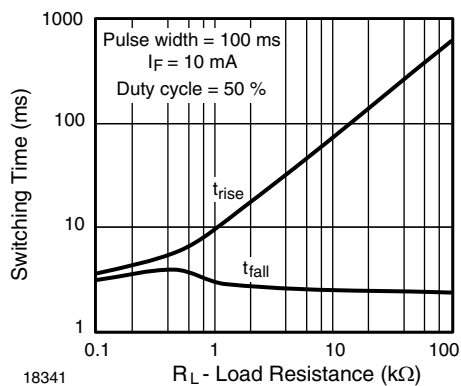
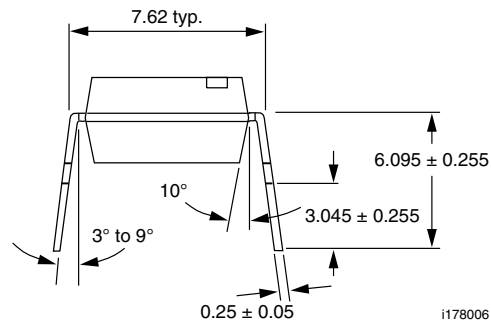
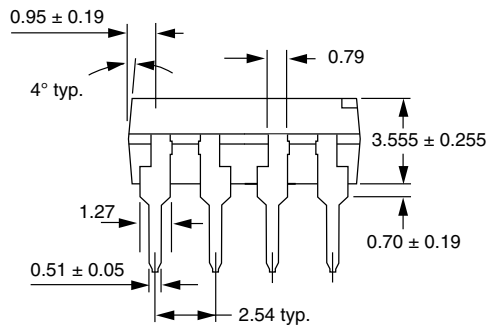
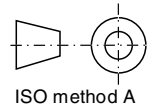
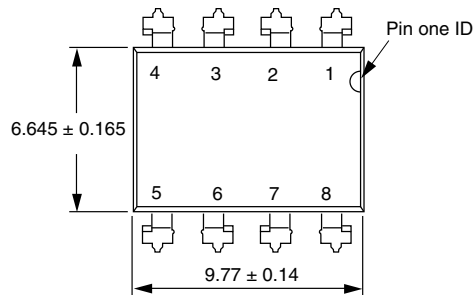
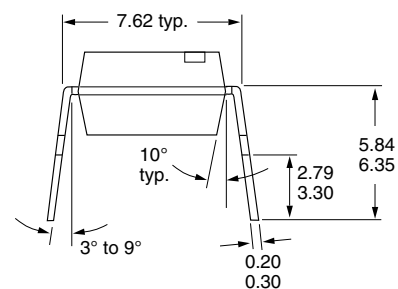
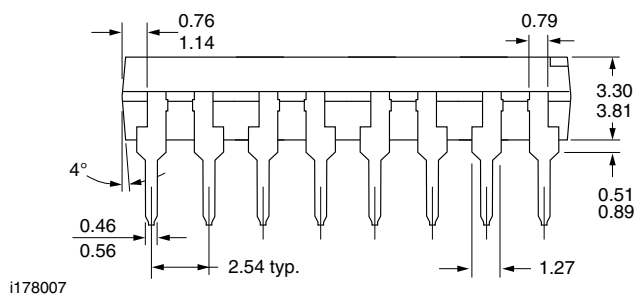
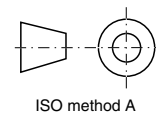
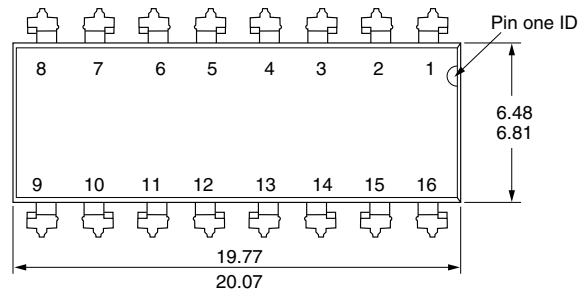


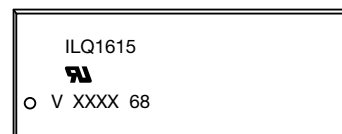
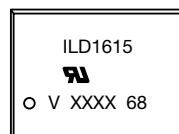
Fig. 11 - Forward Resistance vs. Forward Current


**PACKAGE DIMENSIONS** in millimeters


i178006



i178007

**PACKAGE MARKING**

**Note**

- XXXX = LMC (lot marking code)



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