



ABSOLUTE MAXIMUM RATINGS (T _{amb} = 25 °C, unless otherwise specified)					
PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
INPUT					
Reverse voltage			V _R	5	V
Forward current			I _F	25	mA
Average input current ⁽¹⁾			I _{f(avg)}	20	mA
Input power dissipation ⁽²⁾			P _{diss}	35	mW
OUTPUT					
Supply and output voltage	Pin 8 to 5, pin 6 to 5	6N138	V _{CC} , V _O	-0.5 to 7	V
	Pin 8 to 5, pin 6 to 5	6N139	V _{CC} , V _O	-0.5 to 18	V
Emitter base reverse voltage	Pin 5 to 7			0.5	V
Peak input current	50 % duty cycle - 1 ms pulse width			40	mA
Peak transient input current	t _p ≤ 1 μs, 300 pps			1	A
Output current	Pin 6		I _O	60	mA
Output power dissipation ⁽³⁾⁽⁴⁾			P _{diss}	100	mW
COUPLER					
Isolation test voltage	t = 1 min		V _{ISO}	5300	V _{RMS}
Isolation resistance	V _{IO} = 500 V, T _{amb} = 25 °C		R _{IO}	≥ 10 ¹²	Ω
	V _{IO} = 500 V, T _{amb} = 100 °C		R _{IO}	≥ 10 ¹¹	Ω
Storage temperature			T _{stg}	-55 to +150	°C
Operating temperature			T _{amb}	-55 to +100	°C
Lead soldering temperature ⁽⁵⁾	t = 10 s		T _{slid}	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.
- Derate linearly above 50 °C free-air temperature at a rate of 0.333 mA/°C.
- Derate linearly above 50 °C free-air temperature at a rate of 0.467 mW/°C.
- Derate linearly above 25 °C free-air temperature at a rate of 0.6 mA/°C.
- Derate linearly above 25 °C free-air temperature at a rate of 1 mW/°C.
- 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 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Input forward voltage	I _F = 1.6 mA		V _F		1.4	1.7	V
Input reverse breakdown voltage	I _R = 10 μA		B _{VR}	5			V
Temperature coefficient of forward voltage	I _F = 1.6 mA				-1.8		mV/°C
OUTPUT							
Logic low, output voltage ⁽¹⁾	I _F = 1.6 mA, I _O = 4.8 mA, V _{CC} = 4.5 V	6N138	V _{OL}		0.1	0.4	V
	I _F = 1.6 mA, I _O = 8 mA, V _{CC} = 4.5 V	6N139	V _{OL}		0.1	0.4	V
	I _F = 5 mA, I _O = 15 mA, V _{CC} = 4.5 V	6N139	V _{OL}		0.15	0.4	V
	I _F = 12 mA, I _O = 24 mA, V _{CC} = 4.5 V	6N139	V _{OL}		0.25	0.4	V
Logic high, output current ⁽¹⁾	I _F = 0 mA, V _{CC} = 7 V	6N138	I _{OH}		0.1	250	μA
	I _F = 0 mA, V _{CC} = 18 V	6N139	I _{OH}		0.05	100	μA
Logic low supply current ⁽¹⁾	I _F = 1.6 mA, V _O = OPEN, V _{CC} = 18 V		I _{CCL}		0.2	1.5	mA
Logic high supply current ⁽¹⁾	I _F = 0 mA, V _O = OPEN, V _{CC} = 18 V		I _{CCH}		0.001	10	μA



ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
COUPLER							
Input capacitance	$f = 1\text{ MHz}$, $V_F = 0$		C_{IN}		25		pF
Input output insulation leakage current ⁽²⁾	45 % relative humidity, $T_{amb} = 25\text{ }^{\circ}\text{C}$, $t = 5\text{ s}$, $V_{IO} = 3000\text{ V}_{DC}$					1	μA
Resistance (input to output) ⁽²⁾	$V = 500\text{ V}_{peak}$		R_{IO}		10^{12}		Ω
Capacitance (input to output) ⁽²⁾	$f = 1\text{ MHz}$		C_{IO}		0.6		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) Pin 7 open.

(2) Device considered a two-terminal device: pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7, and 8 shorted together.

CURRENT TRANSFER RATIO							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio ⁽¹⁾⁽²⁾	$I_F = 1.6\text{ mA}$, $V_O = 0.4\text{ V}$, $V_{CC} = 4.5\text{ V}$	6N138	CTR	300	1600		%
Current transfer ratio	$I_F = 0.5\text{ mA}$, $V_O = 0.4\text{ V}$, $V_{CC} = 4.5\text{ V}$	6N139	CTR	400	1600		%
	$I_F = 1.6\text{ mA}$, $V_O = 0.4\text{ V}$, $V_{CC} = 4.5\text{ V}$	6N139	CTR	500	2000		%

Notes(1) DC current transfer ratio is defined as the ratio of output collector current, I_O , to the forward LED input current, I_F times 100 %.

(2) Pin 7 open.

SAFETY AND INSULATION RATINGS							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
Climatic classification	according to IEC 68 part 1			55/100/21			
Comparative tracking index		CTI	175		399		
V_{IOTM}			8000			V	
V_{IORM}			890			V	
P_{SO}					500	mW	
I_{SI}					300	mA	
T_{SI}					175	$^{\circ}\text{C}$	
Creepage distance	Standard DIP-8		8			mm	
Clearance distance	Standard DIP-8		7			mm	
Creepage distance	400 mil DIP-8		8			mm	
Clearance distance	400 mil DIP-8		8			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.

SWITCHING CHARACTERISTICS							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Propagation delay time to logic low at output	$I_F = 1.6\text{ mA}$, $R_L = 2.2\text{ k}\Omega$	6N138	t_{PHL}		2	10	μs
Propagation delay time to logic low at output ⁽¹⁾⁽²⁾	$I_F = 0.5\text{ mA}$, $R_L = 4.7\text{ k}\Omega$	6N139	t_{PHL}		6	25	μs
	$I_F = 12\text{ mA}$, $R_L = 270\text{ }\Omega$	6N139	t_{PHL}		0.6	1	μs
Propagation delay time to logic high at output	$I_F = 1.6\text{ mA}$, $R_L = 2.2\text{ k}\Omega$	6N138	t_{PLH}		2	35	μs
	$I_F = 0.5\text{ mA}$, $R_L = 4.7\text{ k}\Omega$	6N139	t_{PLH}		4	60	μs
Propagation delay time to logic high at output ⁽¹⁾	$I_F = 12\text{ mA}$, $R_L = 270\text{ }\Omega$	6N139	t_{PLH}		1.5	7	μs

Note

(1) Using a resistor between pin 5 and 7 will decrease gain and delay time.

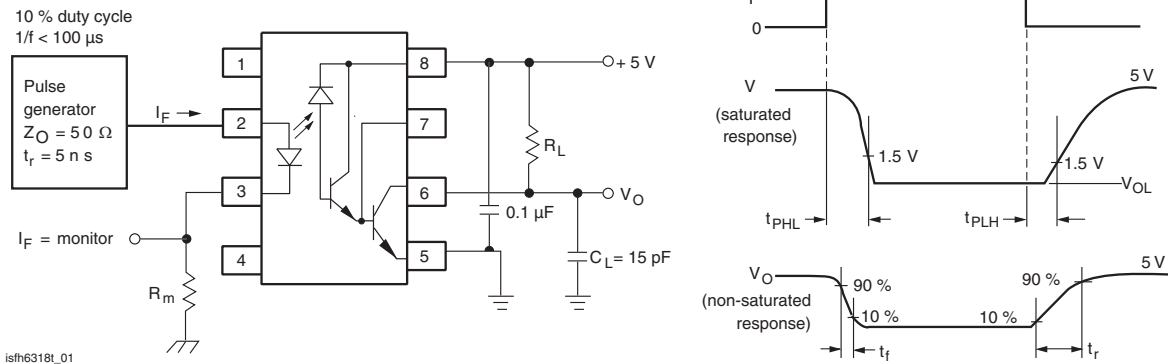


Fig. 1 - Switching Test Circuit

COMMON MODE TRANSIENT IMMUNITY							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Common mode transient immunity, logic high level output (1)(2)	$I_F = 0 \text{ mA}$, $R_L = 2.2 \text{ k}\Omega$, $R_{CC} = 0$, $ V_{CM} = 10 \text{ V}_{P-P}$		$ CM_H $		500		V/μs
Common mode transient immunity, logic low level output (1)(2)	$I_F = 16 \text{ mA}$, $R_L = 2.2 \text{ k}\Omega$, $R_{CC} = 0$, $ V_{CM} = 10 \text{ V}_{P-P}$		$ CM_L $		- 500		V/μs

Notes

- (1) Common mode transient immunity in logic high level is the maximum tolerable (positive) dV_{CM}/dt on the leading edge of the common mode pulse, V_{CM} , to assure that the output will remain in a logic high state (i.e. $V_O > 2 \text{ V}$) common mode transient immunity in logic low level is the maximum tolerable (negative) dV_{CM}/dt on the trailing edge of the common mode pulse signal, V_{CM} to assure that the output will remain in a logic low state (i.e. $V_O < 0.8 \text{ V}$).
- (2) In applications where dV/dt may exceed 50 000 V/μs (such as state discharge) a series resistor, R_{CC} should be included to protect I_C from destructively high surge currents. The recommend value is $R_{CC} \equiv [(1 \text{ V})/(0.15 I_F (\text{mA}))] \text{ k}\Omega$

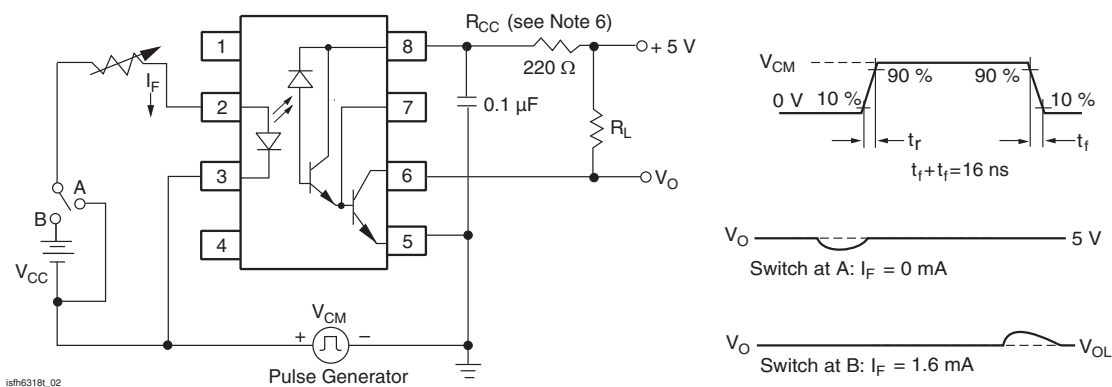


Fig. 2 - Test Circuit for Transient Immunity and Typical Waveforms

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

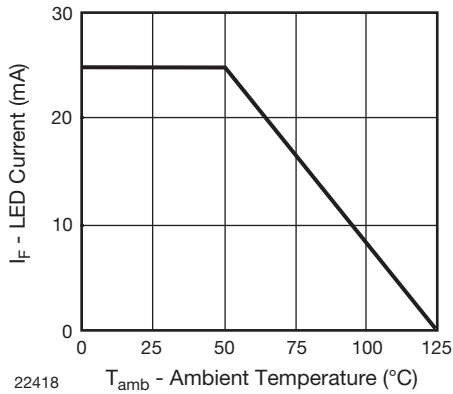


Fig. 3 - Permissible Forward LED Current vs. Temperature

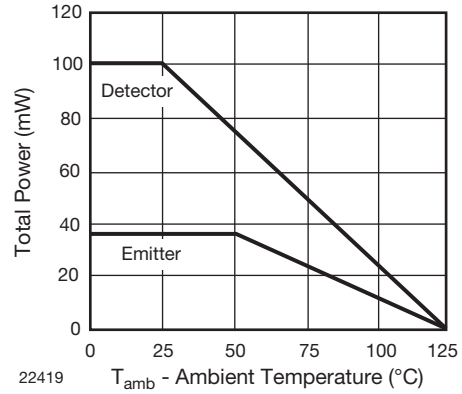
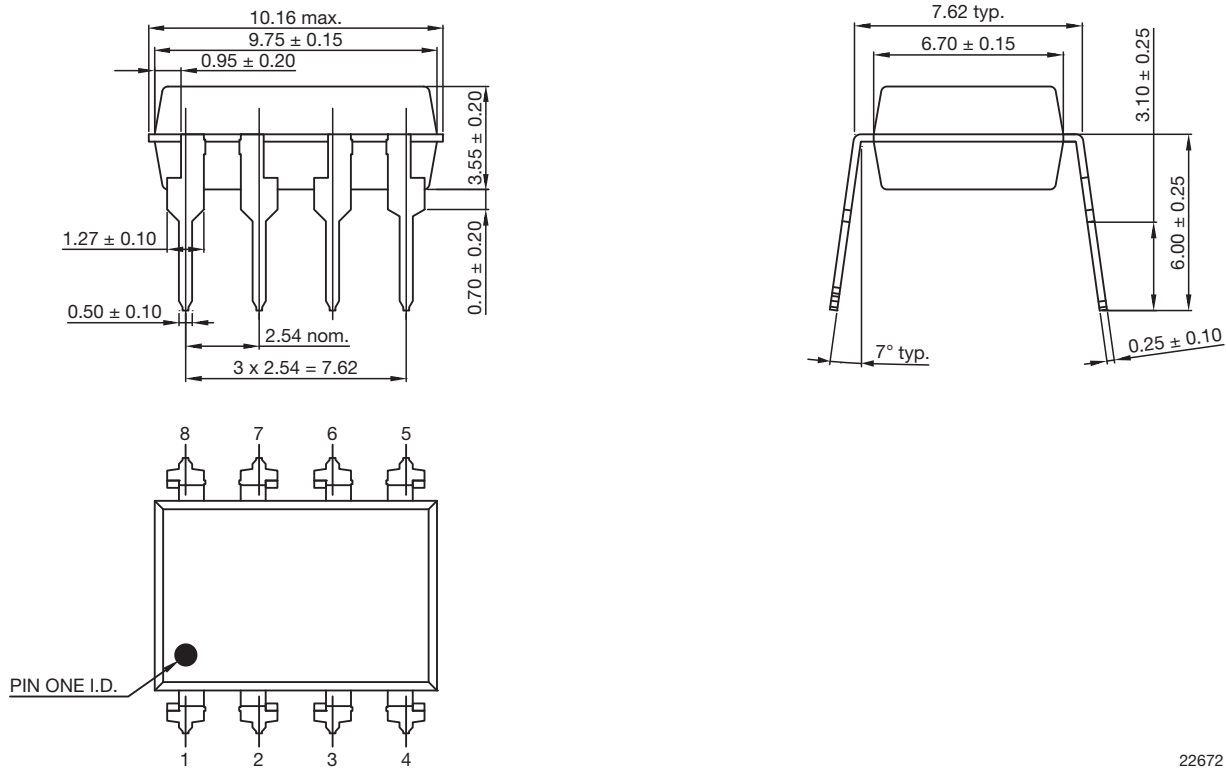


Fig. 4 - Permissible Power Dissipation vs. Temperature

PACKAGE DIMENSIONS in millimeters

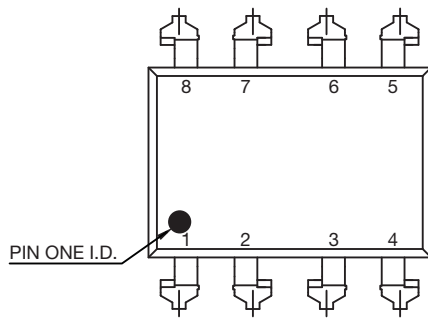
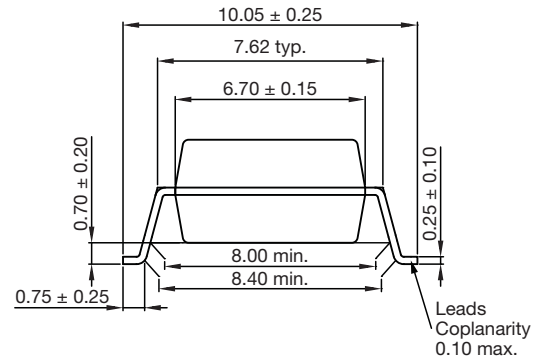
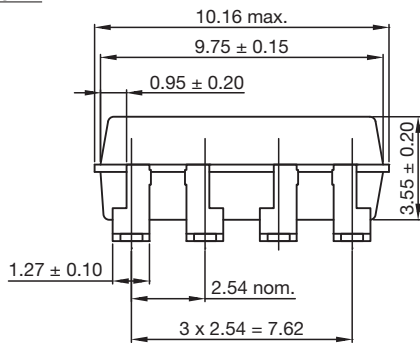
Standard



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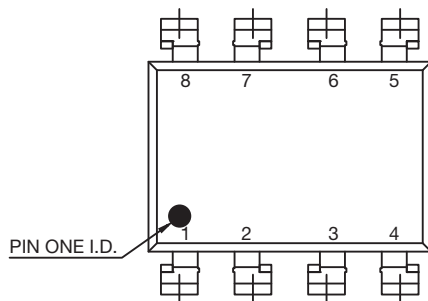
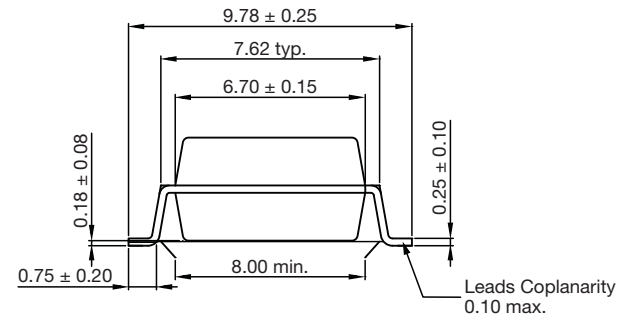
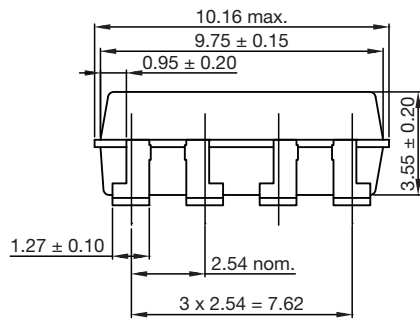


Option 7

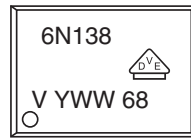


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Option 9



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PACKAGE MARKING (example)

Note

- Basic product marking only, refer to “Option Information” document (www.vishay.com/doc?83713) for option marking

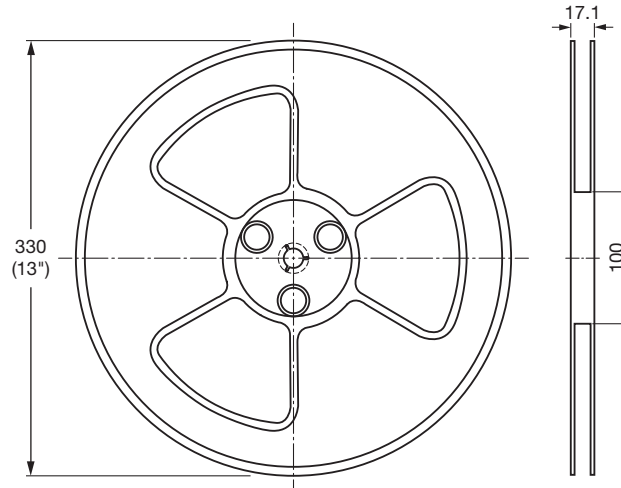
TAPE AND REEL DIMENSIONS in millimeters


Fig. 3 - Reel Dimensions (3000 units per reel)

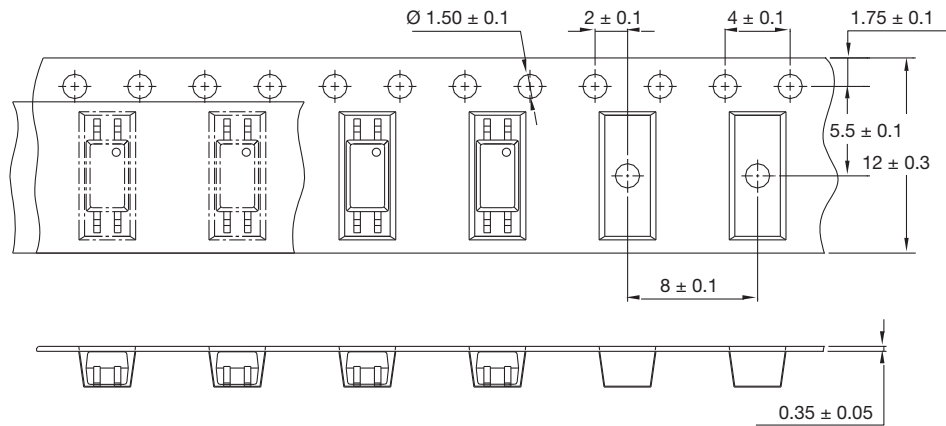


Fig. 4 - Tape Dimensions

SOLDER PROFILES

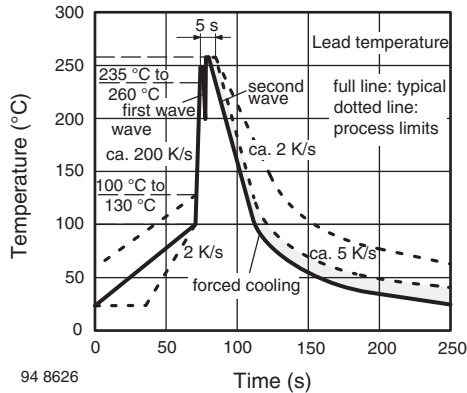


Fig. 5 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP-8 Devices

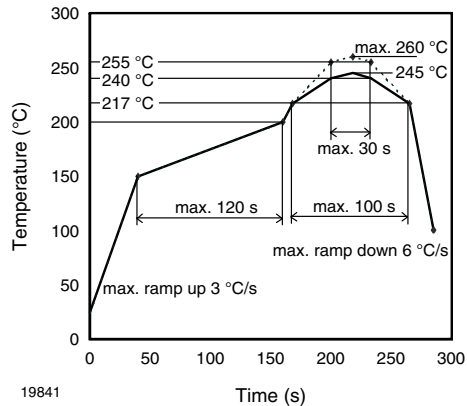


Fig. 6 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD-8 Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: $T_{amb} < 30\text{ °C}$, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



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