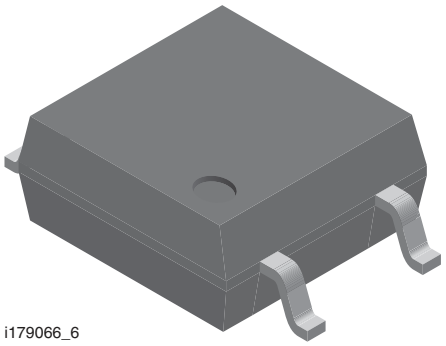
Automotive Photovoltaic MOSFET Driver With Integrated Fast Turn-Off



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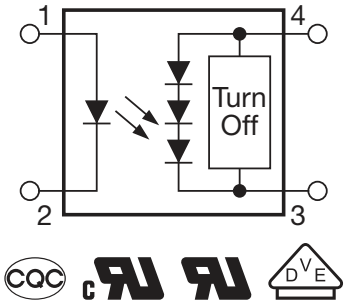
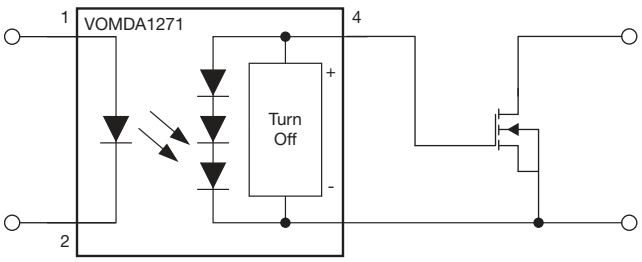




Single MOSFET Driver Application

DESCRIPTION

The VOMDA1271 is an automotive qualified optically isolated MOSFET driver. The VOMDA1271 obtains all the required current to drive its internal circuitry from the infrared emitter on the low voltage, primary side of the isolation barrier. No power supply is needed to provide V_{CC}. The VOMDA1271 features a turn-off circuit to achieve a fast turn off of the MOSFET.

FEATURES

- AEC-Q102 qualified
- Open circuit voltage of 8.5 V typical at I_F = 10 mA
- Short circuit current at 15 µA typical at I_F = 10 mA
- Isolation test voltage 3750 V_{RMS}
- Operating temperature from -40 °C to +125 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

APPLICATIONS

- Automotive pre-charge relay
- Powerwall chargers
- Gate driver for High Voltage MOSFETs
- BMS
- Custom solid-state relays

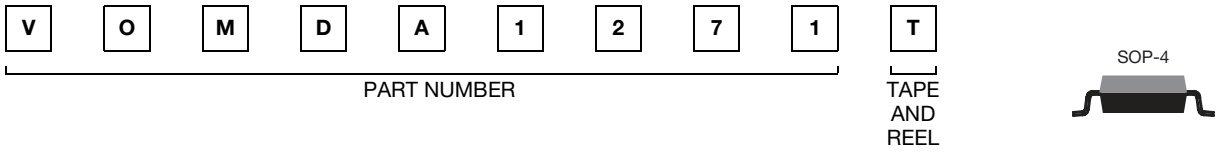
AGENCY APPROVALS

- UL (pending)
- cUL (pending)
- VDE (pending)
- CQC (pending)

LINKS TO ADDITIONAL RESOURCES

Product Page | Application Notes | 3D Models | SPICE Models | Ultra Librarian EDA / CAD | Design Tools

ORDERING INFORMATION



PACKAGE	UL, cUL, VDE, CQC
SOP-4	VOMDA1271T

Note

- The product is available only on tape and reel

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
LED continous forward current		I_F	50	mA
LED reverse voltage		V_R	5	V
Power dissipation		P_{diss}	80	mW
Power derating	T_{amb} > 80 °C	$\Delta P_D/\Delta T_{amb}$	-1.3	mW/°C
MOSFET DRIVER				
Power dissipation		P_{diss}	2	mW
Ambient operating temperature range		T_{amb}	-40 to +125	°C
Storage temperature range		T_{stg}	-40 to +150	°C
Pin soldering temperature	t = 10 s	T_{sld}	260	°C

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
LED forward voltage	I_F = 10 mA	V_F	1.3	1.4	1.5	V
Open circuit voltage	I_F = 5 mA	V_{OC}	-	8.2	-	V
	I_F = 10 mA	V_{OC}	6.5	8.5	-	V
	I_F = 20 mA	V_{OC}	-	8.8	-	V
Short circuit current	I_F = 5 mA	I_{SC}	-	7	-	µA
	I_F = 10 mA	I_{SC}	8	15	-	µA
	I_F = 20 mA	I_{SC}	-	35	-	µA

Note

- Minimum and maximum values are testing 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.

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

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	C_L = 200 pF, R_L = 10 MΩ , I_F = 20 mA, P_W = 2 ms, duty cycle = 50 %	t_{on}	-	32	-	µs
Turn-off time		t_{off}	-	80	-	µs

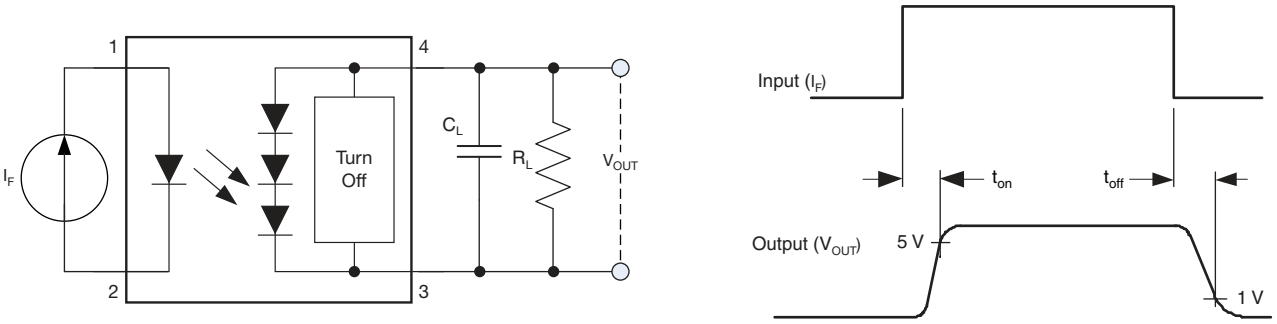


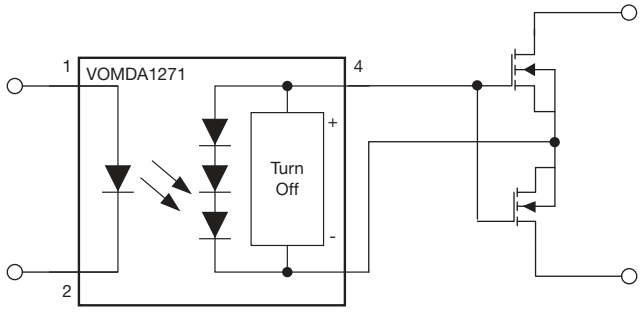
Fig. 1 - t_{on}, t_{off} Test Circuit and Waveforms

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		40 / 125 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	175	
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V_{ISO}	3750	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	6000	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	707	V_{peak}
Isolation resistance	T_{amb} = 125 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{12}	Ω
	T_{amb} = T_S, V_{IO} = 500 V	R_{IO}	≥ 10^{11}	Ω
Output safety power		P_{SO}	350	mW
Input safety current		I_{SI}	150	mA
Input safety temperature		T_S	175	°C
Creepage distance	SOP-4		≥ 5	mm
Clearance distance			≥ 5	mm
Input to output test voltage, method B	V_{IORM} × 1.875 = V_{PR}, 100 % production test with t_M = 1 s, partial discharge < 5 pC	V_{PR}	1326	V_{peak}
Input to output test voltage, method A	V_{IORM} × 1.6 = V_{PR}, 100 % production test with t_M = 10 s, partial discharge < 5 pC	V_{PR}	1131	V_{peak}

Note

- As per DIN EN 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.

APPLICATION EXAMPLES



Bidirectional MOSFET Driver Application

Fig. 2 - Typical MOSFET Driver Applications With Integrated Turn-Off Functionality

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

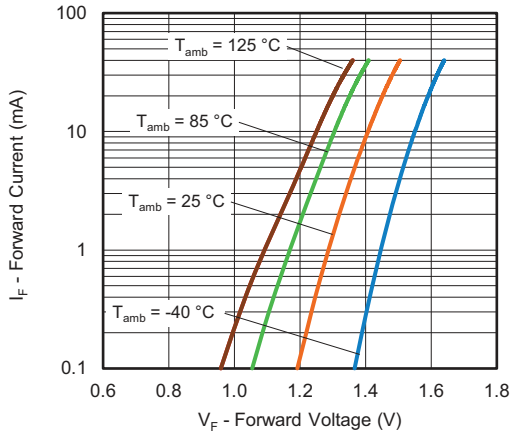


Fig. 3 - Forward Current vs. Forward Voltage

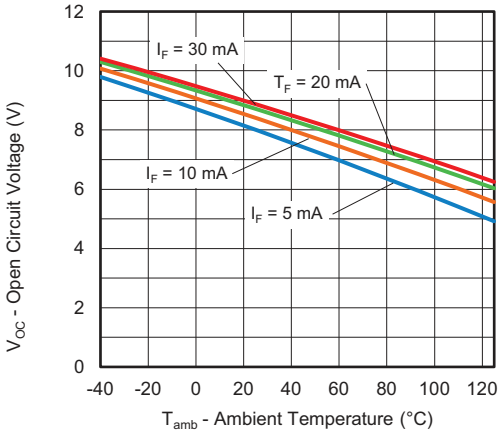


Fig. 5 - Open Circuit Voltage vs. Ambient Temperature

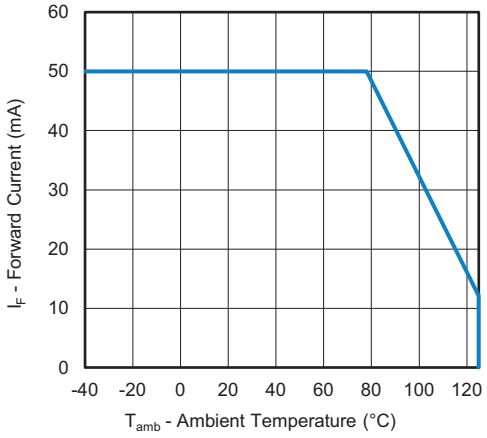


Fig. 4 - Forward Current vs. Ambient Temperature

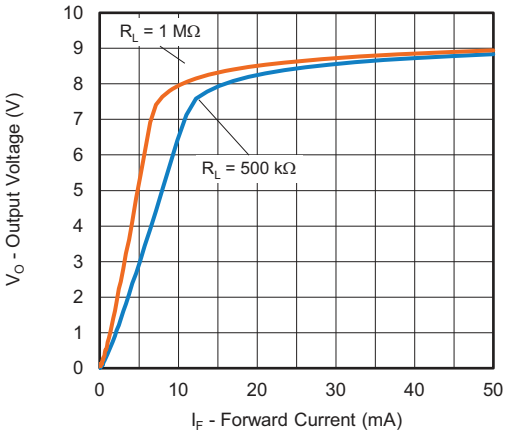


Fig. 6 - Output Voltage vs. Forward Current

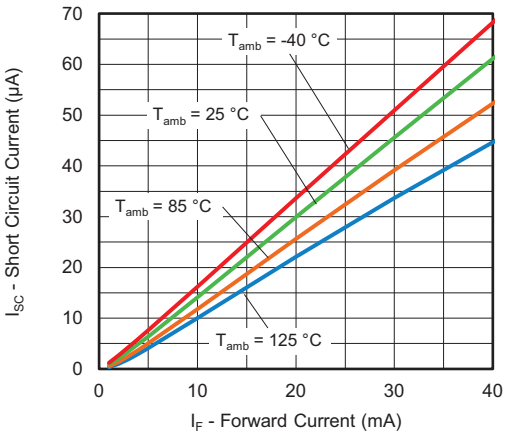


Fig. 7 - Short Circuit Current vs. Forward Current

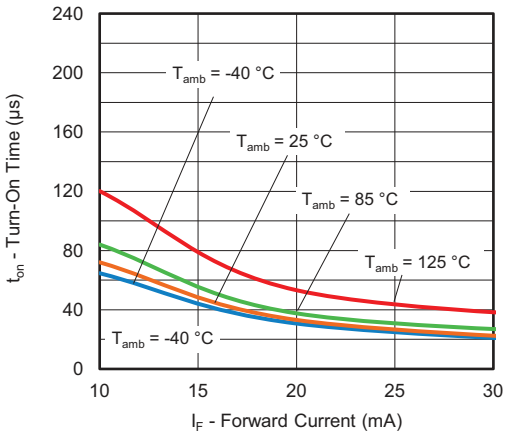


Fig. 10 - Turn-On Time vs. Forward Current

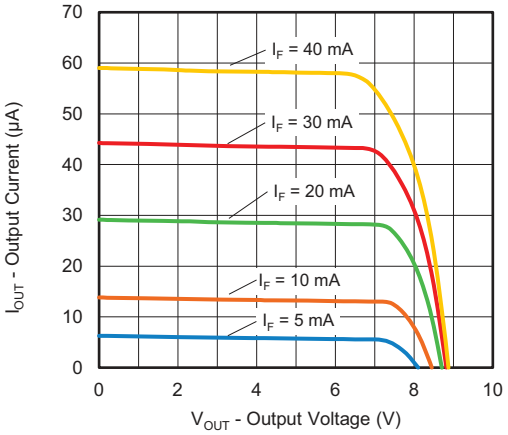


Fig. 8 - Output Current vs. Output Voltage

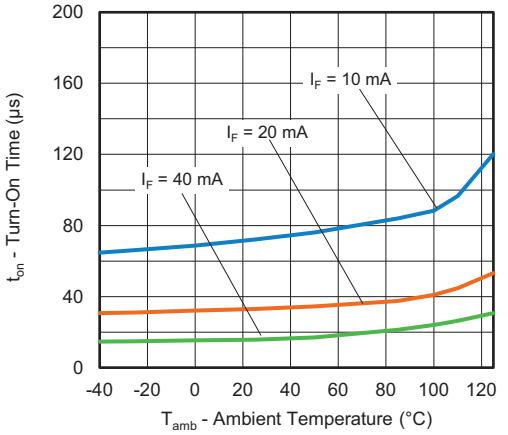


Fig. 11 - Turn-On Time vs. Ambient Temperature

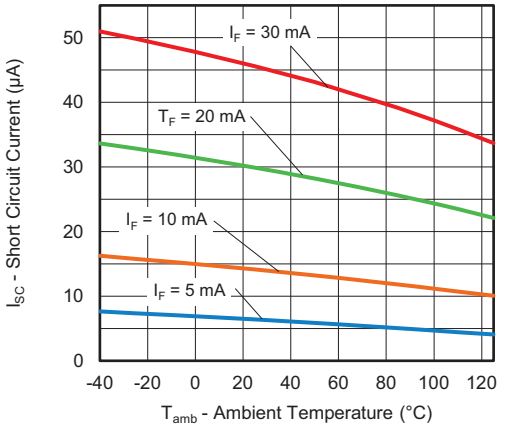


Fig. 9 - Short Circuit Current vs. Ambient Temperature

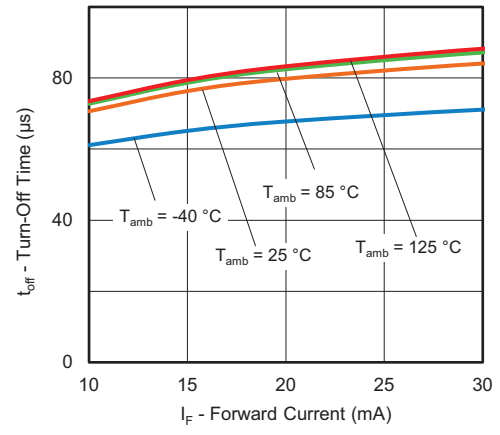


Fig. 12 - Turn-Off Time vs. Forward Current

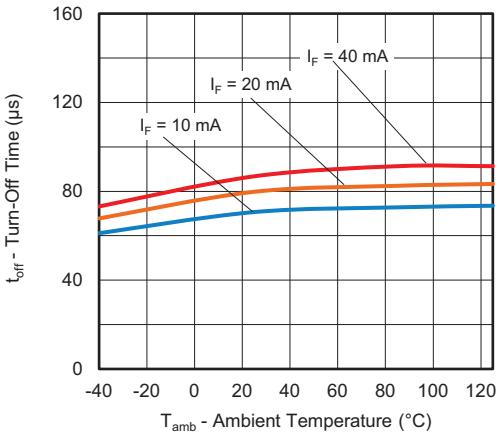


Fig. 13 - Turn-Off Time vs. Ambient Temperature

PACKAGE DIMENSIONS (in millimeters)

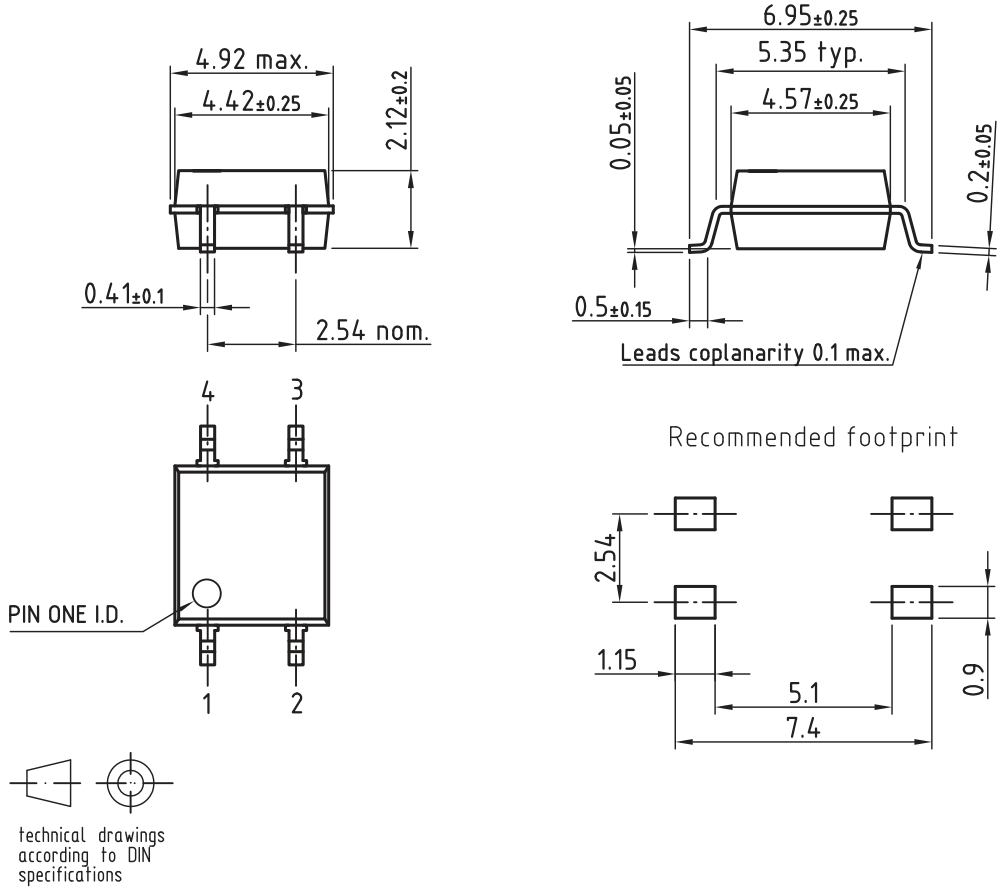


Fig. 14 - Package Drawing

PACKAGE MARKING

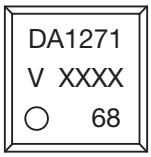


Fig. 15 - VOMDA1271

Notes
- XXXX = LMC (lot marking code)
- Package configuration (T, M) are not part of the package marking

TAPE AND REEL PACKAGING

Dimensions in millimeters

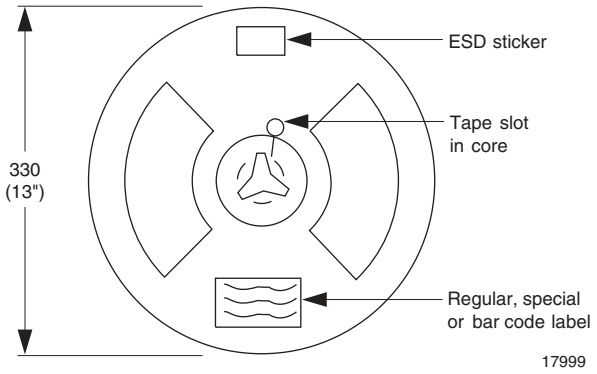
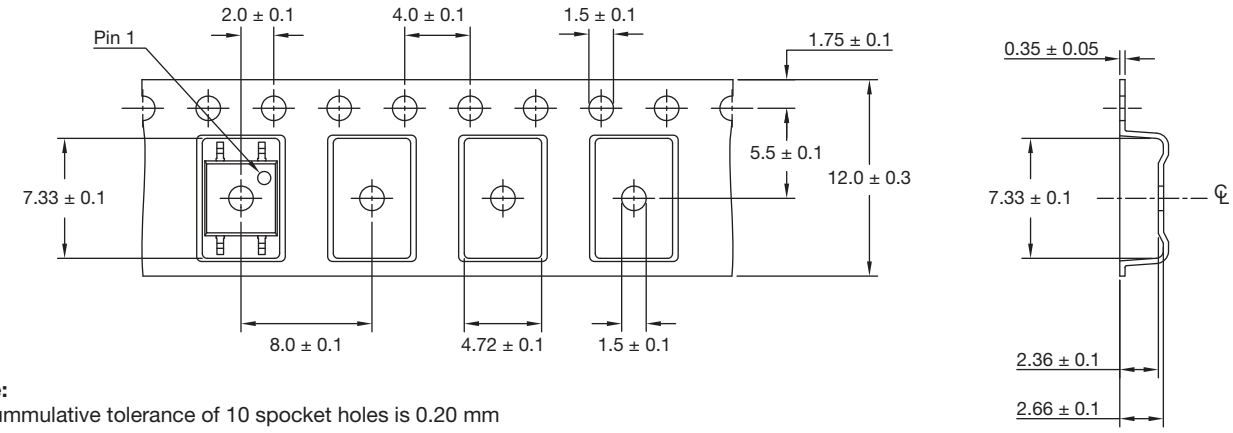


Fig. 16 - Tape and Reel Shipping Medium
(EIA-481, revision A, and IEC 60286), 2000 units per reel



Note:
- Cummulative tolerance of 10 spocket holes is 0.20 mm

Fig. 17 - Tape and Reel Packing (2000 pieces on reel)

SOLDER PROFILES

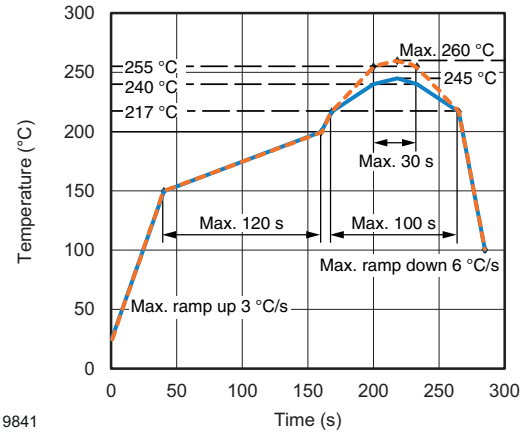


Fig. 18 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: 168 h

Conditions: T_{amb} < 30 °C, RH ≤ 60 %

Moisture sensitivity level 3, according to J-STD-020

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