

2N7002KDW6

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2N7002KDW6

0.2A 60V Dual N-Channel Enhancement Mode MOSFET ESD Protection

Features

- $V_{DS}=60V$, $I_D=0.2A$.
- $R_{DS(on)} \leq 2.3\Omega$ @ $V_{GS}=10V$, $I_D=0.3A$.
- $R_{DS(on)} \leq 2.87\Omega$ @ $V_{GS}=4.5V$, $I_D=0.2A$.
- Advanced trench technology.
- Excellent on-resistance and low gate charge.
- ESD protected:2kV.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex.2N7002KDW6-H.

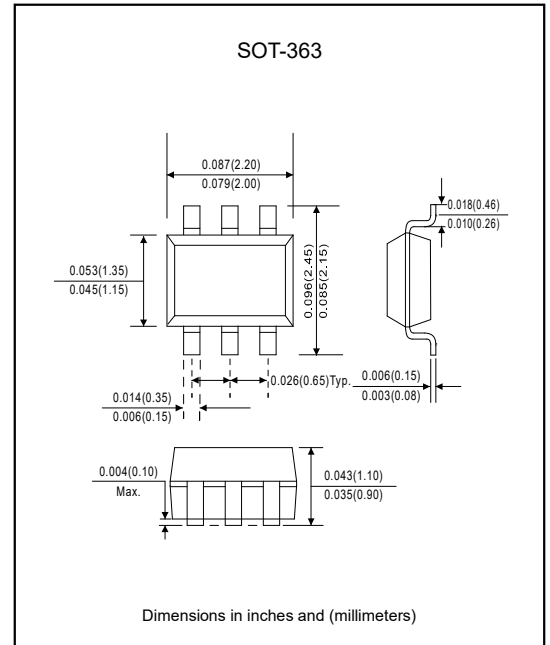
Applications

- Battery operated systems.
- Direct logic-level interface: TTL/CMOS.
- Solid-state relays.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-363.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.

Package outline



Maximum ratings ($T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Ratings	Unit
Drain-source voltage	V_{DS}	60	V
Gate-source voltage	V_{GS}	± 20	V
Continuous drain current ($T_c=25^\circ C$) ($T_c=100^\circ C$)	I_D	0.2	A
		0.13	
Pulsed drain current (Note1)	I_{DM}	0.8	A
Power dissipation ($T_c=25^\circ C$)	P_D	0.38	W
Thermal resistance, junction-ambient (Note2)	$R_{\theta JA}$	328	$^\circ C/W$
Operating Junction temperature range	T_J	+150	$^\circ C$
Storage temperature range	T_{STG}	-55 to +150	$^\circ C$

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Electrical characteristics (At $T_J=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	60			V
Drain-source leakage current	I_{DSS}	$V_{DS}=60\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate-source leakage current	I_{GSS}	$V_{GS}=\pm 20\text{V}$, $V_{DS}=0\text{V}$			± 10	μA

On characteristics

Gate threshold voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1	1.6	2.5	V
Static drain-source on-resistance (Note 3)	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=300\text{mA}$		1.8	2.3	Ω
		$V_{GS}=4.5\text{V}$, $I_D=200\text{mA}$		2.1	2.87	

Dynamic Parameters

Input capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		28		pF
Output capacitance	C_{oss}			11		
Reverse transfer capacitance	C_{rss}			4		

Switching parameters

Total gate charge	Q_g	$V_{GS}=0$ to 4.5V , $V_{DS}=10\text{V}$, $I_D=0.3\text{A}$		1.7		nC
Gate to source charge	Q_{gs}			0.3		
Gate to drain charge	Q_{gd}			0.6		
Turn-on delay time	$t_{d(on)}$	$V_{DD}=10\text{V}$, $V_{GS}=10\text{V}$, $I_D=0.2\text{A}$, $R_G=10\Omega$		2		ns
Rise time	t_r			15		
Turn-off delay time	$t_{d(off)}$			7		
Reverse recovery time	t_f			20		

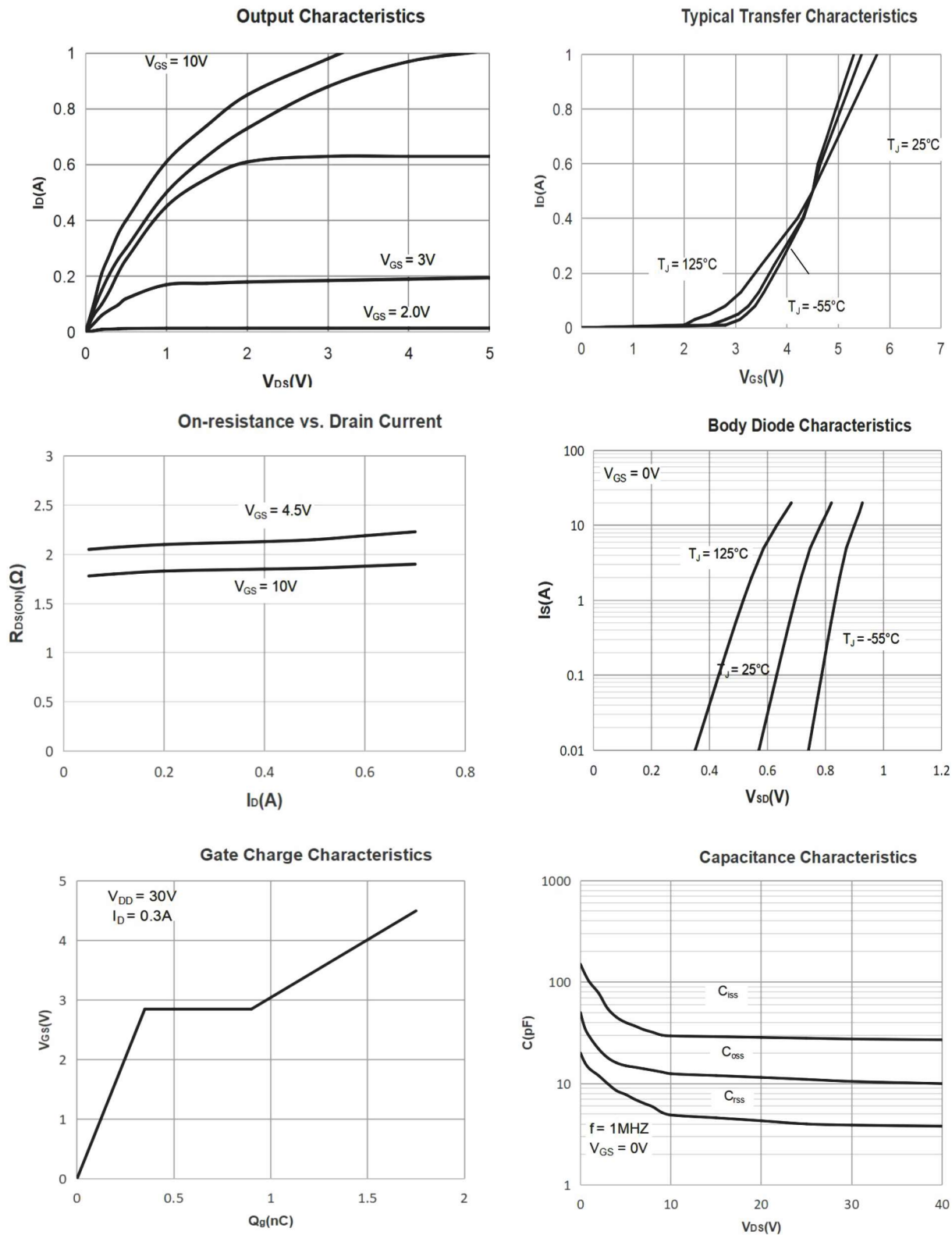
Source-drain diode ratings and characteristics

Drain-source diode forward voltage	V_{SD}	$I_S=0.2\text{A}$, $V_{GS}=0\text{V}$			1.2	V
Maximum continuous drain-source diode forward current	I_S				0.2	A
Maximum pulsed drain-source diode forward current	I_{SM}				0.8	A

Note : 1. Repetitive rating: pulse width limited by maximum junction temperature.
2. $R_{\theta JA}$ is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB.
3. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 0.5\%$.

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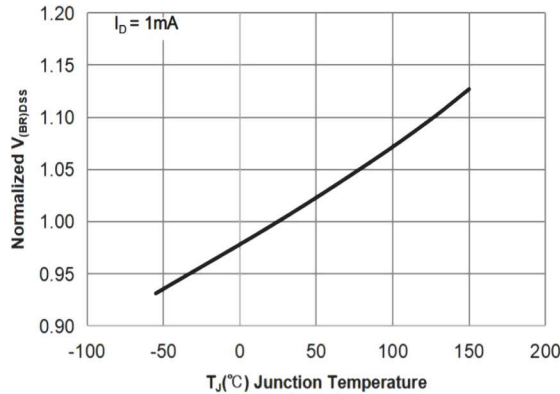
Rating and characteristic curves



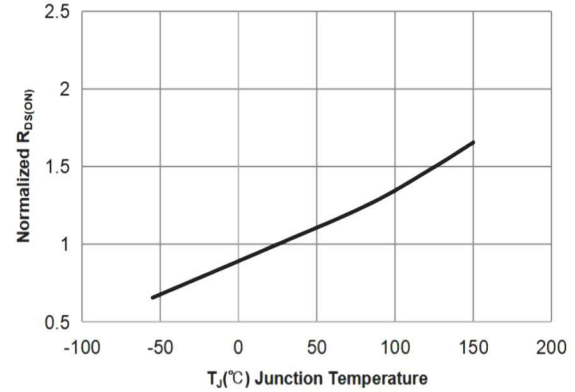
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Rating and characteristic curves

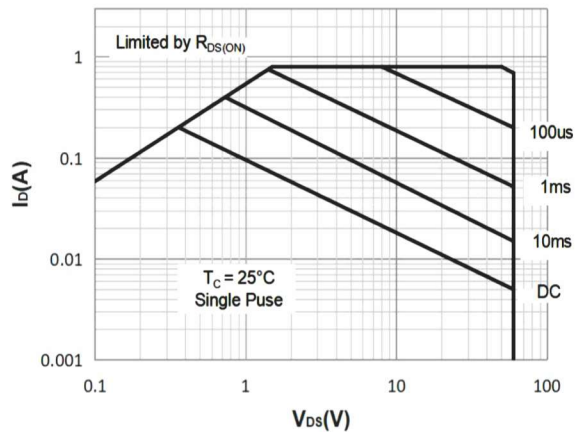
Normalized Breakdown voltage vs. Junction Temperature



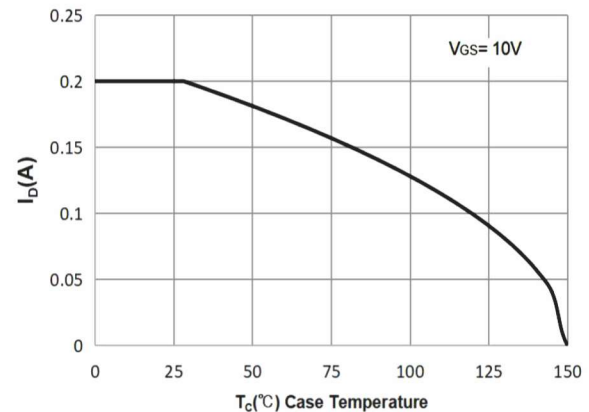
Normalized on Resistance vs. Junction Temperature



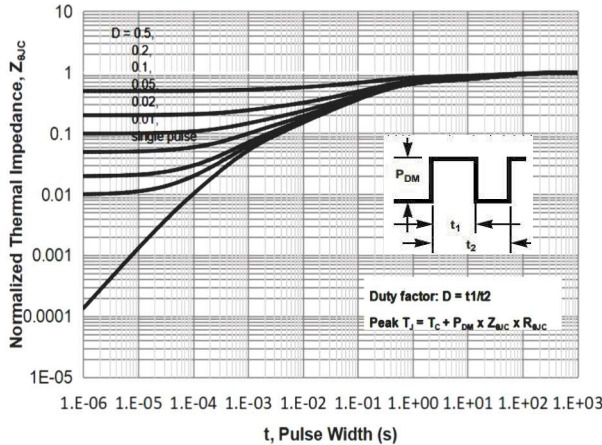
Maximum Safe Operating Area



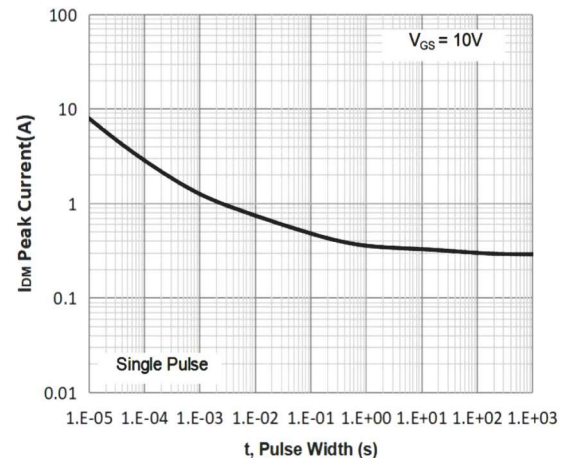
Maximum Continuous Driant Current vs. Case Temperature



Normalized Maximum Transient Thermal Impedance

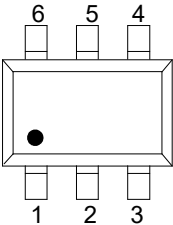
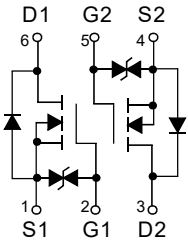


Peak Current Capacity



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Pinning information

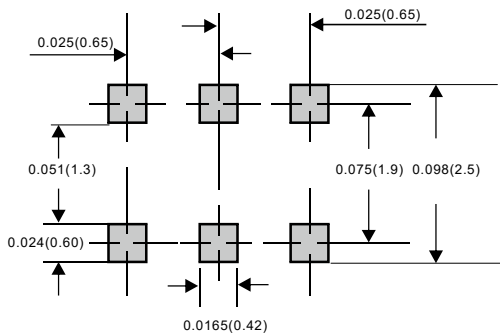
Pin	Simplified outline	Symbol
Pin1 Source1 Pin2 Gate1 Pin3 Drain2 Pin4 Source2 Pin5 Gate2 Pin6 Drain1		

Marking

Type Number	Marking Code
2N7002KDW6	72K

Suggested solder pad layout

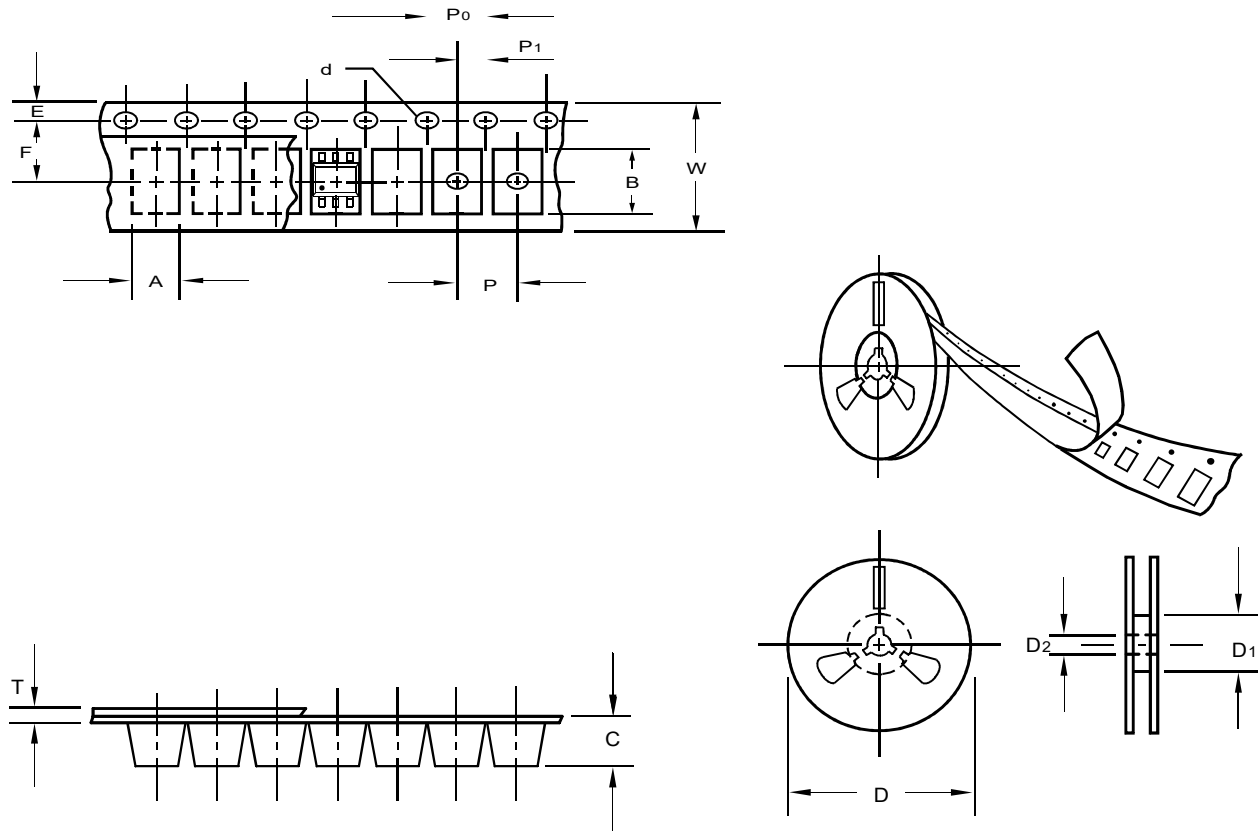
SOT-363



Dimensions in inches and (millimeters)

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Packing information



unit:mm

Item	Symbol	Tolerance	SOT-363
Carrier width	A	0.1	2.36
Carrier length	B	0.1	2.40
Carrier depth	C	0.1	1.20
Sprocket hole	d	0.1	1.50
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D1	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D1	min	62.00
Feed hole diameter	D2	0.5	13.00
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.1	3.50
Punch hole pitch	P	0.1	4.00
Sprocket hole pitch	P0	0.1	4.00
Embossment center	P1	0.1	2.00
Overall tape thickness	T	0.1	0.23
Tape width	W	0.3	8.00
Reel width	W1	1.0	11.40

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

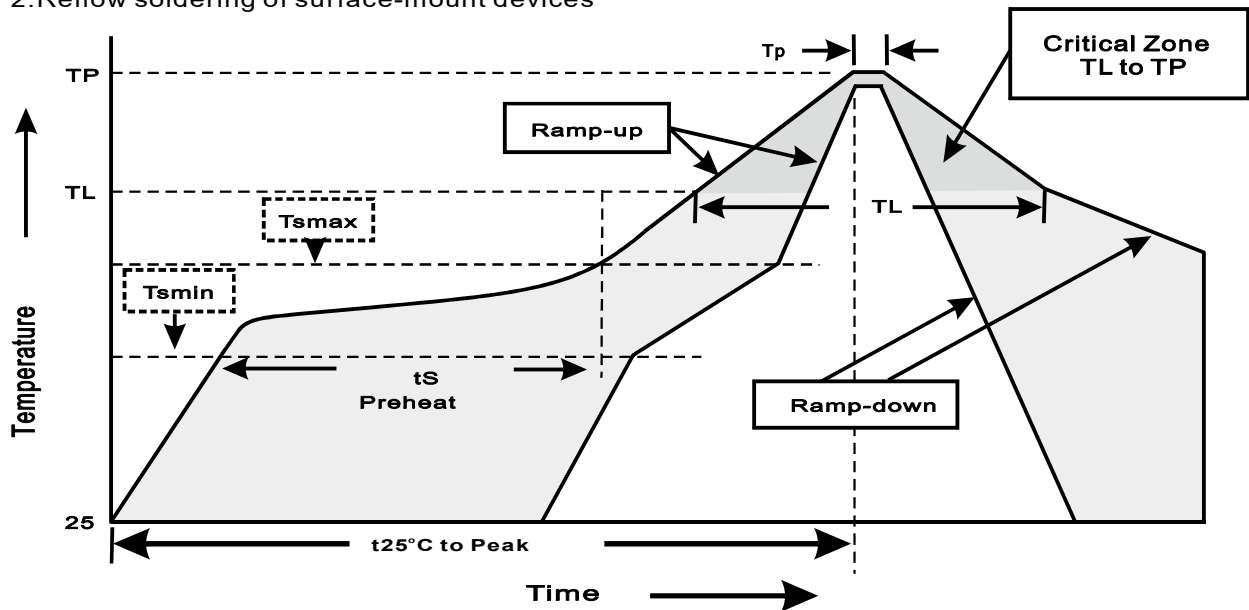
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Reel packing

PACKAGE	REEL SIZE	REEL (pcs)	COMPONENT SPACING (m/m)	BOX (pcs)	INNER BOX (m/m)	REEL DIA, (m/m)	CARTON SIZE (m/m)	CARTON (pcs)
SOT-363	7"	3,000	4.0	30,000	183*123*183	178	382*257*387	240,000

Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



3.Reflow soldering

Profile Feature	Soldering Condition
Average ramp-up rate(T_L to T_P)	<3°C/sec
Preheat -Temperature Min(T_{smin}) -Temperature Max(T_{smax}) -Time(min to max)(t_s)	150°C 200°C 60~120sec
T_{smax} to T_L -Ramp-upRate	<3°C/sec
Time maintained above: -Temperature(T_L) -Time(t_L)	217°C 60~260sec
Peak Temperature(T_P)	255°C-0/+5°C
Time within 5°C of actual Peak Temperature(t_P)	10~30sec
Ramp-down Rate	<6°C/sec
Time 25°C to Peak Temperature	<6minutes