

2N7002KV-H

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2N7002KV-H

340mA 60V Dual N-Channel Enhancement Mode MOSFET ESD Protection

Features

- $V_{DS}=60V$, $I_D=340mA$.
- $R_{DS(ON)} \leq 5.3\Omega$, @ $V_{GS}=4.5V$, $I_D=200mA$.
- $R_{DS(ON)} \leq 5.0\Omega$, @ $V_{GS}=10V$, $I_D=500mA$.
- High density cell design for low on-resistance.
- High saturation current capability.
- Voltage controlled small signal switch.
- Rugged and reliable.
- ESD protected: 1.5KV.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

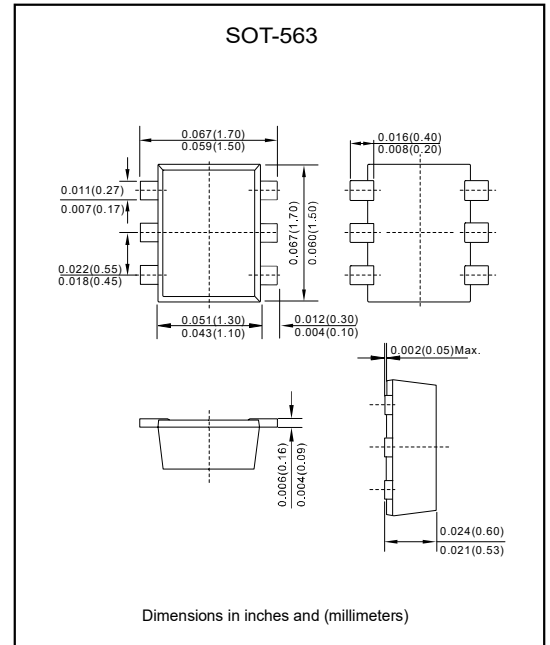
Application

- Load switch for portable devices.
- DC/DC converter.

Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-563.
- Terminals : Solder plated, solder able per MIL-STD-750, Method 2026.
- Mounting position : Any.

Package outline



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

Parameter	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	60	V
Gate-source voltage	V_{GS}	± 20	V
Continuous drain current	I_D	340	mA
Pulsed drain current (note1)	I_{DM}	800	mA
Power dissipation	P_D	0.2	W
Thermal resistance, junction to ambient	$R_{\theta JA}$	625	$^\circ C/W$
Junction temperature	T_J	-55 to +150	$^\circ C$
Storage temperature range	T_{STG}	-55 to +150	$^\circ C$

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Electrical characteristics (At $T_A=25^{\circ}\text{C}$ 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}	$V_{DS}=48\text{V}$, $V_{GS}=0\text{V}$			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 (Note2)	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=1\text{mA}$	1.0	1.3	2.5	V
Static drain-source on-state resistance (Note2)	$R_{DS(ON)}$	$V_{GS}=4.5\text{V}$, $I_D=200\text{mA}$		2.3	5.3	Ω
		$V_{GS}=10\text{V}$, $I_D=500\text{mA}$		1.5	5.0	

Dynamic parameters (Note3)

Input capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=10\text{V}$, $f=1.0\text{MHz}$			40	pF
Out capacitance	C_{oss}				30	
Reverse transfer capacitance	C_{rss}				10	

Switching parameters (Note3)

Turn-on delay time	$t_{d(on)}$	$V_{DD}=50\text{V}$, $V_{GS}=10\text{V}$, $R_L=250\Omega$, $R_G=50\Omega$, $R_{GS}=50\Omega$			10	ns
Turn-off delay time	$t_{d(off)}$				15	ns

Source-drain diode ratings and characteristics

Diode forward voltage (Note2)	V_{SD}	$I_S=300\text{mA}$, $V_{GS}=0\text{V}$			1.5	V
Continuous diode forward current	I_S				0.2	A
Pulse diode forward current (Note1)	I_{SM}				0.53	A
Reverse recovery time (Note3)	t_{rr}	$V_{GS}=0\text{V}$, $I_S=300\text{mA}$, $V_R=25\text{V}$, $dI_S/dt=-100\text{A}/\mu\text{s}$		30		nS
Reverse recovery charge (Note3)	Q_{rr}			30		nC

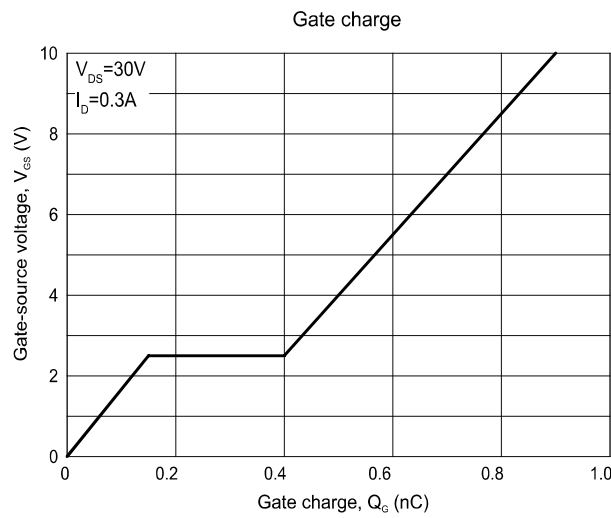
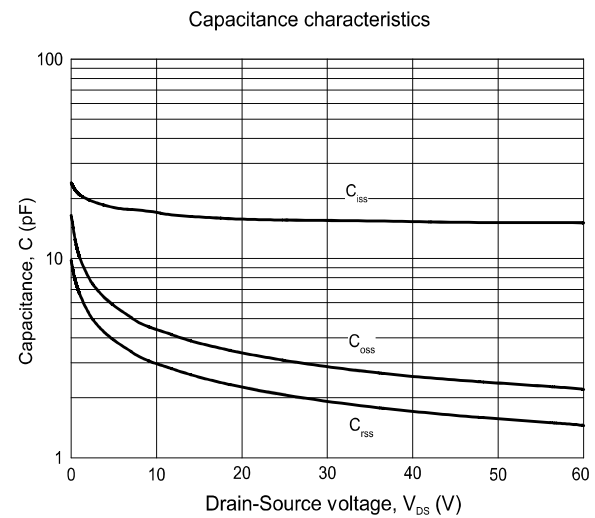
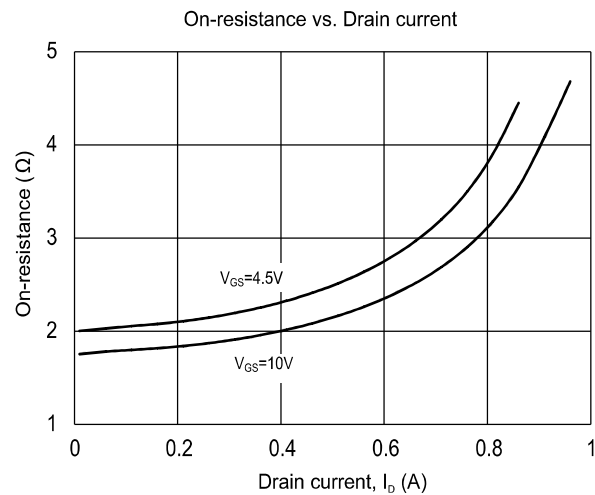
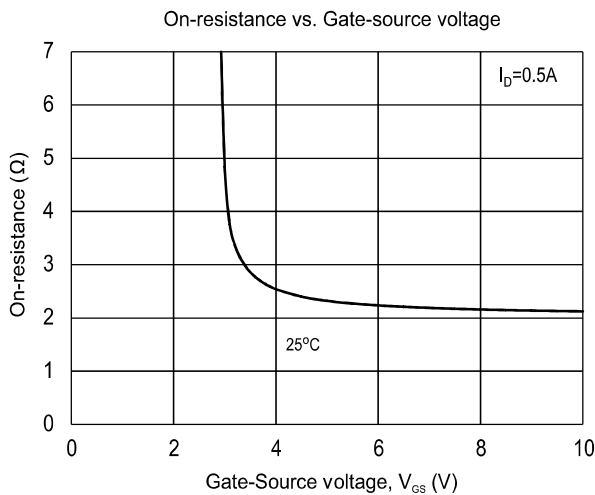
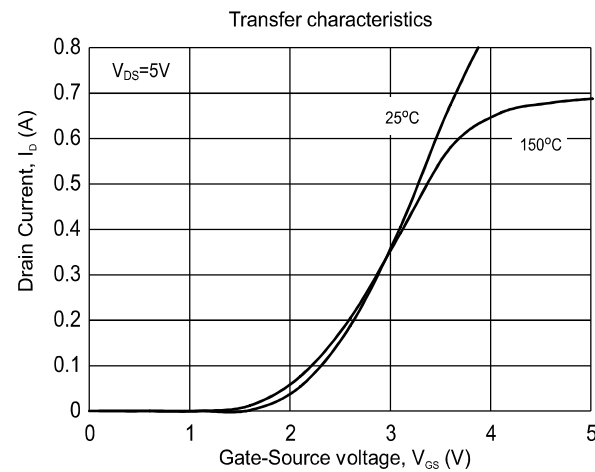
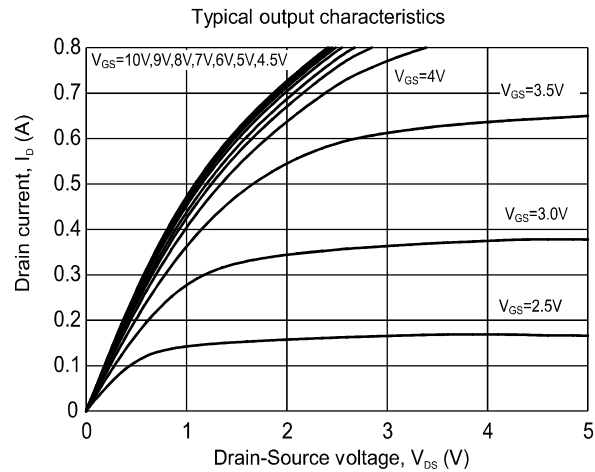
Note : 1. Repetitive rating: pulse width limited by junction temperature.

2. Pulse test : pulse width $\leq 300\mu\text{s}$, duty cycles $\leq 2\%$.

3. These parameters have no way to verify.

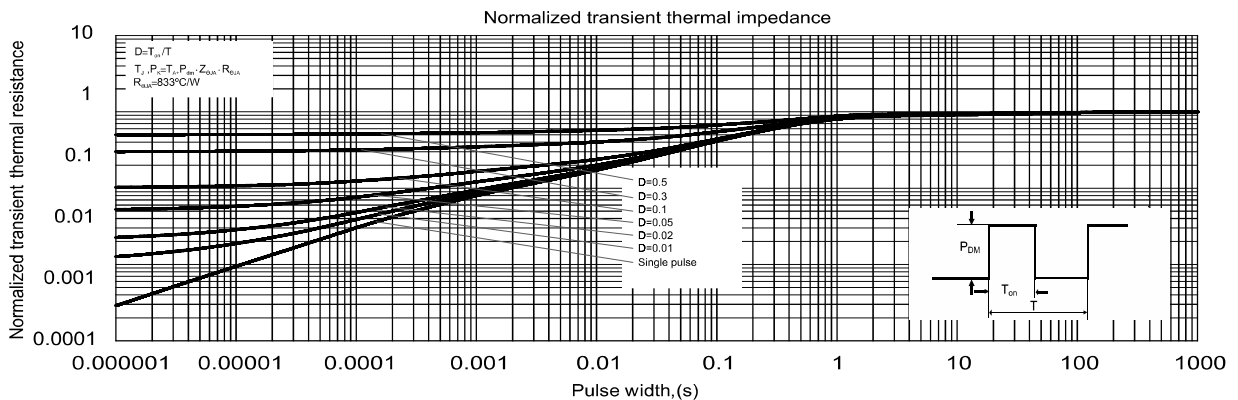
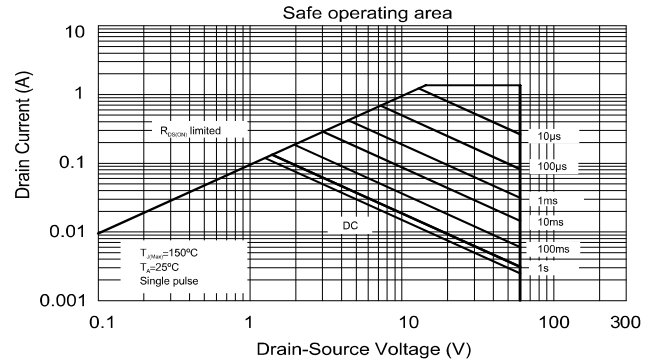
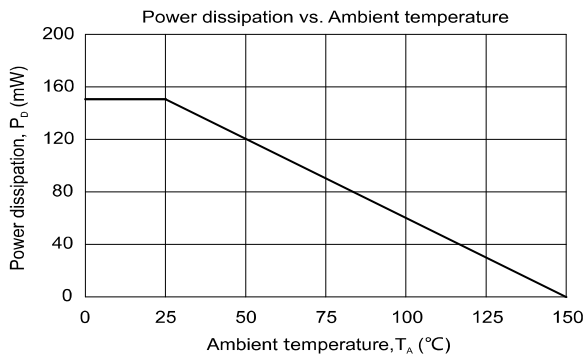
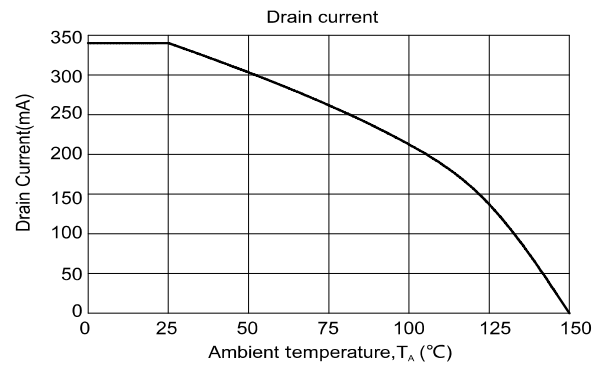
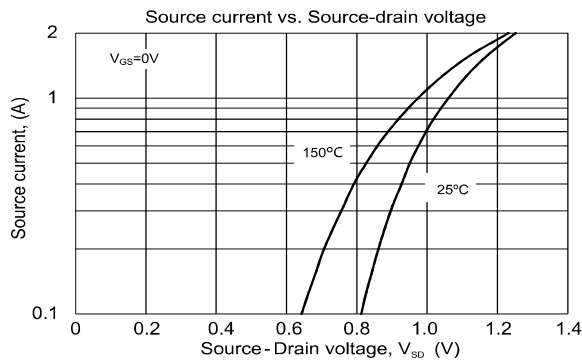
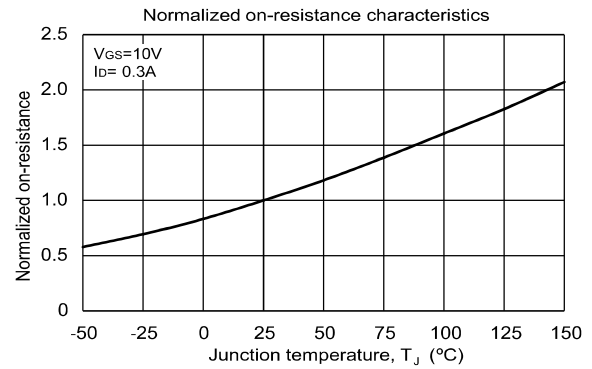
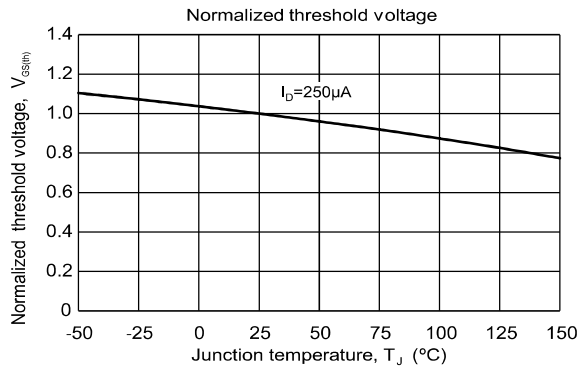
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Rating and characteristic curves



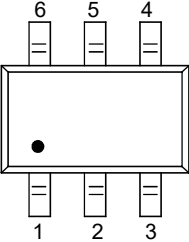
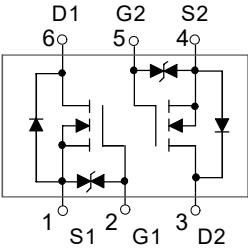
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Rating and characteristic curves



2N7002KV-H

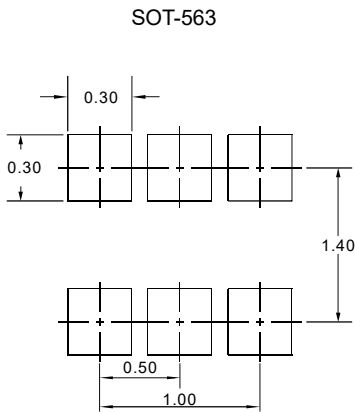
Pinning information

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

Marking

Type number	Marking code
2N7002KV-H	72K

Suggested solder pad layout

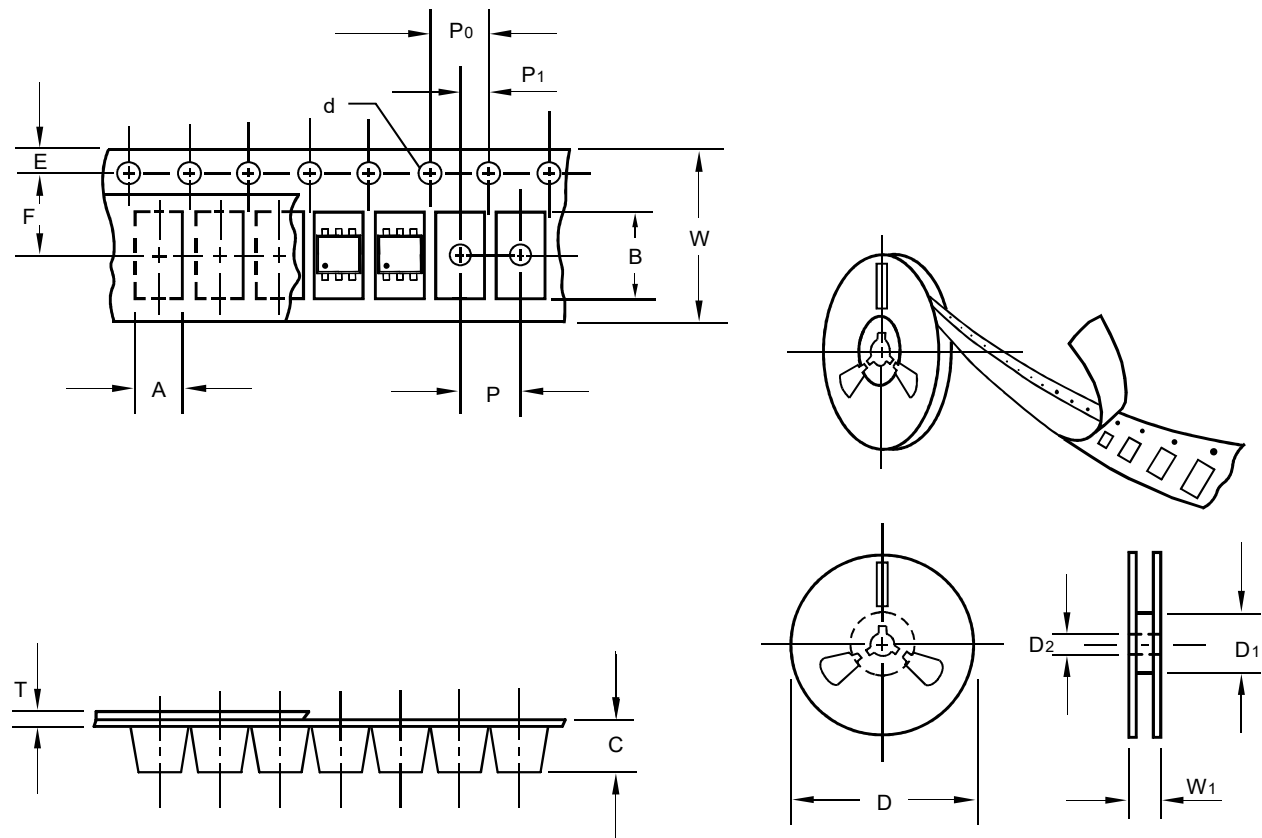


Dimensions in millimeters

- Note :
- 1. Controlling dimension : in millimeters.
 - 2. General tolerance : $\pm 0.05\text{mm}$.
 - 3. The pad layout is for reference purposes only.

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Packing information



unit:mm

Item	Symbol	Tolerance	SOT-563
Carrier width	A	0.1	1.78
Carrier length	B	0.1	1.78
Carrier depth	C	0.1	0.69
Sprocket hole	d	0.1	1.50
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D ₁	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D ₁	min	54.00
Feed hole diameter	D ₂	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	P ₀	0.1	4.00
Embossment center	P ₁	0.1	2.00
Overall tape thickness	T	0.1	0.23
Tape width	W	0.3	8.00
Reel width	W ₁	1.0	12.10

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

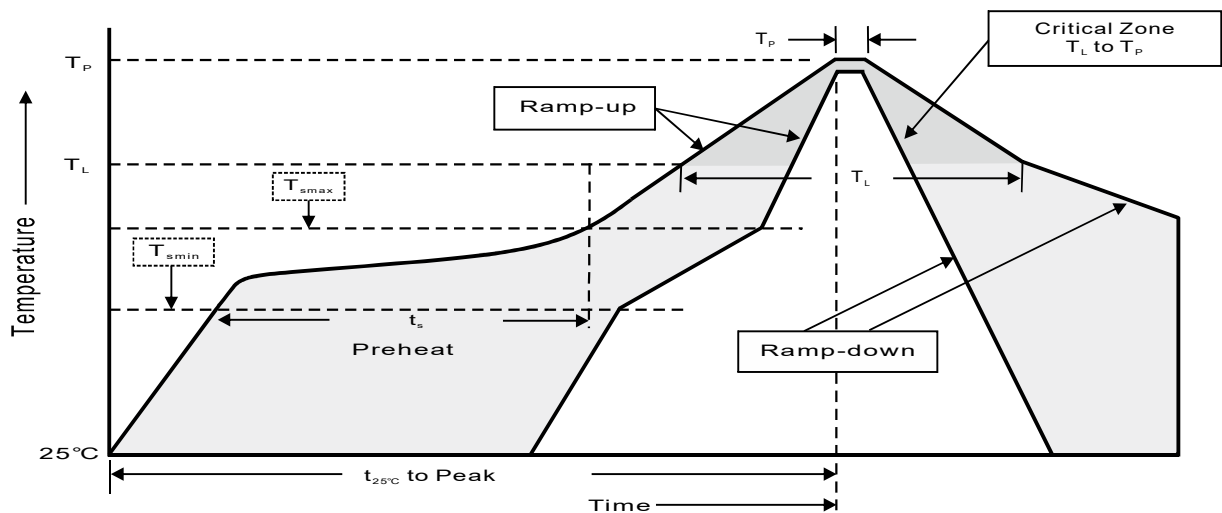
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Reel packing

TYPE NUMBER	PACKAGE	REEL SIZE	REEL (pcs)	REEL DIA, (m/m)
2N7002KV-H	SOT-563	7"	3,000	178

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_{min}) - Temperature Max (T_{max}) - Time (Min to Max) (t_s)	150°C 200°C 60 ~ 120 sec
T_{smax} to T_L - Ramp-up rate	< 3 °C/sec
Time maintained above : - Temperature (T_L) - Time (T_L)	217°C 60 ~ 260 sec
Peak temperature (T_p)	255 °C -0/+5°C
Time with 5°C of actual peak temperature (T_p)	10 ~30 sec
Ramp-down rate	< 6 °C/sec
Time 25°C to peak temperature	< 6 minutes