

FMOS4003K

List

List..... 1

Package outline..... 2

Features..... 2

Mechanical data..... 2

Maximum ratings 2

Electrical characteristics..... 3

Rating and characteristic curves..... 4~5

Pinning information..... 6

Marking..... 6

Suggested solder pad layout..... 6

Packing information..... 7

Reel packing..... 8

Suggested thermal profiles for soldering processes..... 8

FMOS4003K

30V N-Channel Enhancement Mode MOSFET- ESD Protection

Features

- Low gate voltage threshold($V_{gs(th)}$)to facilitate drive circuit design
- Low gate charge for fast switching
- ESD protected gate 1kV
- Minimum breakdown voltage rating of 30V
- Lead-free parts meet RoHS requirements
- Suffix "-H" dinicates Halogen-free part, ex.FMOS4003K-H

Applications

- Level shifters
- Level switches
- Low side load switches
- Portable applications

Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-23
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position : Any
- Weight : Approximated 0.008 gram

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

Parameter		Symbol	Limits	Unit	
Drain-to-source voltage		V_{DSS}	30	V	
Gate-to-source voltage – continuous		V_{GS}	± 20	V	
Continuous drain Current (Note 1)	steady state	I_D	$T_A = 25^{\circ}C$	0.5	A
			$T_A = 85^{\circ}C$	0.37	
Power dissipation (Note 1)	steady state	P_D	0.69	W	
Continuous drain current (Note 1)	$t < 10$ s	I_D	$T_A = 25^{\circ}C$	0.56	A
			$T_A = 85^{\circ}C$	0.40	
Power dissipation (Note 1)	$t < 5$ s	P_D	0.83	W	
Pulsed drain current	$t_p = 10\mu s$	I_{DM}	1.7	A	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +150	$^{\circ}C$	
Continuous Source Current (body diode)		I_S	1.0	A	
Maximum temperature for soldering purposes		T_L	260	$^{\circ}C$	

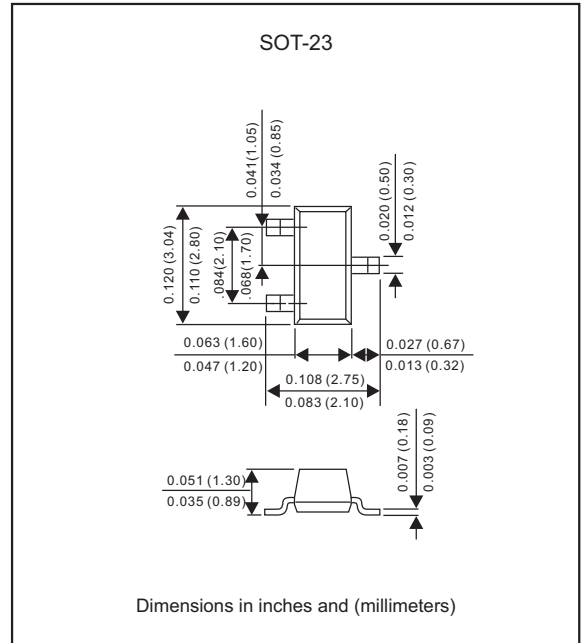
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability

Thermal characteristics

Parameter	Symbol	Limits	Unit
Junction-to-ambient – steady state (Note 1)	$R_{\theta JA}$	180	$^{\circ}C/W$
Junction-to-ambient – $t < 10$ s (Note 1)	$R_{\theta JA}$	150	

1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

Package outline



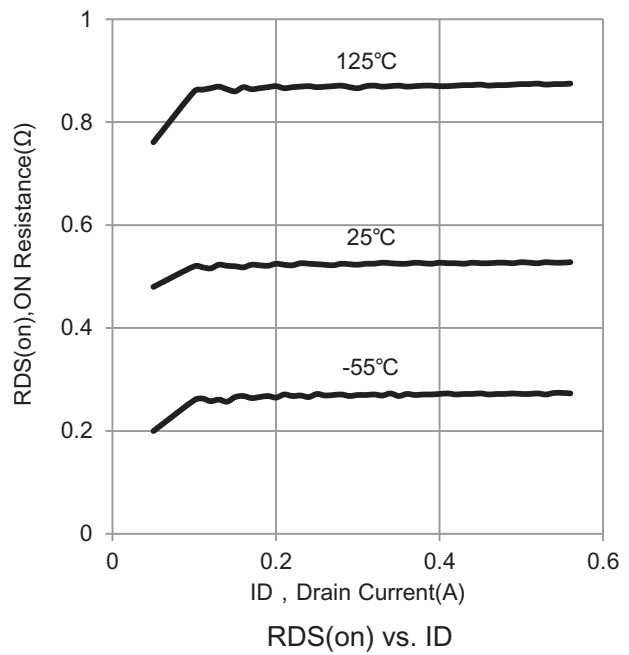
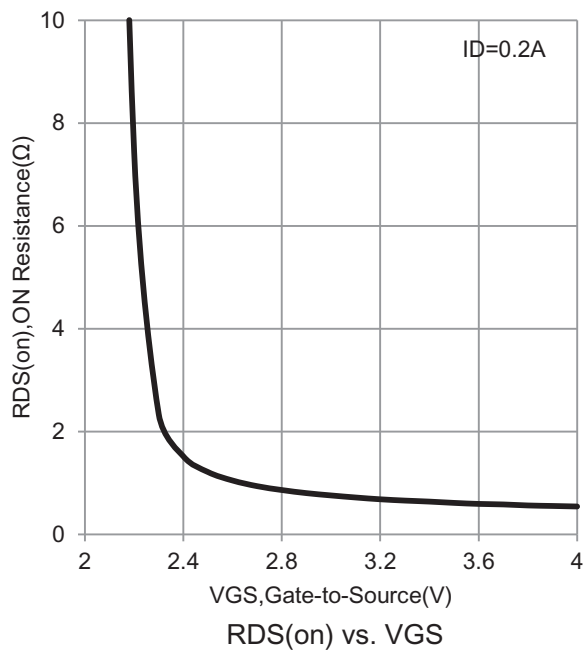
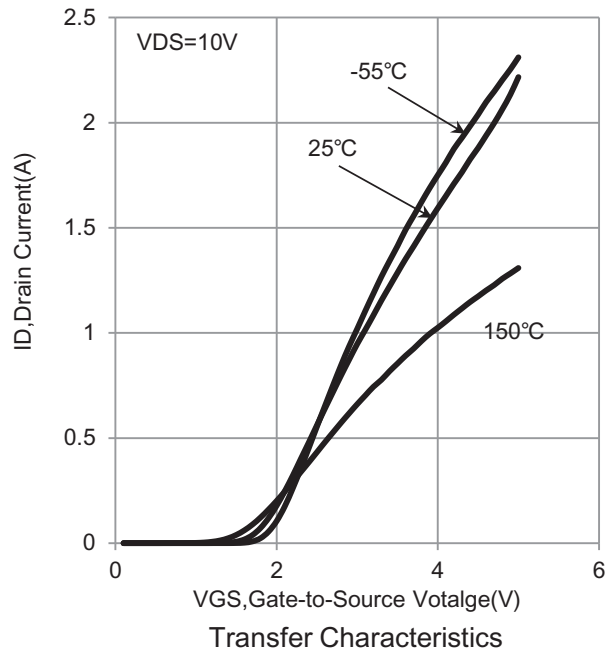
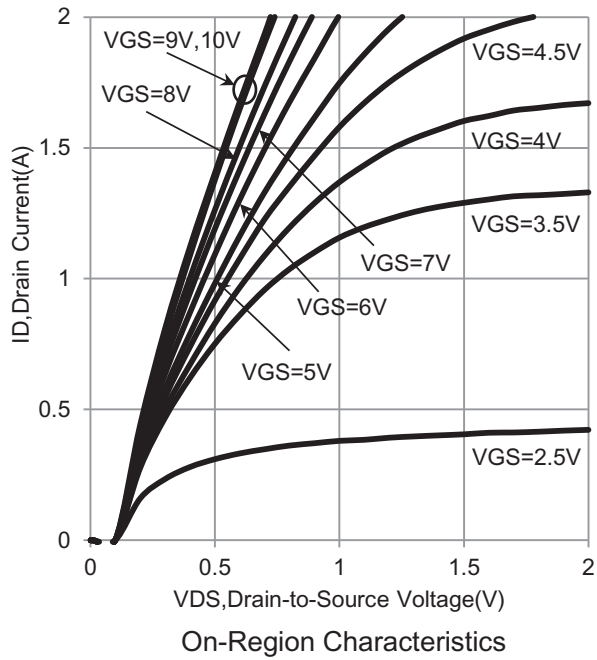
FMOS4003K

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

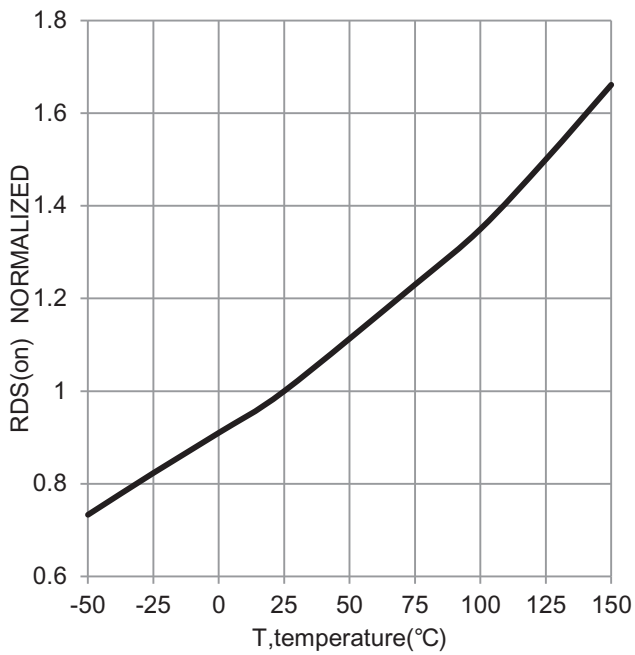
Parameter	Symbol	Test Condition	Min	Typ	Max	Units
OFF CHARACTERISTICS						
Drain to source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 100\mu\text{A}$	30			V
Drain to source breakdown voltage temperature coefficient	$V_{(BR)DSS}/T_J$			40		$\text{mV}/^\circ\text{C}$
Zero gate voltage drain current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 30\text{ V}, T_J = 25^\circ\text{C}$			1.0	μA
Gate to source leakage current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			± 1.0	μA
ON CHARACTERISTICS (note 1)						
Gate threshold voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	0.8		1.6	V
Negative threshold temperature coefficient	$V_{GS(TH)}/T_J$			3.4		$\text{mV}/^\circ\text{C}$
Drain to source on resistance	$R_{DS(on)}$	$V_{GS} = 4.0\text{ V}, I_D = 10\text{ mA}$		1.0	1.5	Ω
		$V_{GS} = 2.5\text{ V}, I_D = 10\text{ mA}$		1.5	2.0	
Forward transconductance	g_{FS}	$V_{DS} = 3.0\text{ V}, I_D = 10\text{ mA}$		0.33		S
DYNAMIC CHARACTERISTICS						
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 5.0\text{ V}$		41		μF
Output capacitance	C_{oss}			12		
Reverse transfer capacitance	C_{rss}			8.1		
SWITCHING CHARACTERISTICS						
Turn on delay time	$t_{d(on)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 5.0\text{ V}, I_D = 0.1\text{ A}, R_G = 50\Omega$		16.7		ns
Rise time	t_r			47.9		
Turn off delay time	$t_{d(off)}$			65.1		
Fall time	t_f			64.2		
SOURCE DRAIN DIODE CHARACTERISTICS						
Forward diode voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 10\text{ mA}, T_J = 25^\circ\text{C}$		0.65	0.7	V
Reverse recovery time	t_{rr}	$V_{GS} = 0\text{ V}, dI_S/dt = 8\text{ A}/\mu\text{s}, I_S = 10\text{ mA}$		14		ns

Note 1: Pulse test: pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2.0\%$

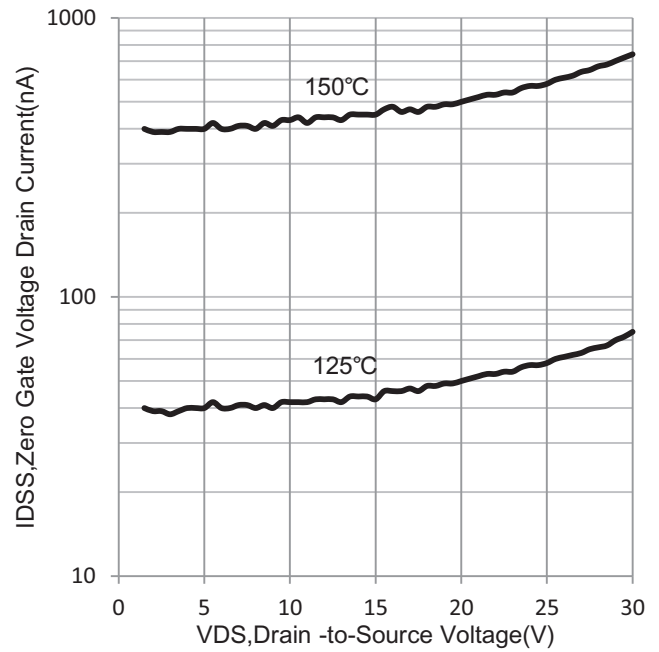
Rating and characteristic curves (FMOS4003K)



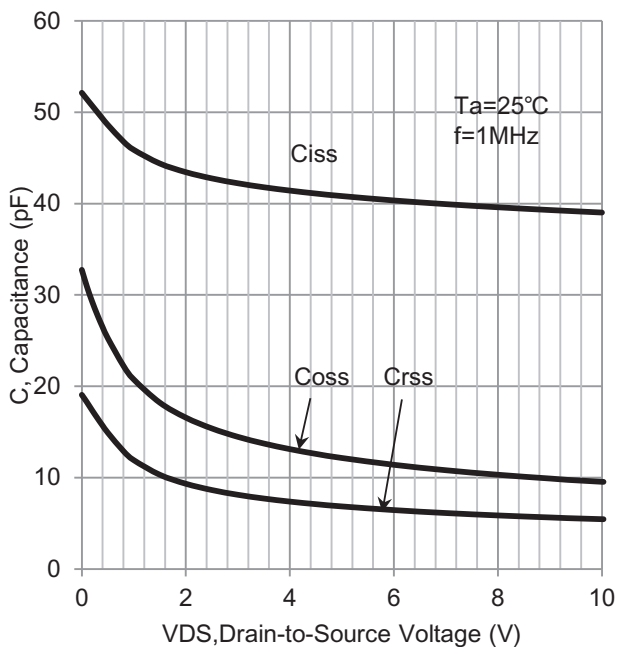
Rating and characteristic curves (FMOS4003K)



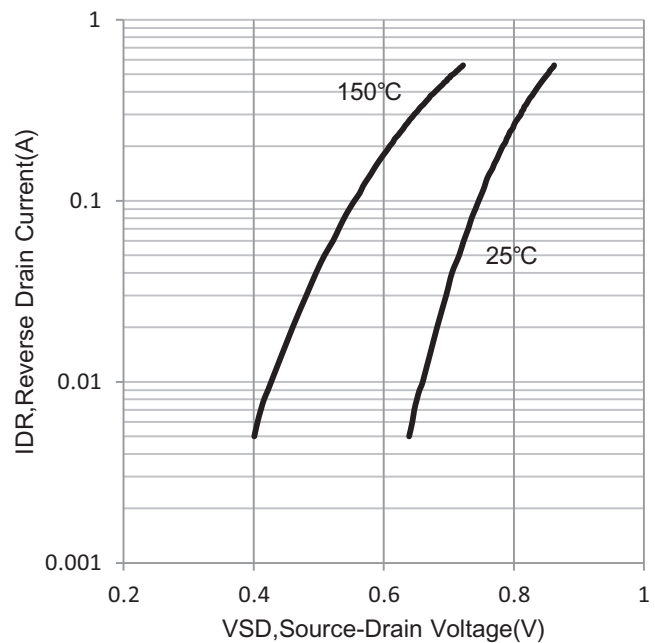
RDS(on) vs. Temperature



IDSS vs. VDS



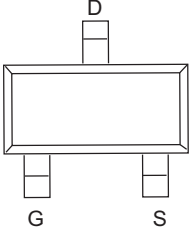
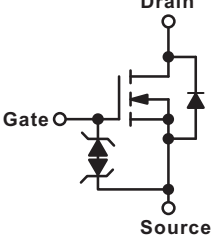
Capacitance Variation



Diode Forward Characteristics

FMOS4003K

Pinning information

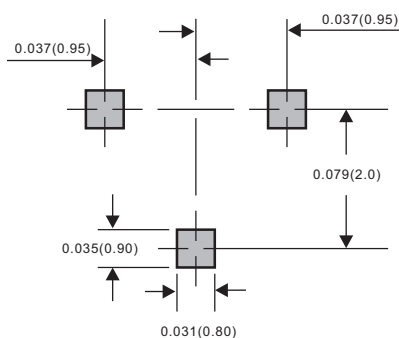
Pin	Simplified outline	Symbol
PinD Drain PinG Gate PinS Source		

Marking

Type number	Marking code
FMOS4003K	TR8

Suggested solder pad layout

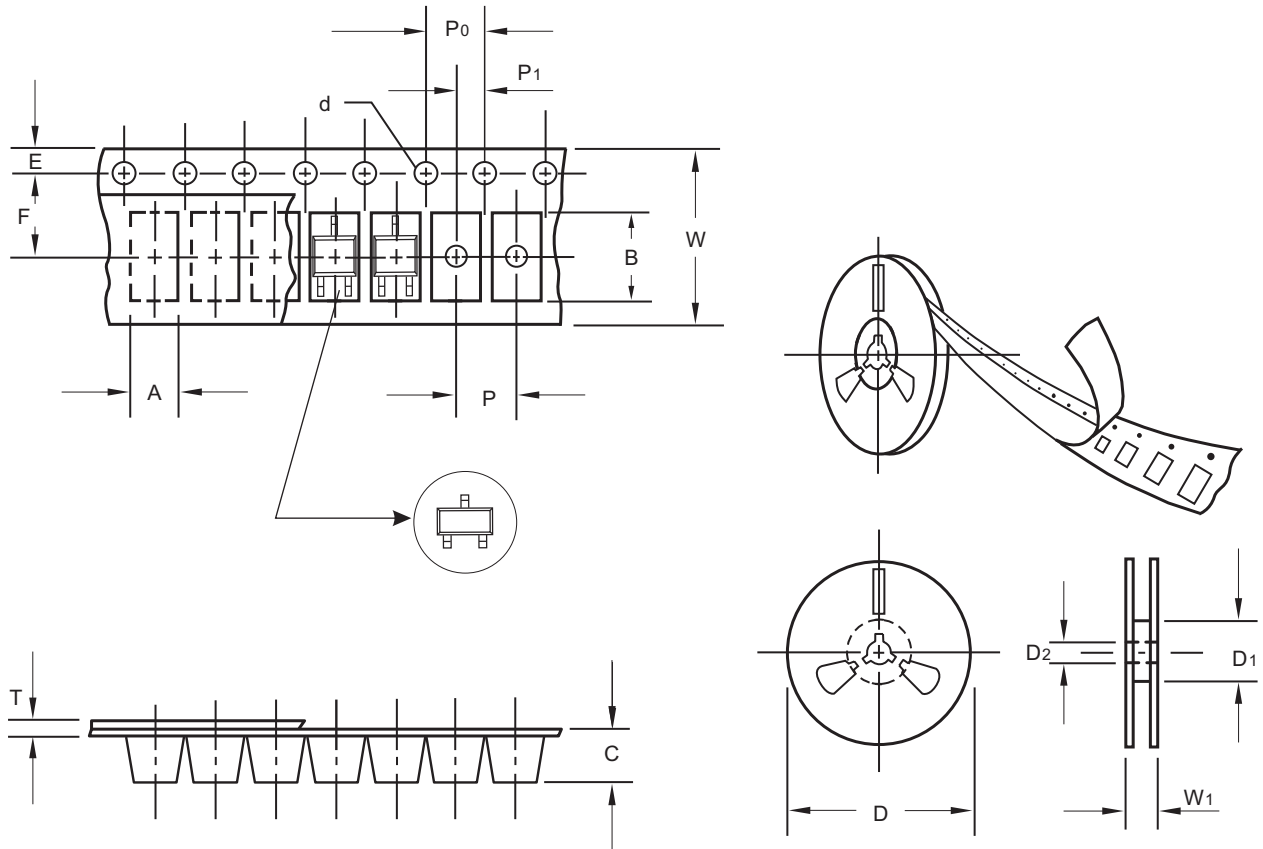
SOT-23



Dimensions in inches and (millimeters)

FMOS4003K

Packing information



unit:mm

Item	Symbol	Tolerance	SOT-23
Carrier width	A	0.1	3.15
Carrier length	B	0.1	2.77
Carrier depth	C	0.1	1.22
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	55.00
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	12.0

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

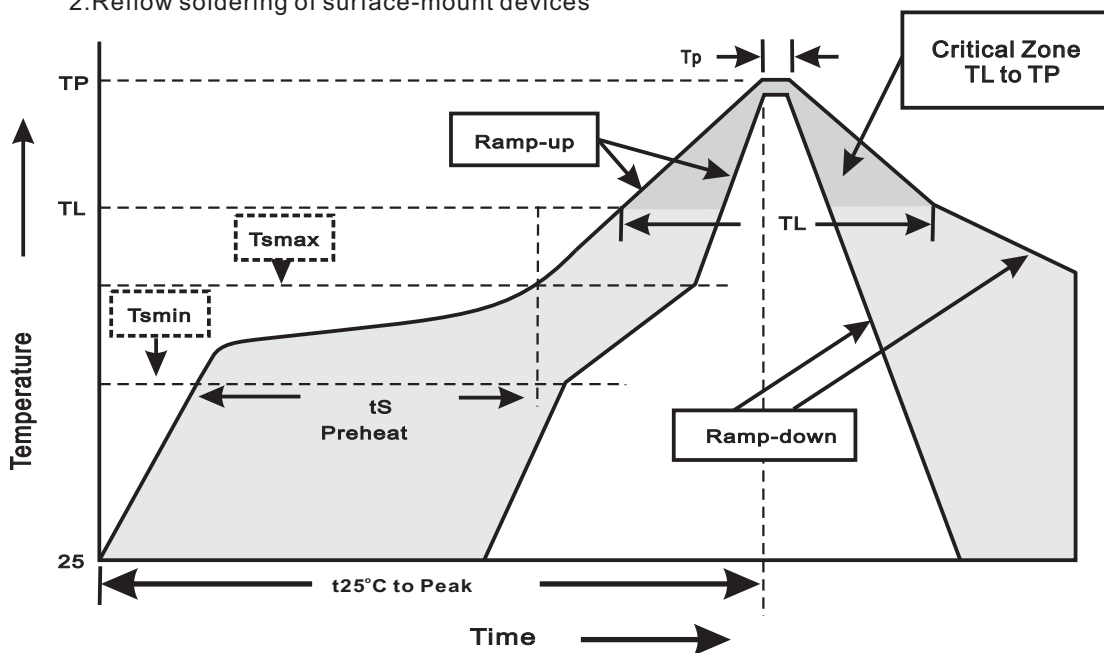
FMOS4003K

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)	APPROX. GROSS WEIGHT (kg)
SOT-23	7"	3,000	4.0	30,000	183*123*183	178	382*257*387	240,000	11.6

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 60~120sec
T _{max} 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