

FMOS3401A-Q1

List

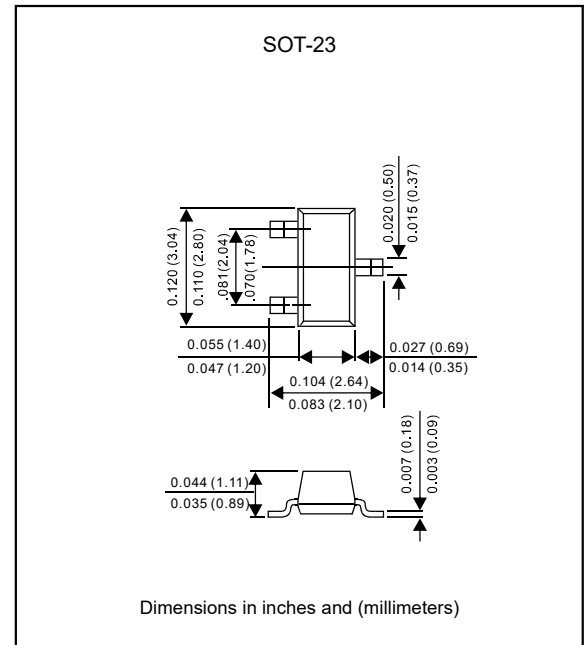
List.....	1
Package outline.....	2
Features.....	2
Mechanical data.....	2
Maximum ratings	2
Electrical characteristics.....	3
Rating and characteristic curves.....	4~5
Pinning information.....	6
Marking.....	6
Suggested solder pad layout.....	6
Packing information.....	7
Reel packing.....	8
Suggested thermal profiles for soldering processes.....	8

FMOS3401A-Q1**-30V, -4.2A P-Channel Enhancement
Mode Field Effect Transistor****Features**

- $-V_{DS} = 30V$.
- $-I_D = 4.2A$ ($-V_{GS} = 10V$).
- $R_{DS(ON)} < 50m\Omega$ ($-V_{GS} = 10V$).
- $R_{DS(ON)} < 65m\Omega$ ($-V_{GS} = 4.5V$).
- $R_{DS(ON)} < 120m\Omega$ ($-V_{GS} = 2.5V$).
- -Q1 for automotive and other applications requiring unique site and control change requirements; AEC-Q101 qualified and PPAP capable.
- We declare that the material of product compliance with RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex.FMOS3401A-Q1-H.

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

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

Parameter	Symbol	Ratings	Unit
Drain-source voltage	$-V_{DS}$	30	V
Gate-source voltage	V_{GS}	± 12	V
Continuous drain current ^A ($T_A=25^{\circ}C$)	$-I_D$	4.2	A
Continuous drain current ^A ($T_A=70^{\circ}C$)		3.5	
Pulsed drain current	$-I_{DM}$	30	A
Power dissipation ($T_A=25^{\circ}C$)	P_D	1.4	W
Power dissipation ($T_A=70^{\circ}C$)		1	
Operating Junction temperature range	T_J	+150	$^{\circ}C$
Storage temperature range	T_{STG}	-55 to +150	$^{\circ}C$
Thermal resistance Junction to ambient ^A (Steady-State)	$R_{\theta JA}$	125	$^{\circ}C/W$
Thermal resistance junction to lead ^C (Steady-State)	$R_{\theta JL}$	60	$^{\circ}C/W$

FMOS3401A-Q1

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	$-BV_{\text{DSS}}$	$-I_{\text{D}}=250\mu\text{A}$, $V_{\text{GS}}=0\text{V}$	30			V
Drain-source leakage current	$-I_{\text{DSS}}$	$-V_{\text{DS}}=24\text{V}$, $V_{\text{GS}}=0\text{V}$			1	μA
Gate-source leakage current	I_{GSS}	$V_{\text{GS}}=\pm 12\text{V}$, $V_{\text{DS}}=0\text{V}$			± 100	nA
On characteristics						
Gate threshold voltage	$-V_{\text{GS(TH)}}$	$V_{\text{DS}}=V_{\text{GS}}$, $-I_{\text{D}}=250\mu\text{A}$	0.7	1	1.3	V
On state drain current	$-I_{\text{D(ON)}}$	$-V_{\text{GS}}=4.5\text{V}$, $-V_{\text{DS}}=5\text{V}$	25			A
Static drain-source on-resistance	$R_{\text{DS(ON)}}$	$-V_{\text{GS}}=10\text{V}$, $-I_{\text{D}}=4.2\text{A}$		42	50	m Ω
		$-V_{\text{GS}}=4.5\text{V}$, $-I_{\text{D}}=4\text{A}$		53	65	
		$-V_{\text{GS}}=2.5\text{V}$, $-I_{\text{D}}=1\text{A}$		80	120	
Dynamic Parameters						
Input capacitance	C_{iss}	$V_{\text{GS}}=0\text{V}$, $-V_{\text{DS}}=15\text{V}$, $f=1.0\text{MHZ}$		954		pF
Output capacitance	C_{oss}			115		
Reverse transfer capacitance	C_{rss}			77		
Gate resistance	R_{g}	$V_{\text{GS}}=0\text{V}$, $V_{\text{DS}}=0\text{V}$, $f=1\text{MHz}$		6		Ω
Switching parameters						
Total gate charge	Q_{g}	$-V_{\text{GS}}=4.5\text{V}$, $-V_{\text{DS}}=15\text{V}$, $-I_{\text{D}}=4\text{A}$		5.1		nC
Gate to source charge	Q_{gs}			0.7		
Gate to Drain charge	Q_{gd}			0.7		
Turn-on delay time	$t_{\text{D(ON)}}$	$-V_{\text{DS}}=15\text{V}$, $-V_{\text{GS}}=10\text{V}$ $R_{\text{G}}=6\Omega$, $R_{\text{L}}=3.6\Omega$		6.3		ns
Rise time	t_{r}			3.2		
Turn-off delay time	$t_{\text{D(OFF)}}$			38.2		
Fall time	t_{f}			12		
Body diode reverse recovery time	t_{rr}	$-I_{\text{F}}=4\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$		20.2		ns
Body diode reverse recovery charge	Q_{rr}			11.2		nC
Source-drain diode ratings and characteristics (Note2)						
Maximum body - Diode continuous current	$-I_{\text{S}}$				2.2	A
Forward transconductance	g_{FS}	$-V_{\text{DS}}=5\text{V}$, $-I_{\text{D}}=5\text{A}$	7	11		S
Drain - source diode forward voltage (Note 1)	$-V_{\text{SD}}$	$-I_{\text{S}}=1\text{A}$, $V_{\text{GS}}=0\text{V}$		0.75	1.0	V

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz.

Copper, in a still air environment with $T_A=25^{\circ}\text{C}$.

The value in any given application depends on the user's specific board design.

The current rating is based on the $t \leq 10\text{s}$ thermal resistance.

B. Repetitive ratings, pulse width limited by junction temperature.

C. The static characteristics in Figures 1 to 6, 12, 14 are obtained using 80 μs pulses, duty cycle 0.5% max.

D. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$.

The SOA curve provides a single pulse rating.

Rating and characteristic curves (FMOS3401A-Q1)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

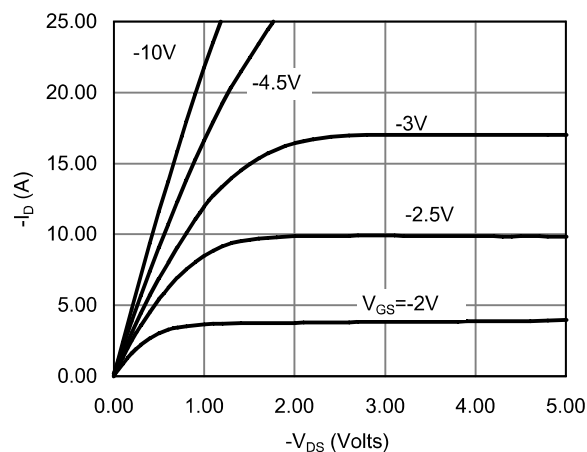


Fig 1: On-Region Characteristics

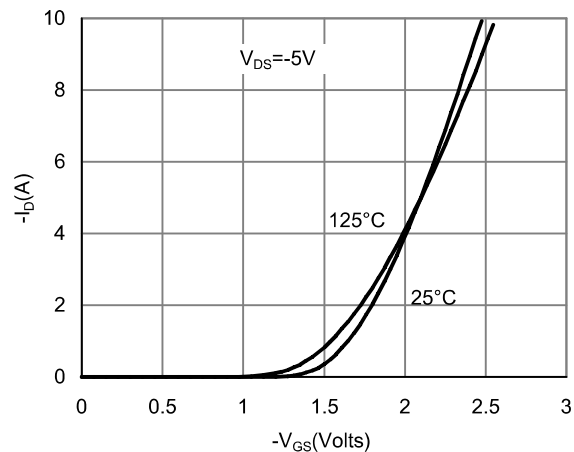


Figure 2: Transfer Characteristics

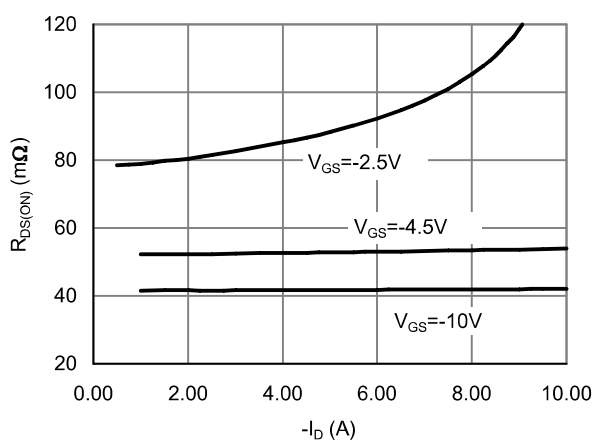


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

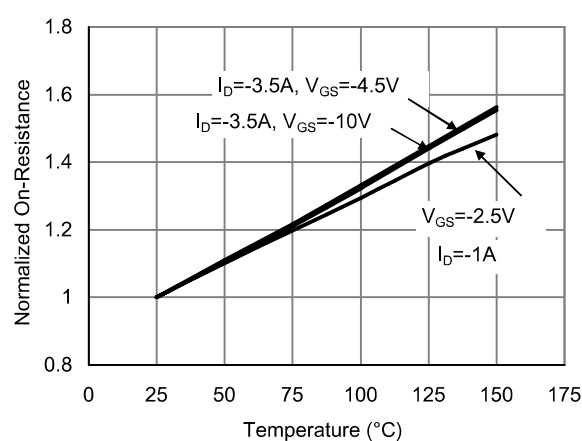


Figure 4: On-Resistance vs. Junction Temperature

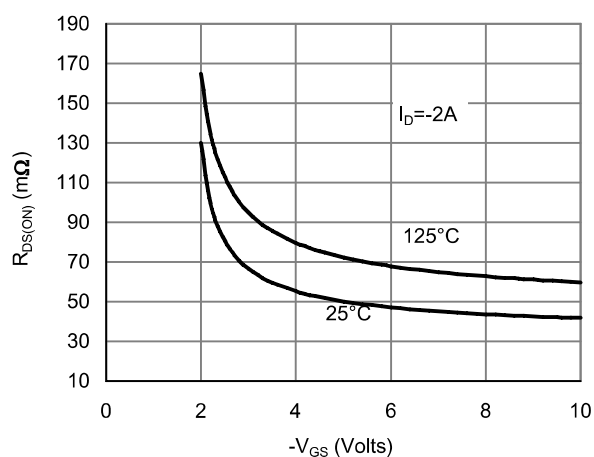


Figure 5: On-Resistance vs. Gate-Source Voltage

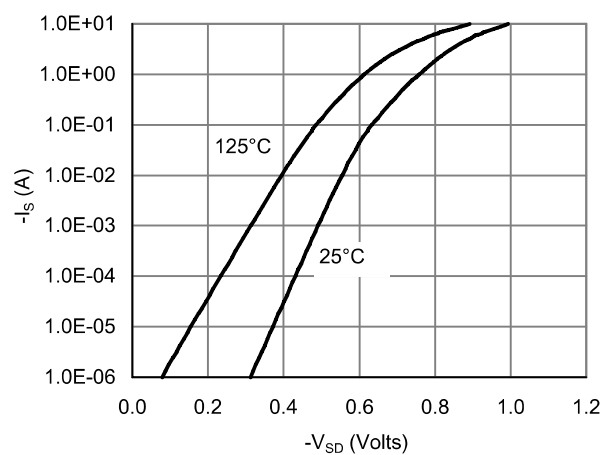


Figure 6: Body-Diode Characteristics

Rating and characteristic curves (FMOS3401A-Q1)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

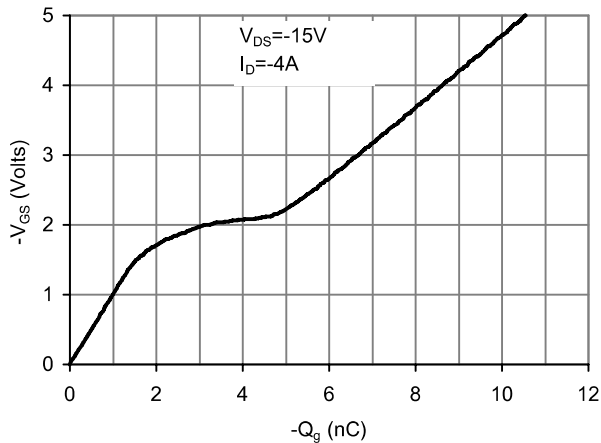


Figure 7: Gate-Charge Characteristics

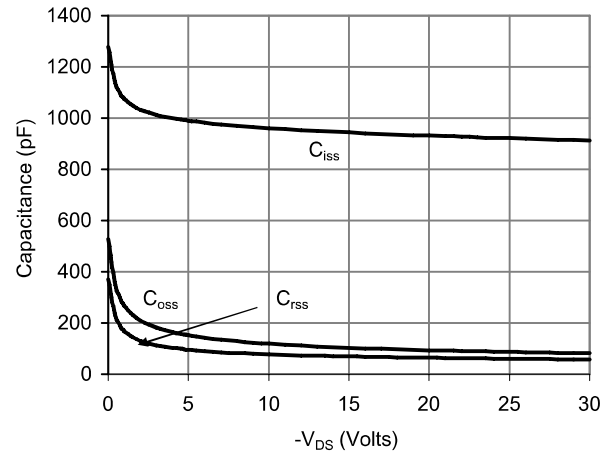


Figure 8: Capacitance Characteristics

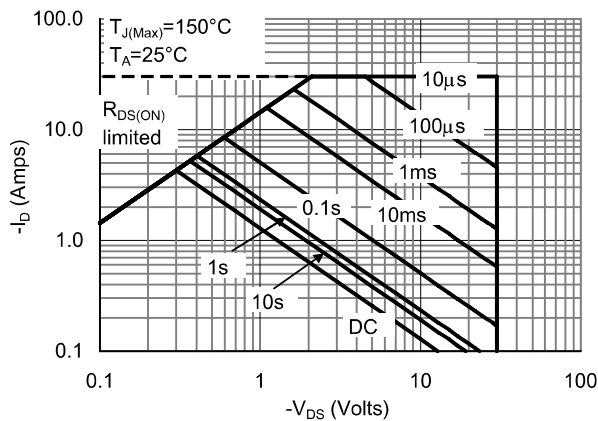


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

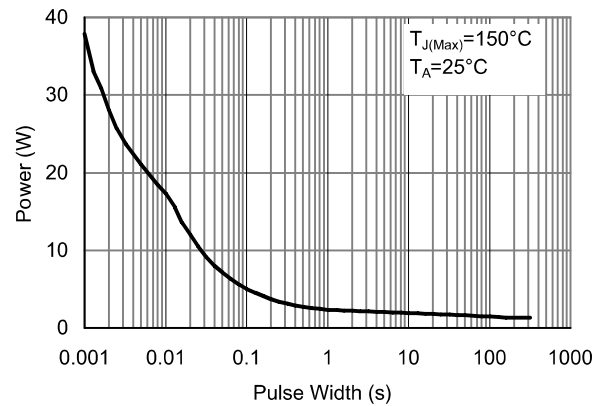


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

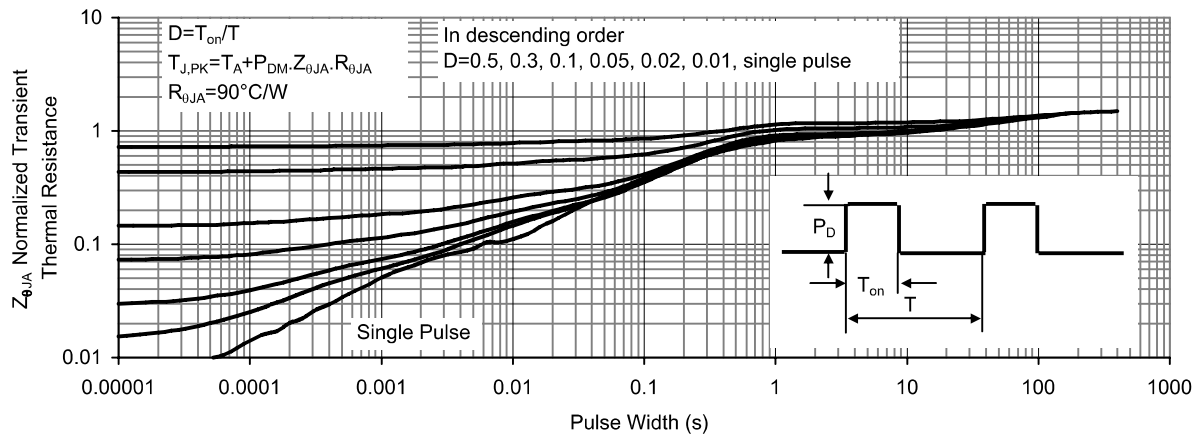
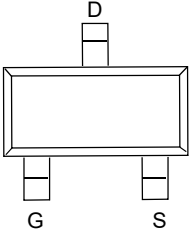
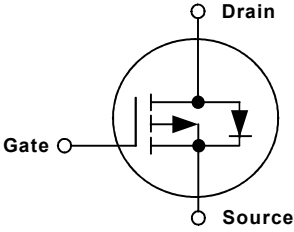


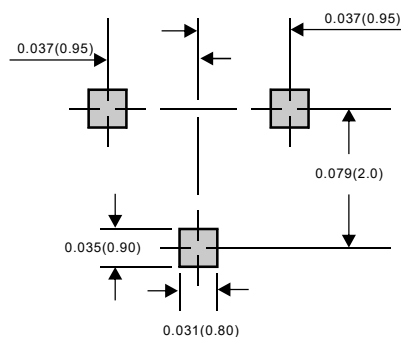
Figure 11: Normalized Maximum Transient Thermal Impedance

FMOS3401A-Q1**Pinning information**

Pin	Simplified outline	Symbol
PinD Drain PinG Gate PinS Source		

Marking

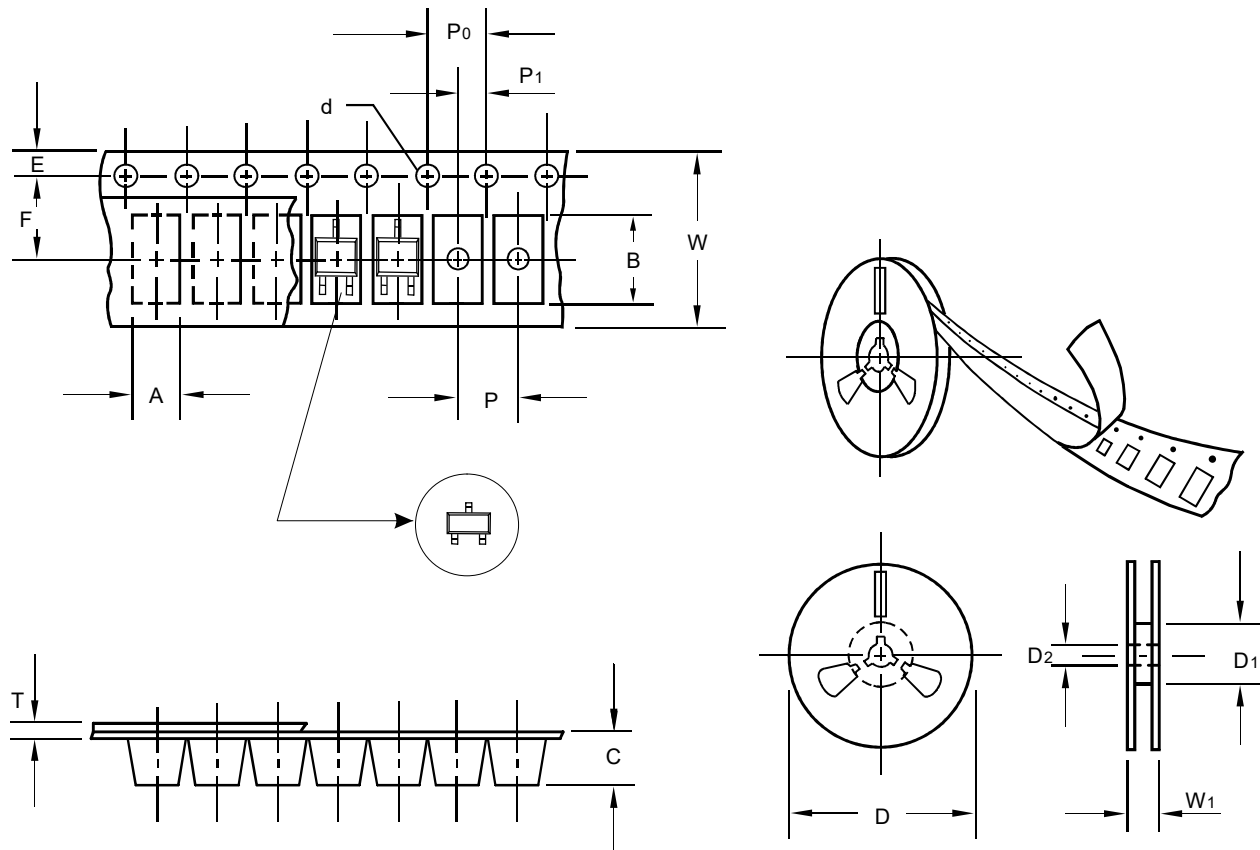
Type number	Marking Code
FMOS3401A-Q1	3401

Suggested solder pad layout**SOT-23**

Dimensions in inches and (millimeters)

FMOS3401A-Q1

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	54.40
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.

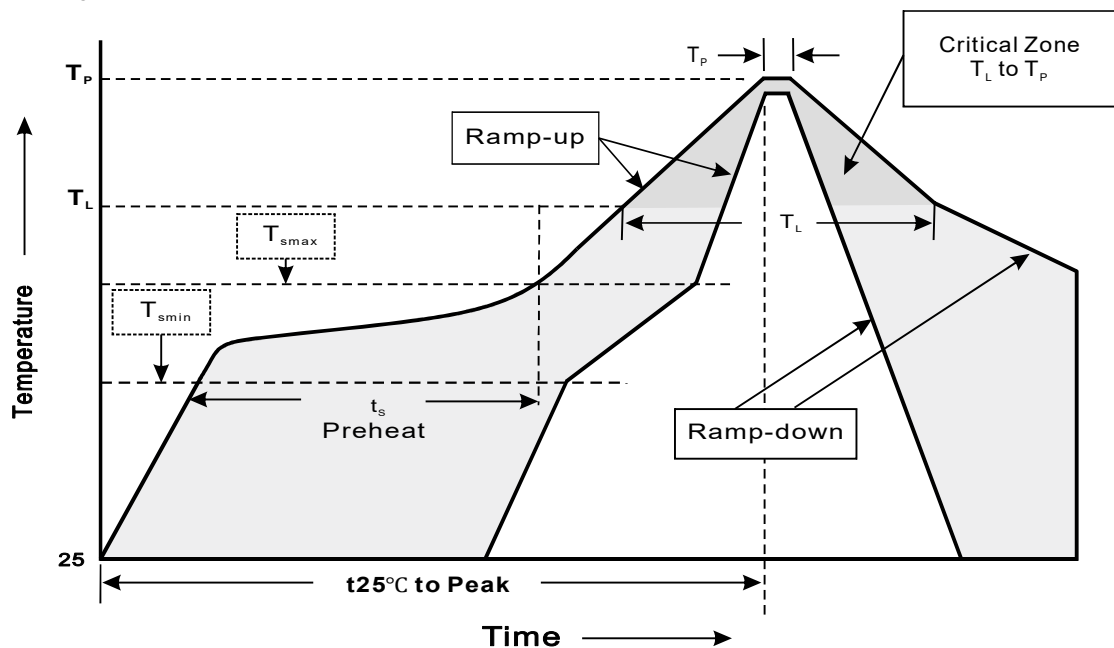
FMOS3401A-Q1

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_{smin}) -Temperature Max (T_{smax}) -Time (min to max) (t_s)	150°C 200°C 60 ~ 120sec
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 within 5°C of actual peak Temperature(T_P)	10 ~ 30sec
Ramp-down rate	< 6°C/sec
Time 25°C to peak temperature	< 6 minutes