

FMOSAC248N04-Q1

List

List.....1

Package outline.....2

Features.....2

Applications.....2

Mechanical data.....2

Maximum ratings2

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

High reliability test capabilities.....9

FMOSAC248N04-Q1

248A 40V N-Channel Enhancement Mode Power MOSFET

Features

- $V_{DS}=40V$, $I_D=248A$.
- $R_{DS(ON)} \leq 1.3m\Omega$, @ $V_{GS}=10V$, $I_D=60A$.
- $R_{DS(ON)} \leq 1.75m\Omega$, @ $V_{GS}=7V$, $I_D=60A$.
- Good stability and uniformity with high E_{AS} .
- High density cell design for ultra-low on-resistance.
- Excellent package for good heat dissipation.
- Battery switch and load switch.
- Qualified for AEC-Q101 standards for high reliability.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex. FMOSAC248N04-Q1-H.

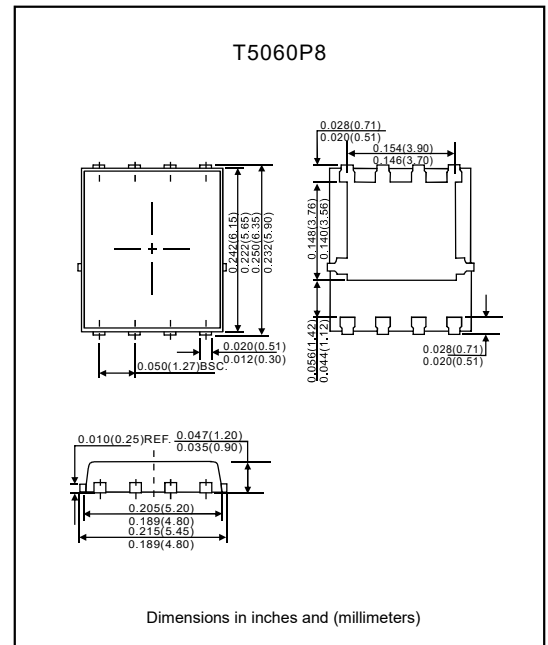
Applications

- SMPS and general purpose applications.
- Uninterruptible power supply.
- Hard switching and high-speed frequency circuit.

Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, T5060P8.
- Mounting Position : Any.

Package outline

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

Parameter	Symbol	Ratings	Unit
Drain-source voltage	V_{DS}	40	V
Gate-source voltage	V_{GS}	± 20	V
Continuous drain current ($T_c=25^\circ C$) (Note1) ($T_c=100^\circ C$)	I_D	248	A
		175	A
Pulsed drain current (Note2)	I_{DM}	992	A
Single pulse avalanche energy (Note3)	E_{AS}	1025	mJ
Power dissipation (Note1)	P_D	136	W
Thermal resistance, junction to ambient (Note4)	$R_{\theta JA}$	62.5	$^\circ C/W$
Thermal resistance, junction to case	$R_{\theta JC}$	1.1	$^\circ C/W$
Operating Junction temperature	T_J	+175	$^\circ C$
Storage temperature range	T_{STG}	-55 to +175	$^\circ C$

FMOSAC248N04-Q1

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	BV_{DS}	$I_D=1\text{mA}$, $V_{GS}=0\text{V}$	40			V
Drain-source leakage current	I_{DSS}	$V_{DS}=40\text{V}$, $V_{GS}=0\text{V}$			1	μA
		$V_{DS}=40\text{V}$, $V_{GS}=0\text{V}$, $T_J=125^{\circ}\text{C}$			50	
		$V_{DS}=40\text{V}$, $V_{GS}=0\text{V}$, $T_J=150^{\circ}\text{C}$			500	
Gate-source leakage current	I_{GSS}	$V_{GS}=\pm 20\text{V}$, $V_{DS}=0\text{V}$			± 100	nA

On characteristics (Note5)

Gate threshold voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}$, $I_D=100\mu\text{A}$	2.5	2.9	3.5	V
Static drain-source on-resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=60\text{A}$		1	1.3	m Ω
		$V_{GS}=7\text{V}$, $I_D=60\text{A}$		1.25	1.75	

Dynamic parameters

Input capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=100\text{kHz}$		5690		pF
Out capacitance	C_{oss}			1460		
Reverse transfer capacitance	C_{rss}			37		
Gate resistance	R_g	$f=1.0\text{MHz}$		5		Ω

Switching parameters

Total gate charge	Q_g	$V_{GS}=10\text{V}$, $V_{DD}=32\text{V}$, $I_D=120\text{A}$		72		nC
Gate to source charge	Q_{gs}			27		
Gate to drain charge	Q_{gd}			14.7		
Gate plateau voltage	$V_{plateau}$			4.9		V
Turn-on delay time	$t_{d(on)}$	$V_{DD}=20\text{V}$, $V_{GS}=10\text{V}$, $R_g=2.5\Omega$, $I_D=50\text{A}$, $R_L=0.4\Omega$		18		ns
Rise time	t_r			11		
Turn-off delay time	$t_{d(off)}$			48		
Fall time	t_f			42		

Source-drain diode ratings and characteristics

Drain-source diode forward voltage (Note 5)	V_{SD}	$I_S=60\text{A}$, $V_{GS}=0\text{V}$			1.1	V
Continuous source current (Note 1)	I_S				152	A
Pulsed drain-source diode forward (Note 2)	I_{SM}				608	A
Reverse recovery time	t_{rr}	$V_R=20\text{V}$, $I_F=50\text{A}$, $di_F/dt=50\text{A}/\mu\text{s}$		74.6		ns
Reverse recovery charge	Q_{rr}			63.8		nC

Note : 1. $T_C=25^{\circ}\text{C}$, $R_{\theta JA}=1.1^{\circ}\text{C/W}$.

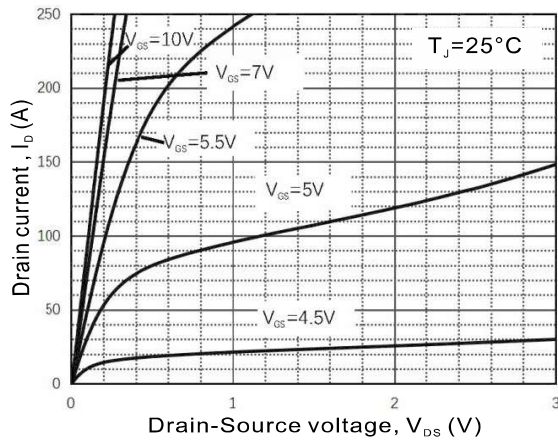
2. Limited by maximum junction temperature.

3. Test condition: $V_{DD}=50\text{V}$, $V_{GS}=10\text{V}$, $L=0.5\text{mH}$, $R_g=25\Omega$, starting at $T_J=25^{\circ}\text{C}$.4. Measured with the device mounted on 1 inch² FR-4 board with 2oz. copper, in a still air environment with $T_A=25^{\circ}\text{C}$.5. Pulse test: pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.

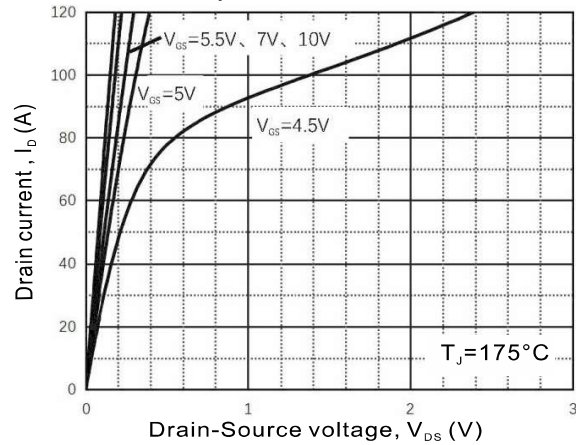
FMOSAC248N04-Q1

Rating and characteristic curves

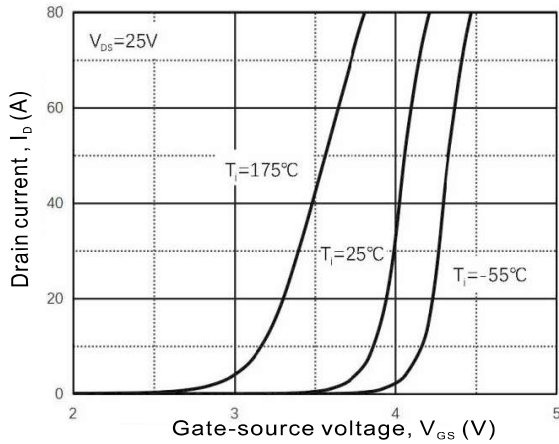
Output characteristics



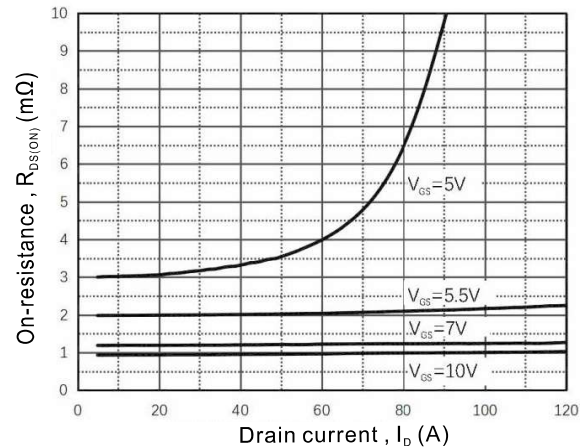
Output characteristics



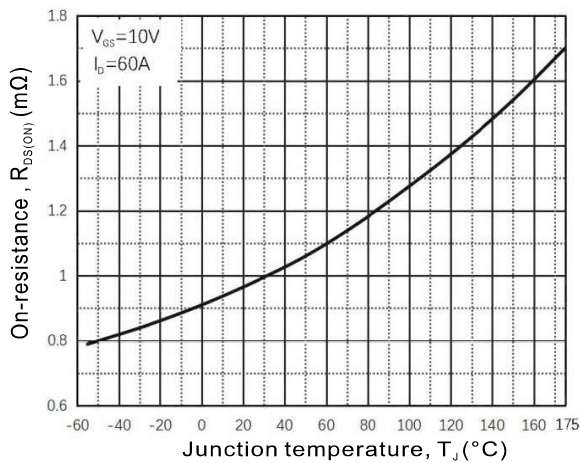
Transfer characteristics



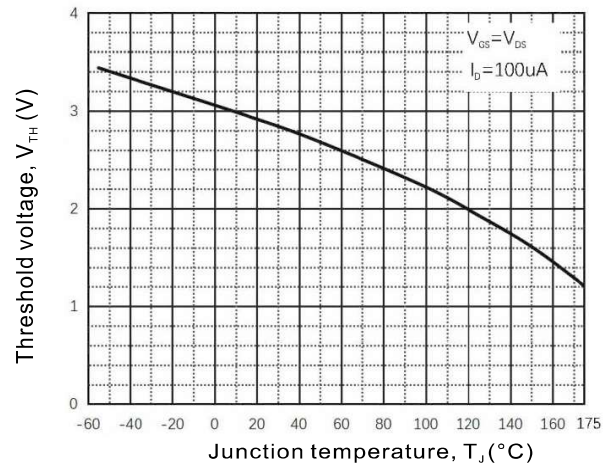
On-resistance vs. Drain current



On-resistance vs. Junction temperature

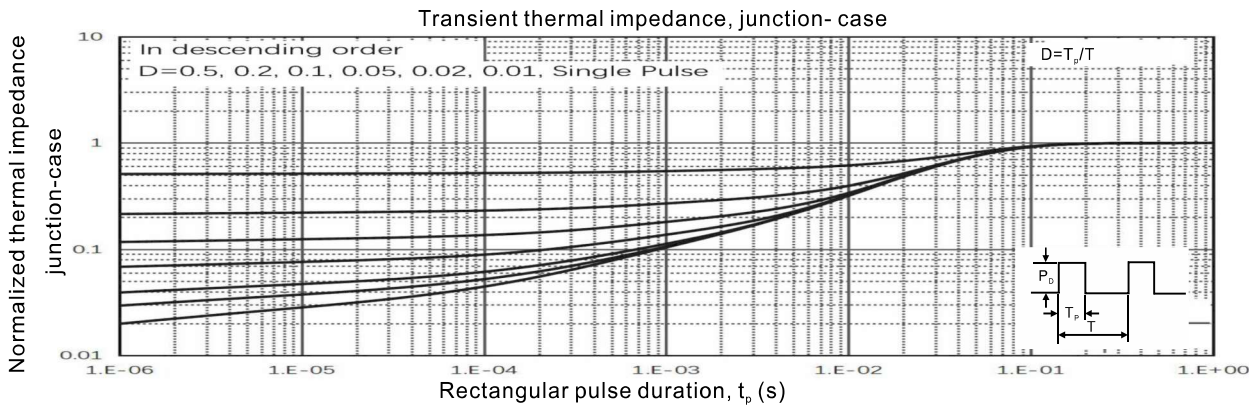
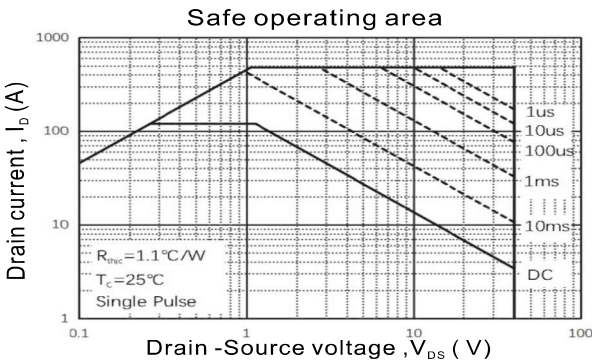
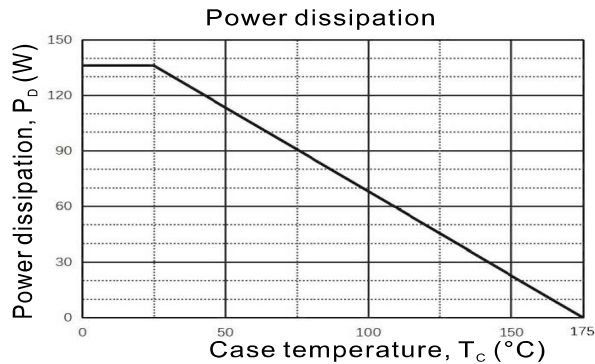
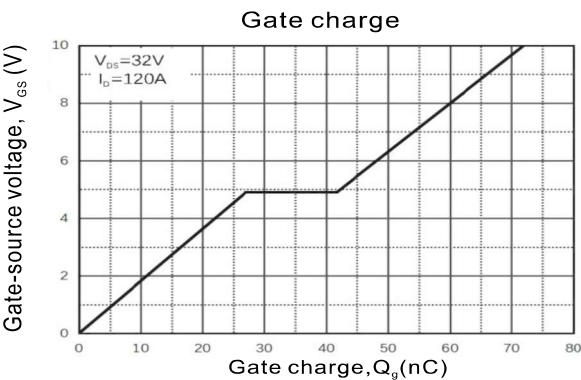
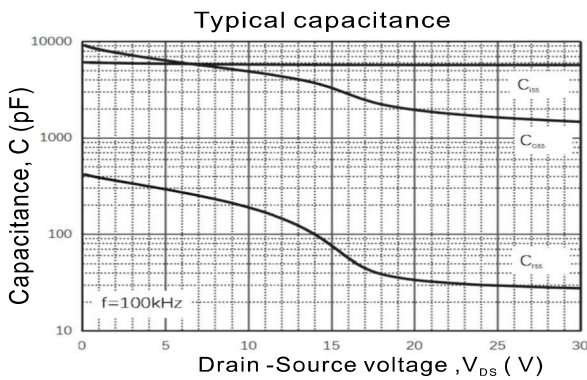
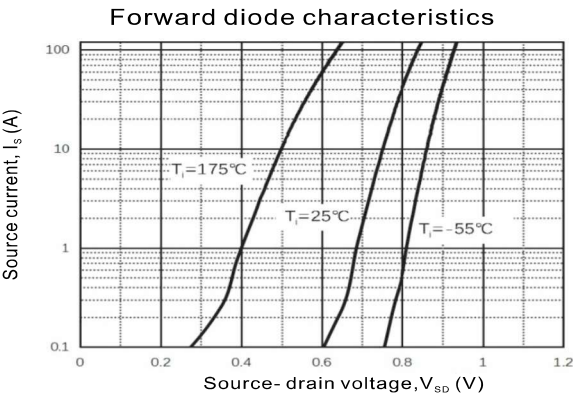
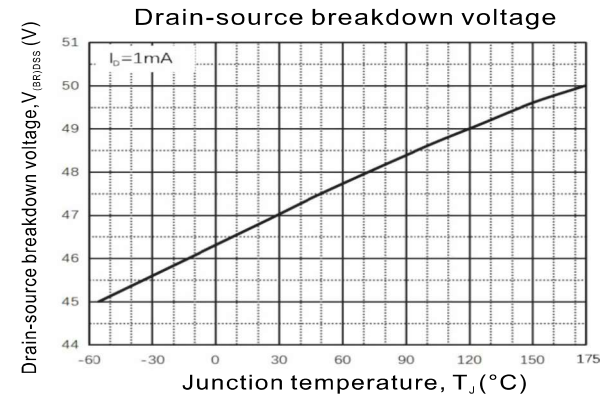


Gate threshold vs. Junction temperature



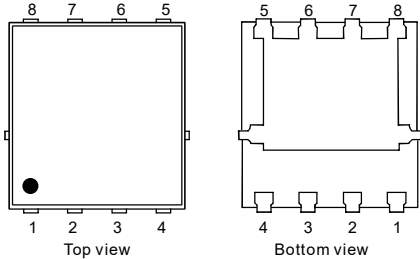
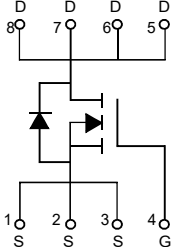
FMOSAC248N04-Q1

Rating and characteristic curves



FMOSAC248N04-Q1

Pinning information

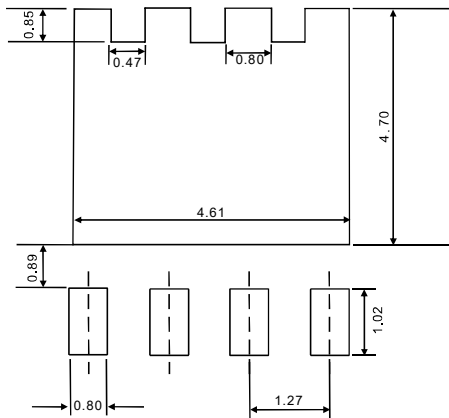
Pin	Simplified outline	Symbol
Pin 1, 2, 3, Source Pin 4 Gate Pin 5, 6, 7, 8 Drain		

Marking

Type number	Marking code
FMOSAC248N04-Q1	AC248N04

Suggested solder pad layout

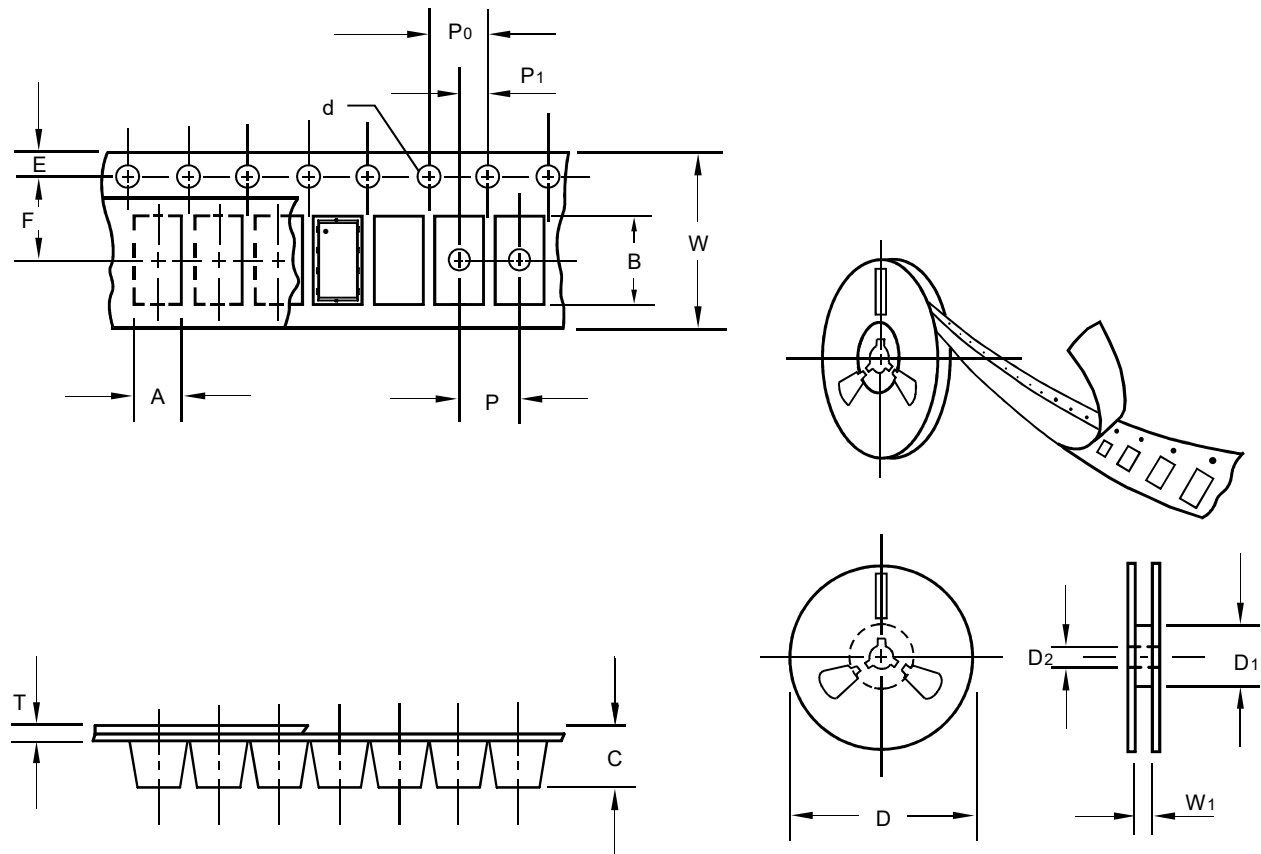
T5060P8



Note:
1. Controlling dimension: in millimeters.
2. General tolerance: ± 0.1 mm
3. The pad layout is for reference purposes only.

FMOSAC248N04-Q1

Packing information



unit:mm

Item	Symbol	Tolerance	T5060P8
Carrier width	A	0.1	6.60
Carrier length	B	0.1	5.40
Carrier depth	C	0.1	1.30
Sprocket hole	d	0.1	1.50
13" Reel outside diameter	D	2.0	330.00
13" Reel inner diameter	D1	min	100.00
7" Reel outside diameter	D	2.0	-
7" Reel inner diameter	D1	min	-
Feed hole diameter	D2	0.5	13.50
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.1	5.50
Punch hole pitch	P	0.1	8.00
Sprocket hole pitch	P0	0.1	4.00
Embossment center	P1	0.1	2.00
Tape width	W	0.3	12.00
Reel width	W1	1.0	13.40

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

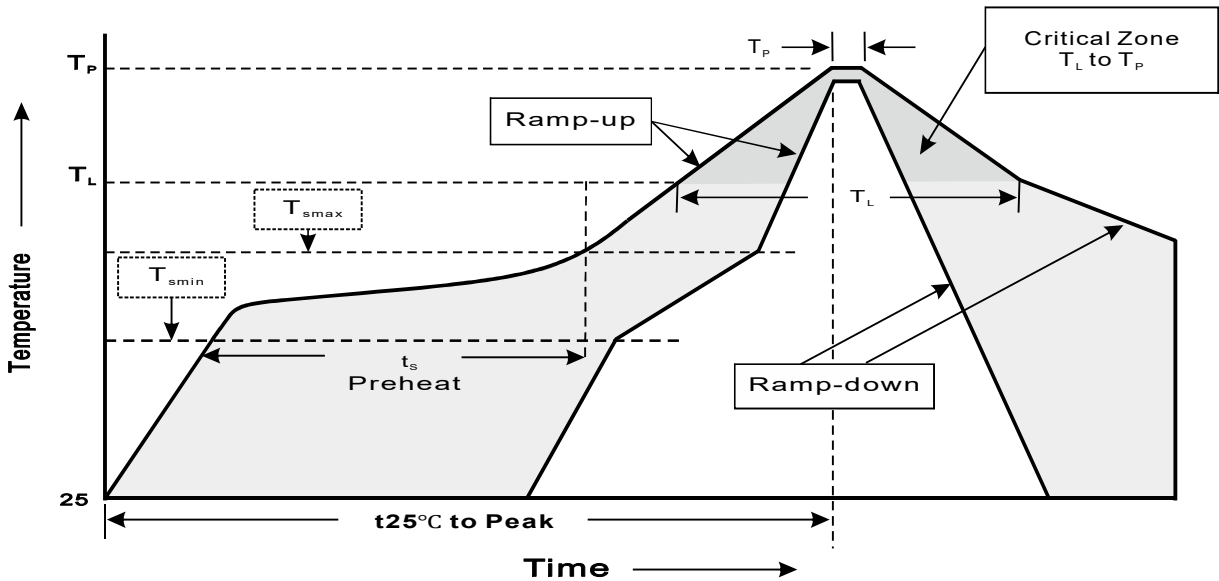
FMOSAC248N04-Q1

Reel packing

Device	Outline	Device Package	Reel Size	Reel (pcs)
FMOSAC80N04-Q1	Taping	T5060P8	13 inch	5,000

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-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

FMOSAC248N04-Q1

High reliability test capabilities

Item Test	Conditions	Reference
1. MSL Preconditioning	24hr bake@125°C+168hrs@85°C /85%RH+3xIR@260°C+1flux immersion+alcohol+DI H2O rinse	JESD22-A113
2. High Temperature Reverse Bias	$V_{DS}=V_{DS}^*80\%$ ($T_J=T_J \text{ max.}$) Test Duration:1000hrs	JESD22-A108
3. High Temperature Storage Life	$T_a=150^\circ\text{C}$ Test Duration:1000hrs	JESD22 A-103
4. Temperature Cycle	-55°C (15min) to 150°C (15min) Test Cycles:1000cycles	JESD22 A-104
5. Autoclave	$P=2\text{atm}$ $T_a=121^\circ\text{C}$ RH=100% Test Duration:96hrs	JESD22 A-102
6. Solderability	$245\pm5^\circ\text{C}$ for 5sec	J-STD-002
7. Moisture Resistance	$T_a=85^\circ\text{C}$ / 85% Relative humidity Test Duration:1000hrs	MIL-STD-750E METHOD 1021.2
8. Resistance To Solder Heat	$260\pm5^\circ\text{C}$ for 10sec	JESD22 B-106
9. High Temperature High Humidity Reverse Bias	$T_a=85^\circ\text{C}$, 85%RH, $V_{DS}=80\%$ rated V_{DS} Test Duration: 1000hrs	JESD22-A101