

FMOSAB40N04A-Q1

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FMOSAB40N04A-Q1

40A 40V N-Channel Enhancement Mode Power MOSFET

Features

- $V_{DS} = 40V$, $I_D = 40A$.
- $R_{DS(ON)} \leq 3.2\ m\Omega$, @ $V_{GS} = 10V$, $I_D = 20A$.
- $R_{DS(ON)} \leq 3.8\ m\Omega$, @ $V_{GS} = 7V$, $I_D = 20A$.
- $R_{DS(ON)} \leq 5.0\ m\Omega$, @ $V_{GS} = 4.5V$, $I_D = 20A$.
- 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.FMOSAB40N04A-Q1-H.

Applications

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

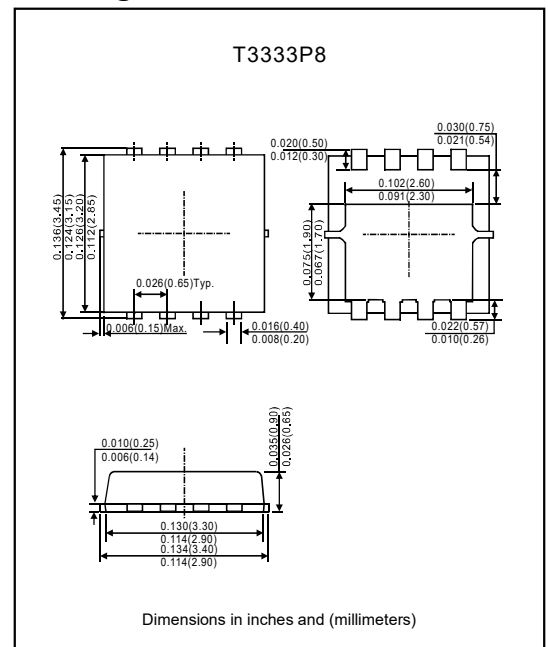
Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, T3333P8.
- Mounting Position : Any.

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 (Note1)	I_D	40	A
		78	
Pulsed drain current (Note2)	I_{DM}	312	A
Single pulse avalanche energy (Note3)	E_{AS}	148	mJ
Power dissipation (Note4)	P_D	45	W
Thermal resistance, junction to ambient (Note5)	$R_{\theta JA}$	62.5	$^\circ C/W$
Thermal resistance, junction to case	$R_{\theta JC}$	3.3	$^\circ C/W$
Operating Junction temperature	T_J	+175	$^\circ C$
Storage temperature range	T_{STG}	-55 to +175	$^\circ C$

Package outline



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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_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	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	
Gate-Source leakage current	I_{GSS}	$V_{GS}=\pm 20\text{V}$, $V_{DS}=0\text{V}$			± 100	nA

On characteristics (Note6)

Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=1\text{mA}$	1.2	1.7	2.3	V
Static drain-source on-resistance	$R_{DS(on)}$	$V_{GS}=10\text{V}$, $I_D=20\text{A}$		2.3	3.2	m Ω
		$V_{GS}=7\text{V}$, $I_D=20\text{A}$		2.7	3.8	
		$V_{GS}=4.5\text{V}$, $I_D=20\text{A}$		3.6	5	

Dynamic characteristics

Input capacitance	C_{iss}	$V_{DS}=25\text{V}$, $V_{GS}=0\text{V}$, $f=100\text{kHz}$		1520		pF
Output capacitance	C_{oss}			480		
Reverse transfer capacitance	C_{rss}			32		
Gate resistance	R_G	$f=1.0\text{MHz}$		3.2		Ω

Switching characteristics

Total gate charge	Q_g	$V_{GS}=10\text{V}$, $V_{DD}=32\text{V}$, $I_D=20\text{A}$		23		nC
Gate-Source charge	Q_{gs}			4.5		
Gate-Drain Charge	Q_{gd}			5.8		
Gate plateau voltage	$V_{plateau}$			2.3		V
Turn-on delay time	$t_{d(on)}$	$V_{DD}=20\text{V}$, $V_{GS}=10\text{V}$, $R_G=2.5\Omega$, $I_D=20\text{A}$, $R_L=0.4\Omega$		6		ns
Turn-on rise time	t_r			3.5		
Turn-off delay time	$t_{d(off)}$			18		
Turn-off fall time	t_f			4.6		

Drain-Source diode characteristics and maximum ratings

Drain-Source diode forward voltage (Note6)	V_{SD}	$I_S=40\text{A}$, $V_{GS}=0\text{V}$		0.8	1.1	V
Continuous source current (Note 1)	I_S				40	A
Pulsed drain-source diode forward (Note 2)	I_{SM}				312	A
Body diode reverse recovery time	t_{rr}	$I_F=40\text{A}$, $V_R=20\text{V}$, $di_F/dt=100\text{A}/\mu\text{s}$		24		ns
Body diode reverse recovery charge	Q_{rr}			17		nC

Note: 1. Current is limited by package; the chip is able to carry 78A at $T_c=25^{\circ}\text{C}$ with $R_{\theta JC}=3.3^{\circ}\text{C}/\text{W}$

2. Limited only by maximum temperature allowed.

3. Test condition: $V_{DD}=50\text{V}$, $V_{GS}=10\text{V}$, $L=0.5\text{mH}$, $R_G=25\Omega$, starting at $T_J=25^{\circ}\text{C}$.

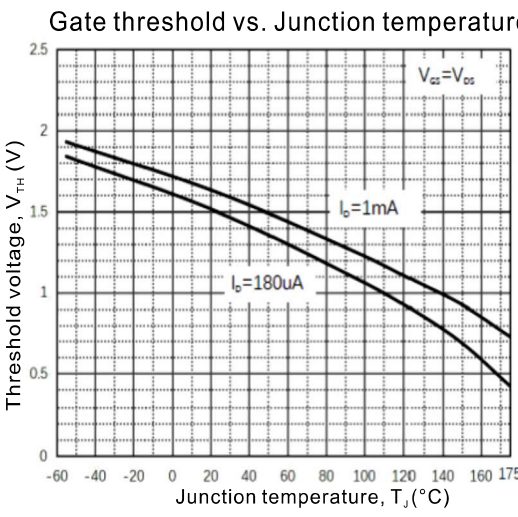
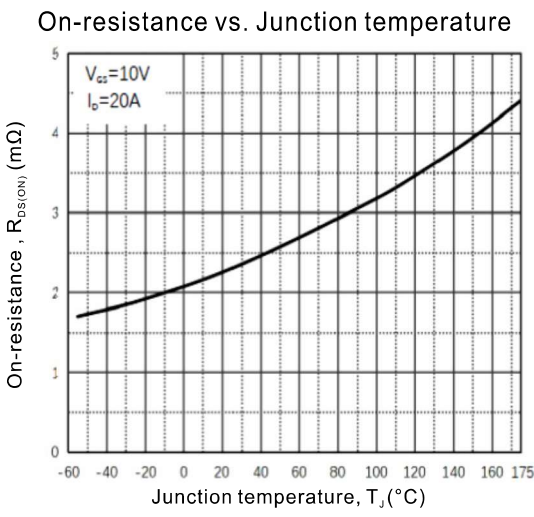
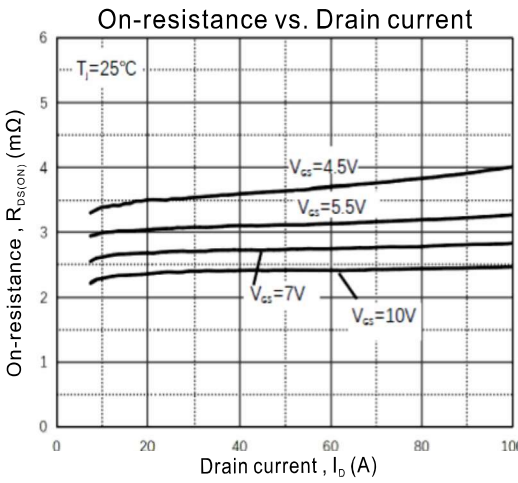
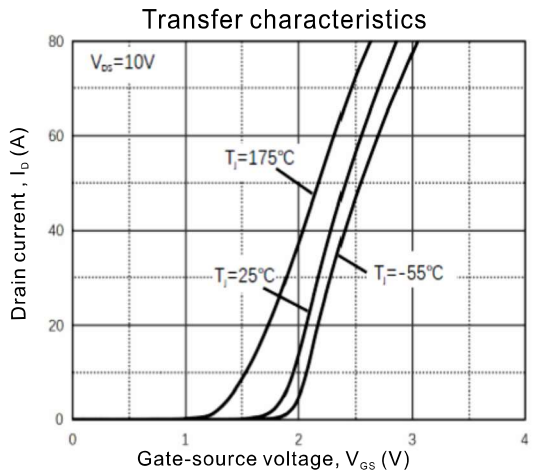
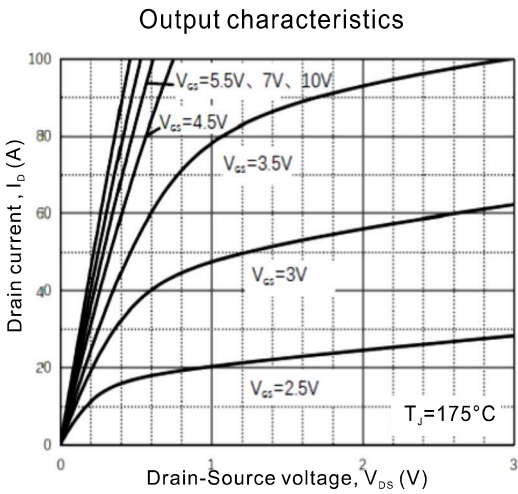
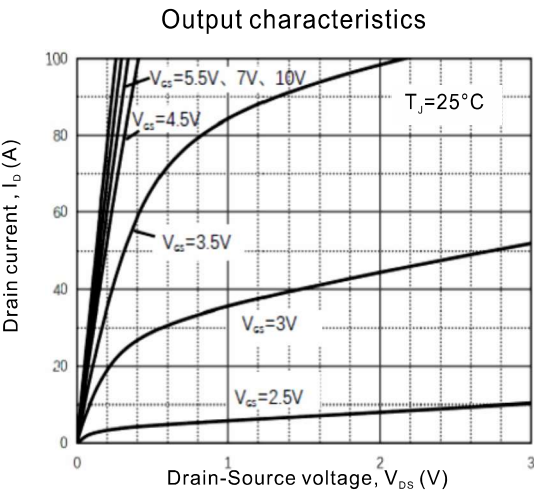
4. $T_c=25^{\circ}\text{C}$

5. Measured with the device mounted on 1 inch² FR-4 board with 2oz. copper, in a still air environment with $T_A=25^{\circ}\text{C}$.

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

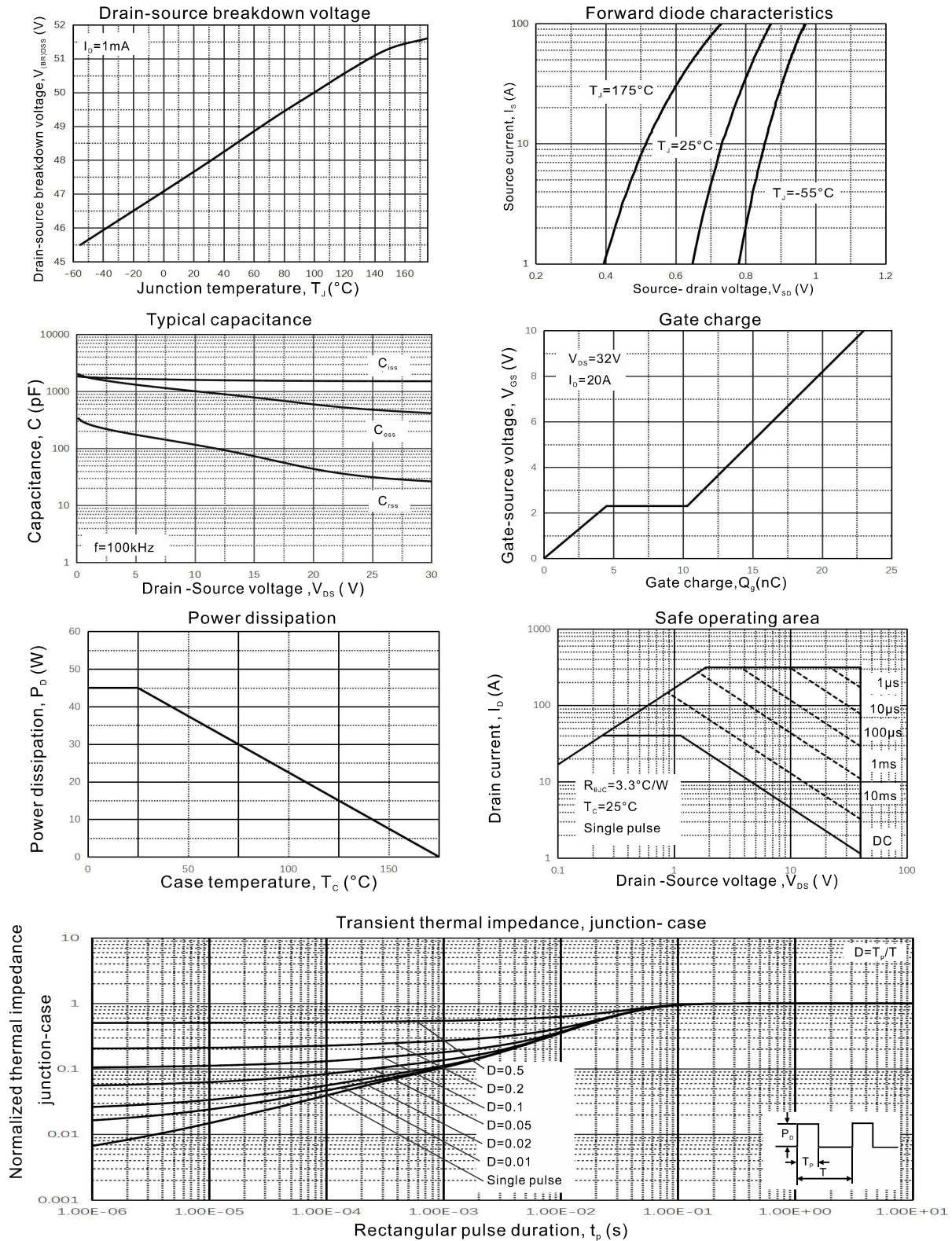
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Rating and characteristic curves



FMOSAB40N04A-Q1

Rating and characteristic curves



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Pinning information

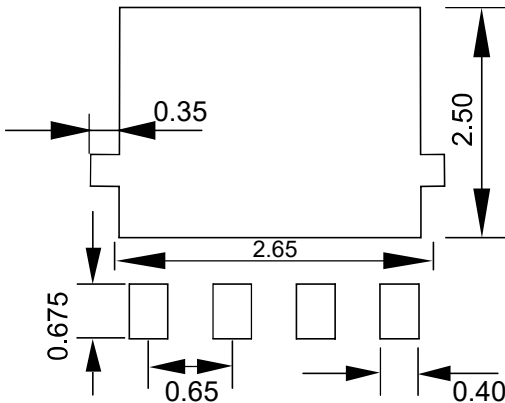
Pin	Simplified outline	Symbol
Pin 1, 2, 3 Source Pin 4 Gate Pin 5, 6, 7, 8 Drain	Top view Bottom view	

Marking

Type number	Marking code
FMOSAB40N04A-Q1	AB40N04A

Suggested solder pad layout

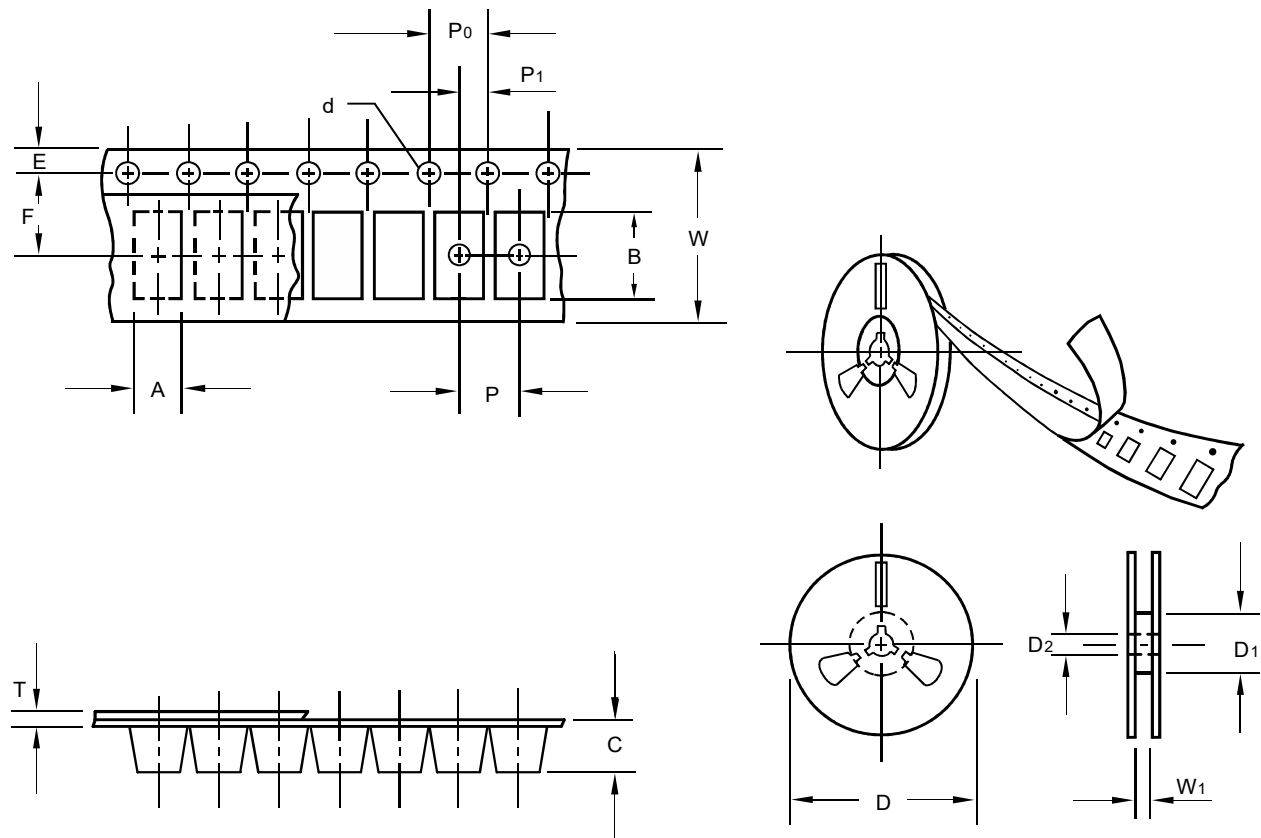
T3333P8



Note:
1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.1\text{mm}$
3. The pad layout is for reference purposes only.

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Packing information



unit:mm

Item	Symbol	Tolerance	T3333P8
Carrier width	A	0.1	3.55
Carrier length	B	0.1	3.55
Carrier depth	C	0.1	1.10
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	13.00
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	12.40

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

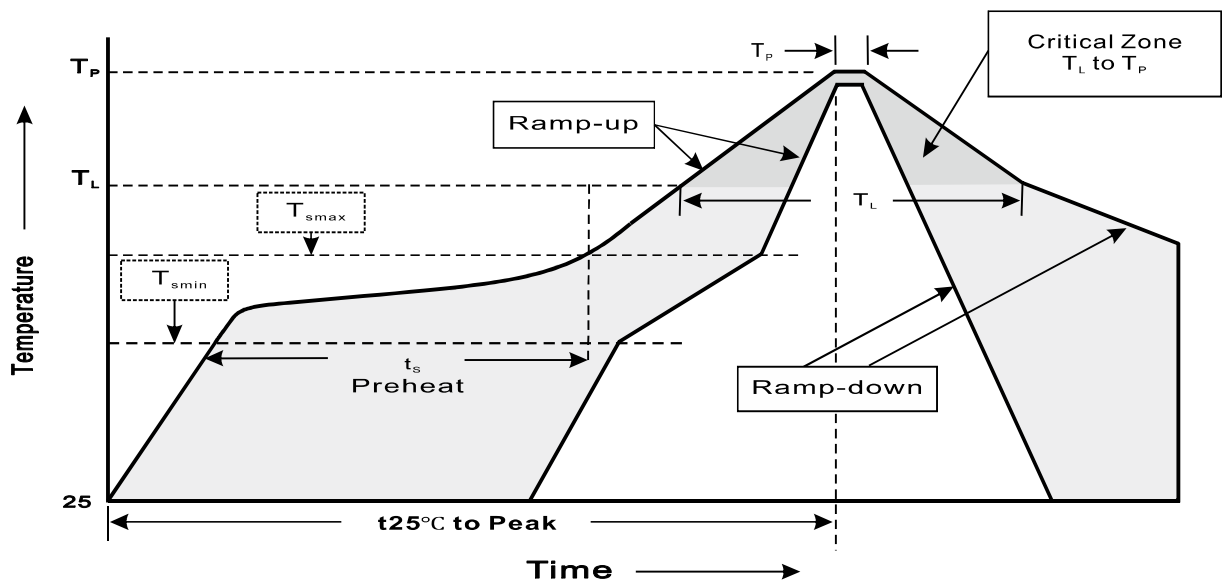
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Reel packing

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)
T3333P8	13"	5,000	8.0	10,000	355*335*38	330	350*330*360	80,000

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

FMOSAB40N04A-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	$V_{DS}=V_{DS}^{*}80\%$ ($T_J=T_J^{max.}$) 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