

FMOSGTQC330N10-Q1-H

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FMOSGTQC330N10-Q1-H

330A 100V N-Channel Shield Gate Trench Enhancement Mode Power MOSFET

Features

- $V_{DS}=100V$, $I_D=330A$.
- $R_{DS(ON)} \leq 2.0m\Omega$, @ $V_{GS}=10V$, $I_D=20A$.
- Very low on-resistance.
- Excellent gate charge x on-resistance product (FOM).
- 100% UIS and R_g and ΔV_{ds} tested.
- Qualified to AEC-Q101 standards for high reliability.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

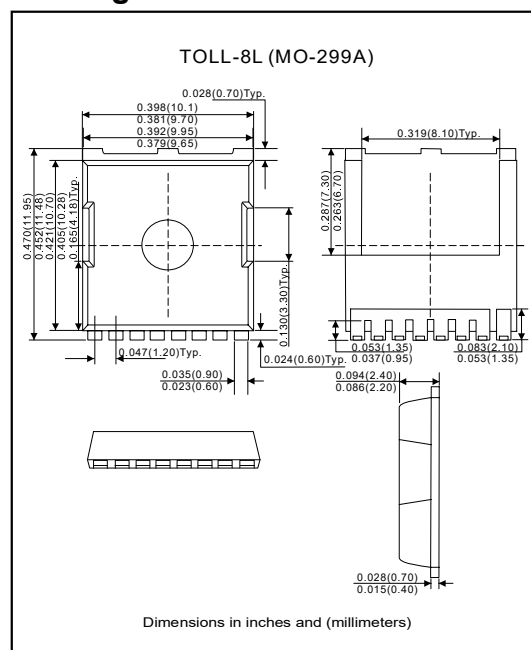
Applications

- Automotive application.
- DC/DC converter.
- Ideal for high-frequency switching and synchronous rectification.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case: Molded plastic, TOLL-8L (MO-299A).
- Weight : Approximated 760mg.

Package outline

Maximum ratings (At $T_c=25^\circ C$ unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	100	V
Gate-source voltage	V_{GS}	± 20	V
Continuous drain current	I_D	330	A
		240	
Pulsed drain current (Note 1)	I_{DM}	1320	A
Single pulsed, avalanche energy (Note 4)	E_{AS}	2975	mJ
Derating factor	-	2.67	W/ $^\circ C$
Power dissipation	P_D	400	W
Thermal resistance, junction to case	$R_{\theta JC}$	0.38	$^\circ C/W$
Junction temperature	T_J	+175	$^\circ C$
Storage temperature range	T_{STG}	-55 to +175	$^\circ C$

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	BV_{DS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	100			V
Drain-source leakage current	I_{DSS}	$V_{DS}=100\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate-source leakage current	I_{GSS}	$V_{GS}=\pm 20\text{V}$, $V_{DS}=0\text{V}$			± 100	nA

On characteristics (Note2)

Gate threshold voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2	3	4	V
Static drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=20\text{A}$		1.5	2.0	m Ω
Forward transconductance	g_{FS}	$V_{DS}=5\text{V}$, $I_D=165\text{A}$		200		S

Dynamic parameters (Note3)

Input capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=1.0\text{MHz}$		17000	22100	pF
Out capacitance	C_{oss}			1500	1950	
Reverse transfer capacitance	C_{rss}			77	155	
Gate resistance	R_g	$f=1.0\text{MHz}$	0.2	2.8	4.0	Ω

Switching parameters (Note3)

Total gate charge ($V_{GS}=10\text{V}$)	Q_g	$V_{GS}=10\text{V}$, $V_{DS}=50\text{V}$, $I_D=20\text{A}$		252	327.5	nC
Gate to source charge	Q_{gs}			72	93.5	
Gate to drain charge	Q_{gd}			63	82	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=50\text{V}$, $V_{GS}=10\text{V}$, $I_D=20\text{A}$, $R_g=1.6\Omega$		37		ns
Rise time	t_r			29		
Turn-off delay time	$t_{d(off)}$			82		
Fall time	t_f			34		

Source-drain diode ratings and characteristics

Drain-source diode forward voltage (Note3)	V_{SD}	$I_S=20\text{A}$, $V_{GS}=0\text{V}$			1.2	V
Continuous drain-source diode forward current (Note2)	I_S				330	A
Body diode reverse recovery time	t_{rr}	$I_F=20\text{A}$, $T_J=25^\circ\text{C}$, $di/dt=100\text{A}/\mu\text{s}$ (Note2)		105	210	ns
Body diode reverse recovery charge	Q_{rr}			290	580	nC

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

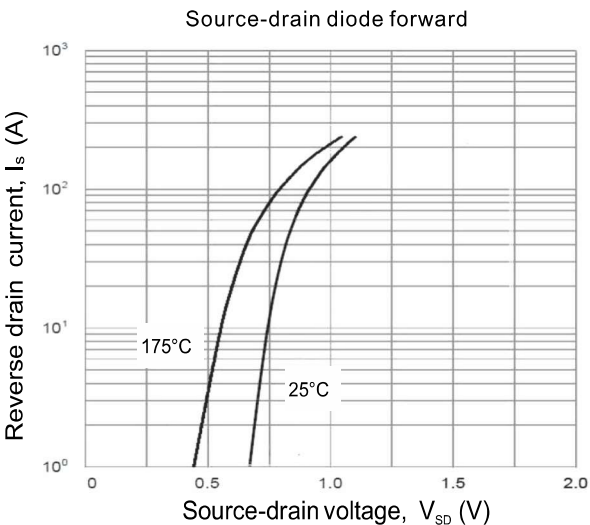
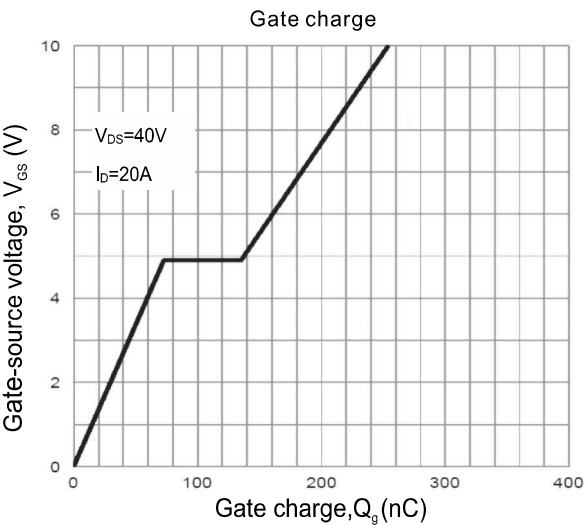
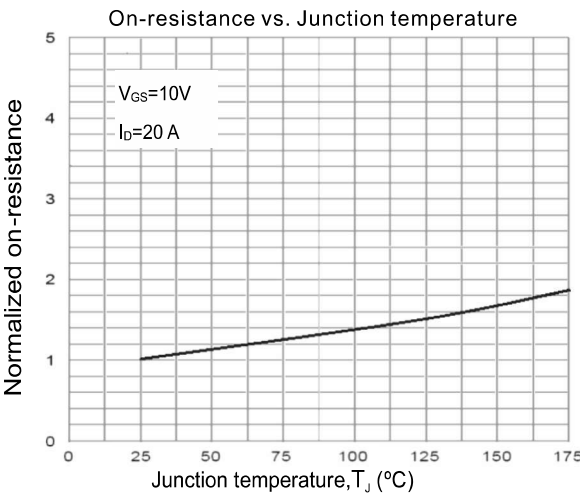
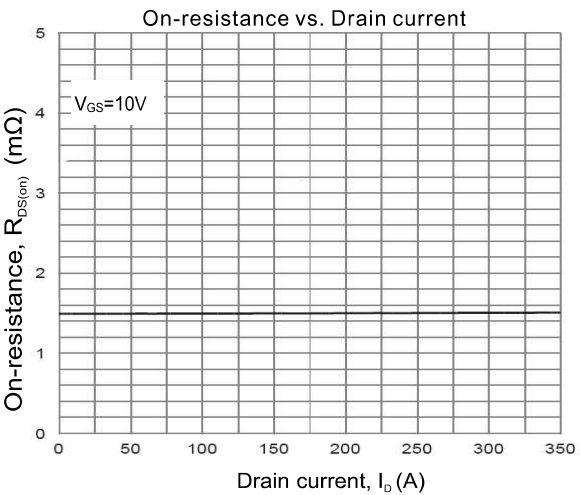
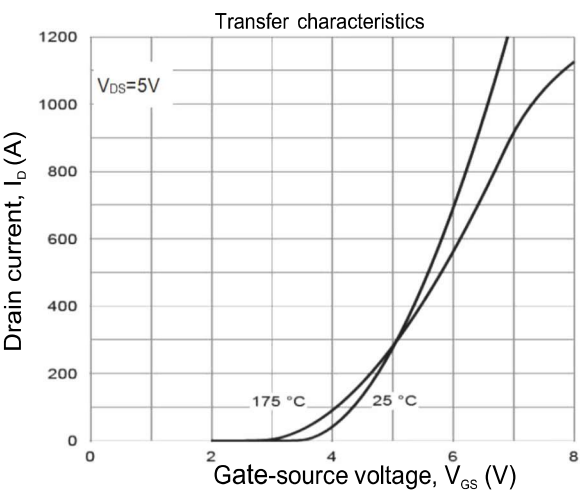
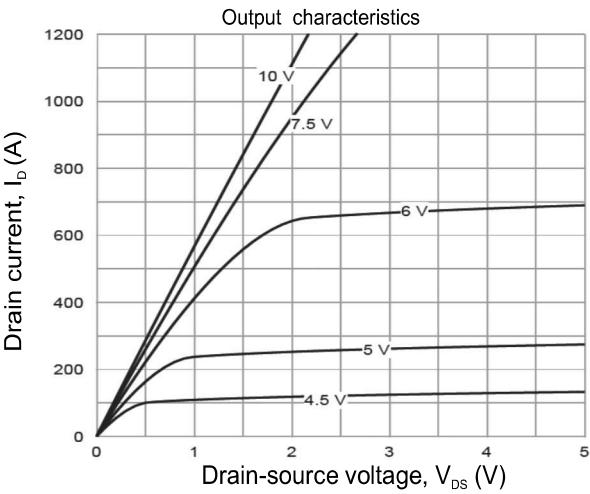
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it.

3. Guaranteed by design, not subject to production.

4. E_{AS} condition: $T_J=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $V_G=10\text{V}$, $L=0.5\text{mH}$, $R_g=25\Omega$.

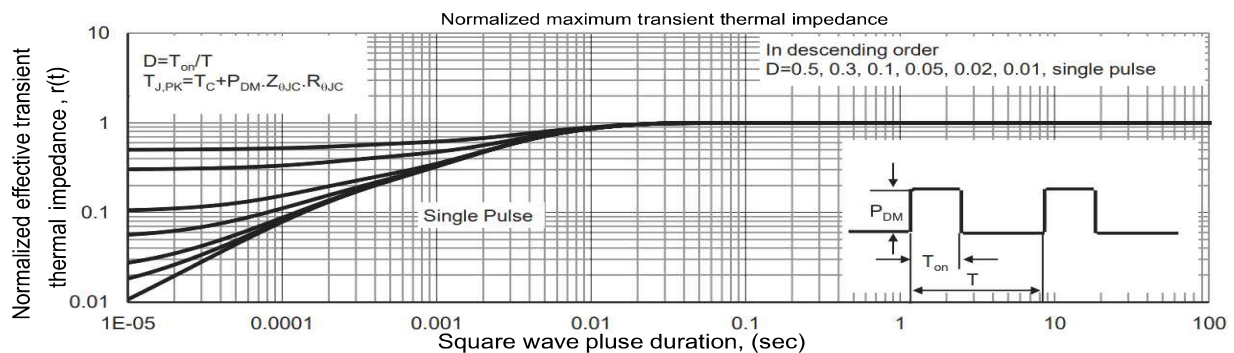
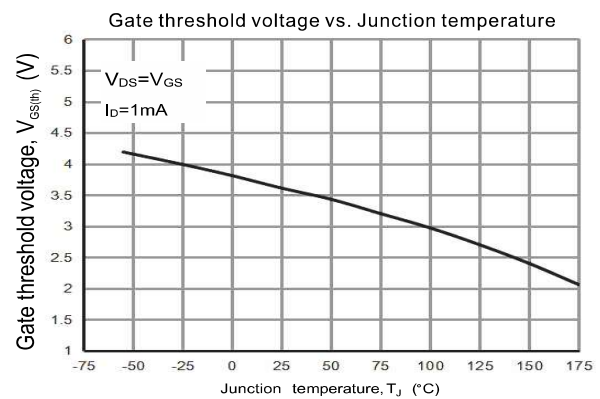
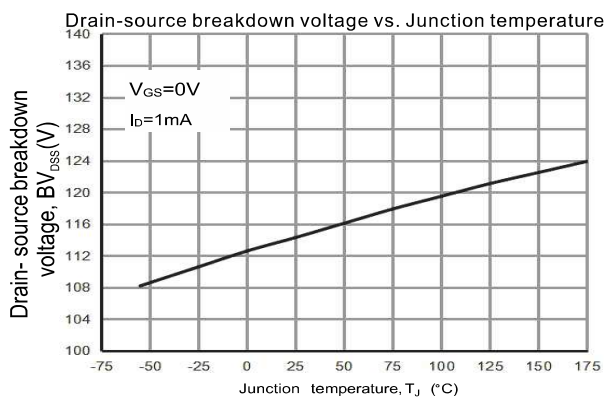
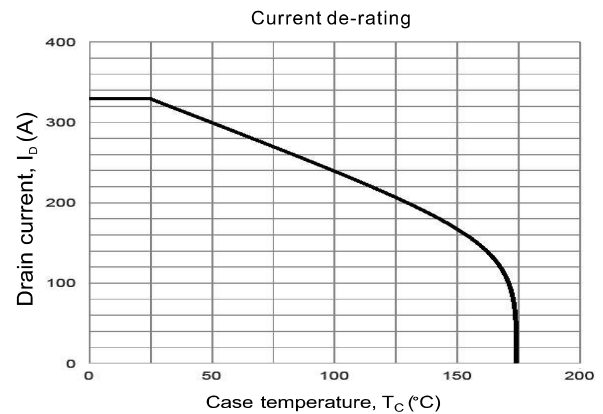
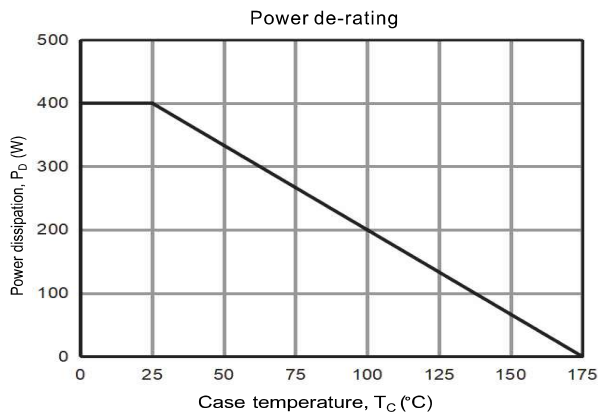
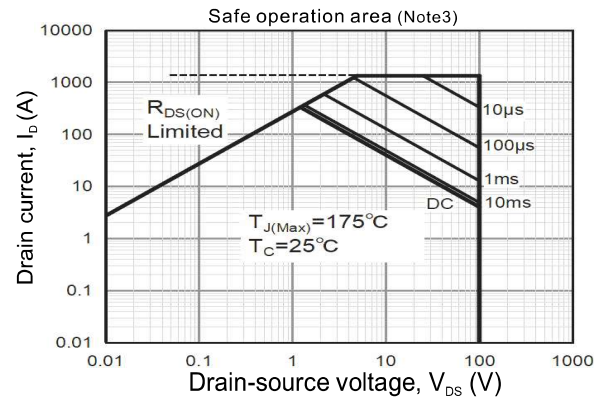
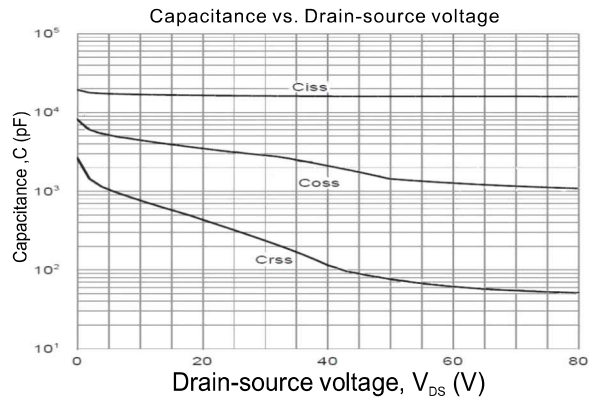
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Rating and characteristics curves



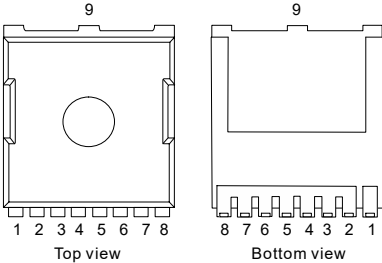
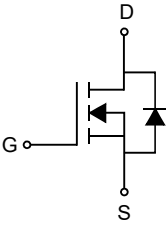
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Rating and characteristics curves



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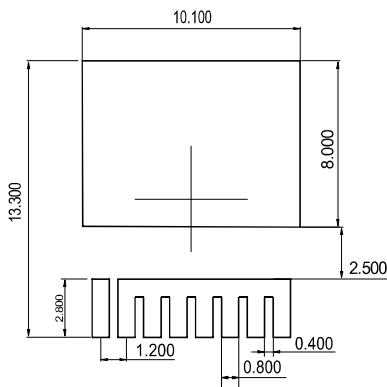
Pinning information

Pin	Simplified outline	Symbol
Pin 1 Gate Pin 2, 3, 4, 5, 6, 7, 8 Source Pin 9 Drain		

Marking

Type number	Marking code
FMOSGTQC330N10-Q1-H	AP020N10LL

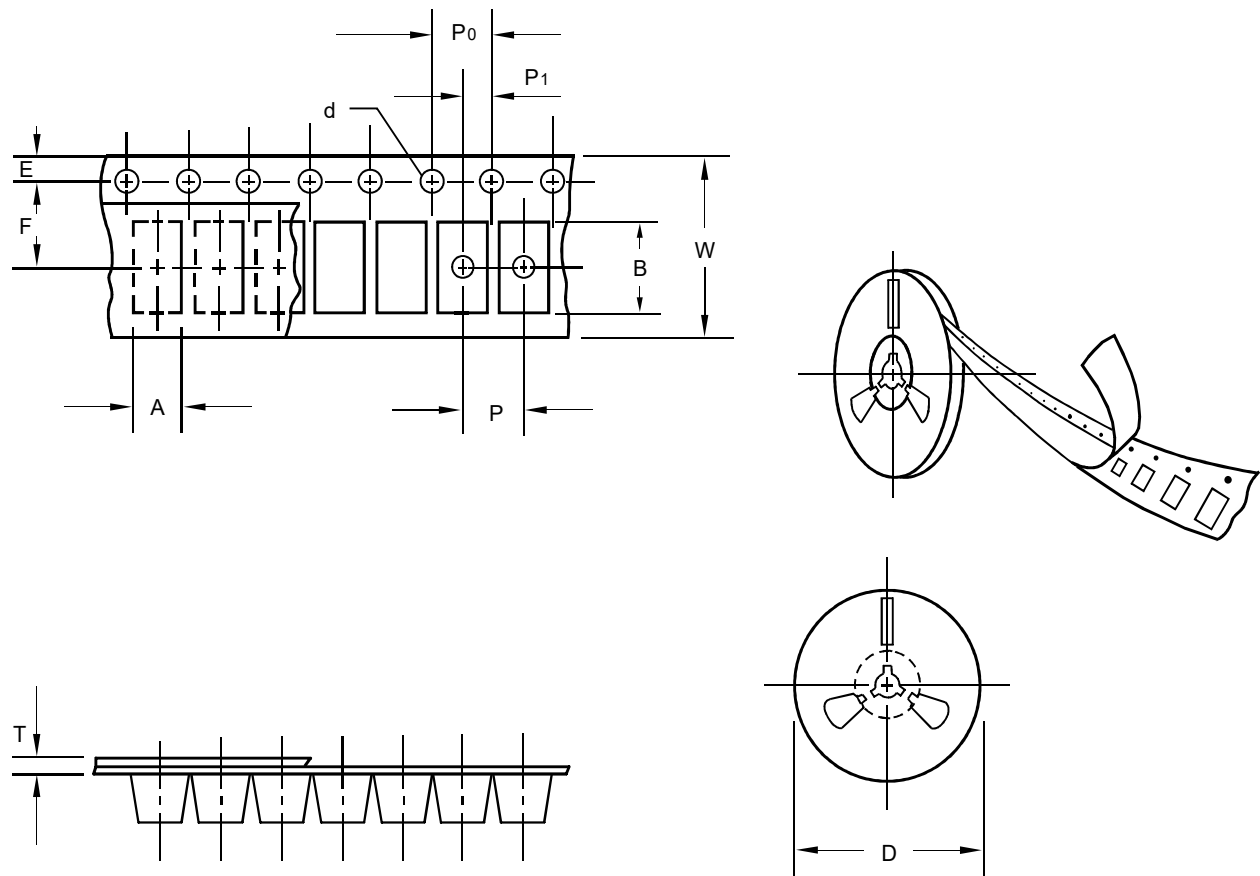
Suggested solder pad layout



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

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Packing information



unit:mm

Item	Symbol	Tolerance	TOLL-8L
Carrier width	A	0.5	12.28
Carrier length	B	0.5	10.50
Sprocket hole	d	0.1	1.50
13" Reel outside diameter	D	2.0	330.0
7" Reel outside diameter	D	2.0	-
7" Reel inner diameter	D1	min	-
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.1	11.50
Punch hole pitch	P	0.1	12.0
Sprocket hole pitch	P0	0.1	4.0
Embossment center	P1	0.1	2.0
Overall tape thickness	T	0.3	0.3
Tape width	W	0.5	24.0

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

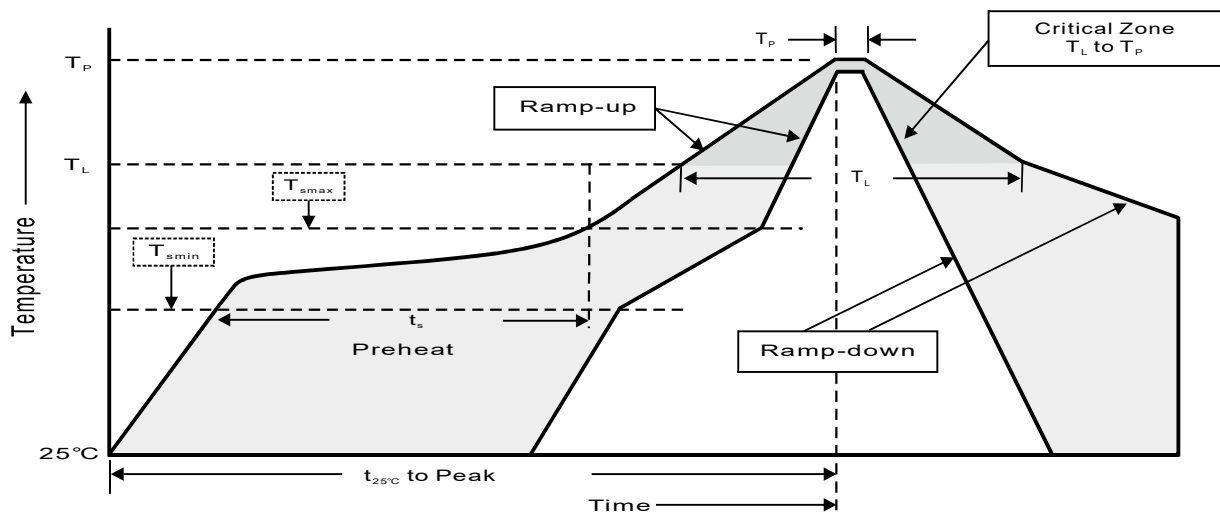
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Reel packing

DEVICE	PACKAGE	REEL SIZE	REEL (pcs)
FMOSGTQC330N10-Q1-H	TOLL-8L	13"	2,000

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 ~ 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

FMOSGTQC330N10-Q1-H**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	$P=2\text{atm}$ $T_a=121^\circ\text{C}$ $\text{RH}=100\%$ 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