FMOSVNP3439E-Q1-H

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FMOSVNP3439E-Q1-H

20V N-Channel and -20V P-Channel Enhancement Mode MOSFET ESD Protection

Features

N-channel:

•V_{DS}=20V, I_D=0.75A.

•$R_{DS(ON)}$≤ 380mΩ, @V_{GS}=4.5V, I_D=0.65A.

•$R_{DS(ON)}$≤ 450mΩ, @V_{GS}=2.5V, I_D=0.55A.

P-channel:

•-V_{DS}=20V, -I_D=0.66A.

•$R_{DS(ON)}$≤ 520mΩ, @ -V_{GS}=4.5V, -I_D=1.0A.

•$R_{DS(ON)}$≤ 700mΩ, @ -V_{GS}=2.5V, -I_D=0.8A.

•Low on-resistance.

•Operated at low logic level gate drive.

•ESD protected gate.

•Qualified to AEC-Q101 standards for high reliability.

•Lead-free parts meet RoHS requirements.

•Halogen-free (IEC61249-2-21).

Application

• Load/power switch and Interfacing switching.

• Battery management for ultra small portable electronics.

• Logic level shift.

Mechanical data

• Epoxy:UL94-V0 rated flame retardant.

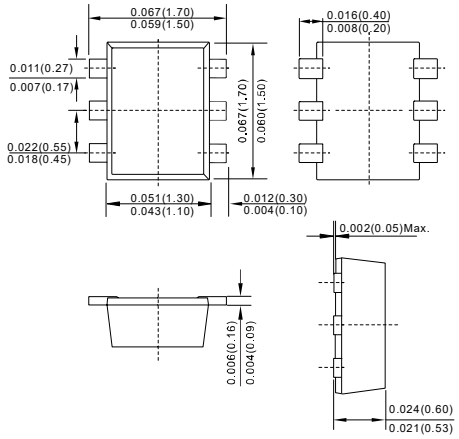
• Case : Molded plastic, SOT-563.

• Terminals : Solder plated, solder able per MIL-STD-750, Method 2026.

• Mounting position : Any.

Package outline

SOT-563



Dimensions in inches and (millimeters)

Maximum ratings (At T_A=25°C unless otherwise noted)

Parameter	Symbol	Ratings		Unit
		N-Channel	P-Channel	
Drain to source voltage	V_{DS}	20	-20	V
Gate-source voltage	V_{GS}	±12	±12	V
Continuous drain current (note1)	I_D	0.75	-0.66	A
Pulsed drain current (t_p=10μs)	I_{DM}	1.8	-1.2	A
Thermal resistance, junction to ambient (note1)	$R_{\theta JA}$	833		°C/W
Lead temperature for soldering purposes (1/8" from case for 10s)	T_L	260		°C
Junction temperature	T_J	+150		°C
Storage temperature range	T_{STG}	-55 to + 150		°C

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Electrical characteristics (N-Channel) (At T_A=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off characteristics						
Drain-source breakdown voltage	BV_{DSS}	I_D=250μA, V_{GS}=0V	20			V
Drain-source leakage current	I_{DSS}	V_{DS}=20V, V_{GS}=0V			1	μA
Gate-source leakage current	I_{GSS}	V_{GS}=±10V, V_{DS}=0V			±20	μA
On characteristics						
Gate threshold voltage (Note2)	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	0.35		1.1	V
Static drain-source on-state resistance (Note2)	$R_{DS(ON)}$	V_{GS}=4.5V, I_D=0.65A			380	mΩ
		V_{GS}=2.5V, I_D=0.55A			450	
		V_{GS}=1.8V, I_D=0.45A			800	
Forward tranconductance (Note2)	g_{FS}	V_{DS}=10V, I_D=0.8A		1.6		S
Dynamic parameters (Note4)						
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=16V, f=1.0MHz		79	120	pF
Out capacitance	C_{oss}			13	20	
Reverse transfer capacitance	C_{rss}			9	15	
Switching parameters (Note3, 4)						
Turn-on delay time	$t_{d(on)}$	V_{DS}=10V, V_{GS}=4.5V, I_D=500mA, R_{GEN}=10Ω		6.7		ns
Turn-on rise time	t_r			4.8		
Turn-off delay time	$t_{d(off)}$			17.3		
Turn-off fall time	t_f			7.4		
Source-drain diode ratings and characteristics						
Diode forward voltage	V_{SD}	I_S=0.15A, V_{GS}=0V			1.2	V

Note : 1. Surface mounted on FR4 board using the minimum recommended pad size.
2. Pulse test : pulse width = 300us, duty cycle≤ 2%.
3. Switching characteristics are independent of operating junction temperature.
4. Graranted by design, not subject to producting.

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Electrical characteristics (P-Channel) (At T_A=25°C unless otherwise specified)

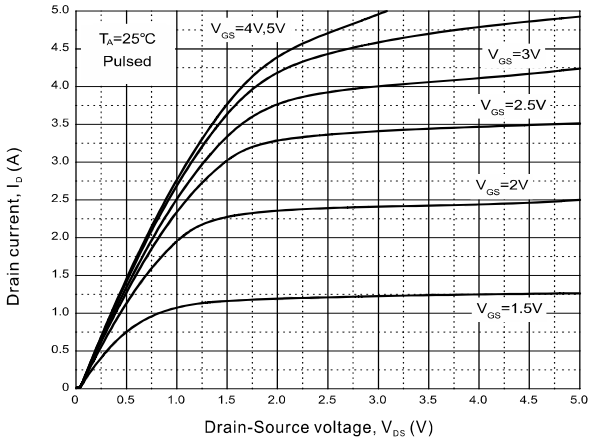
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off characteristics						
Drain-source breakdown voltage	$-BV_{DSS}$	$-I_D$=250μA, V_{GS}=0V	20			V
Drain-source leakage current	$-I_{DSS}$	$-V_{DS}$=20V, V_{GS}=0V			1	μA
Gate-source leakage current	I_{GSS}	V_{GS}=±10V, V_{DS}=0V			±20	μA
On characteristics						
Gate threshold voltage (Note2)	$-V_{GS(TH)}$	V_{DS}=V_{GS}, $-I_D$=250μA	0.35		1.1	V
Static drain-source on-state resistance (Note2)	$R_{DS(ON)}$	$-V_{GS}$=4.5V, $-I_D$=1.0A		270	520	mΩ
		$-V_{GS}$=2.5V, $-I_D$=0.8A		320	700	
		$-V_{GS}$=1.8V, $-I_D$=0.5A		950		
Forward tranconductance (Note2)	g_{FS}	$-V_{DS}$=10V, $-I_D$=0.54A		1.2		S
Dynamic parameters (Note4)						
Input capacitance	C_{iss}	V_{GS}=0V, $-V_{DS}$=16V, f=1.0MHz		113	170	pF
Out capacitance	C_{oss}			15	25	
Reverse transfer capacitance	C_{rss}			9	15	
Switching parameters (Note3, 4)						
Turn-on delay time	$t_{d(on)}$	$-V_{DS}$=10V, $-V_{GS}$=4.5V, $-I_D$=200mA, R_{GEN}=10Ω		9		ns
Turn-on rise time	t_r			5.8		
Turn-off delay time	$t_{d(off)}$			32.7		
Turn-off fall time	t_f			20.3		
Source-drain diode ratings and characteristics						
Diode forward voltage	$-V_{SD}$	$-I_S$=0.5A, V_{GS}=0V			1.2	V

Note : 1. Surface mounted on FR4 board using the minimum recommended pad size.
2. Pulse test : pulse width = 300us, duty cycle≤ 2%.
3. Switching characteristics are independent of operating junction temperature.
4. Graranted by design, not subject to producting.

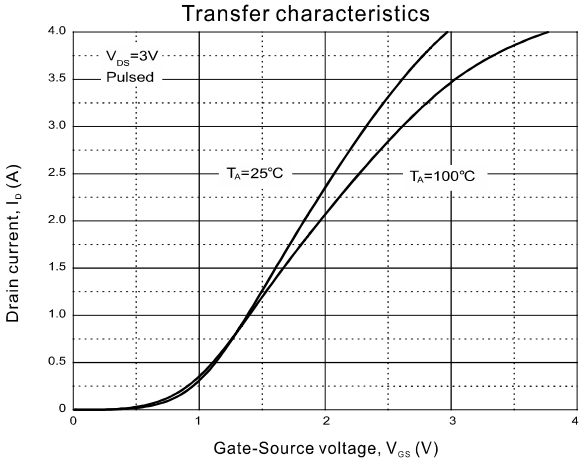
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Rating and characteristic curves (N-channel)

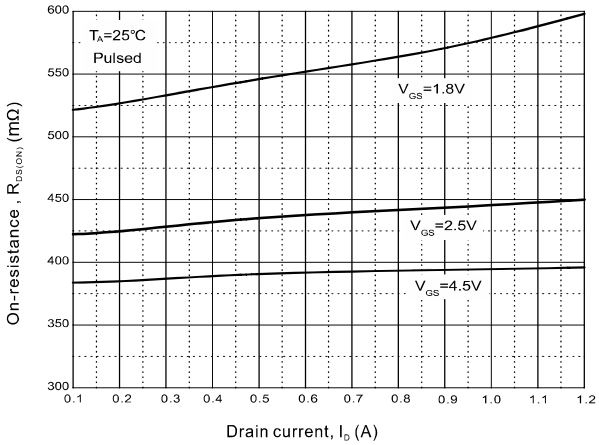
Output characteristics



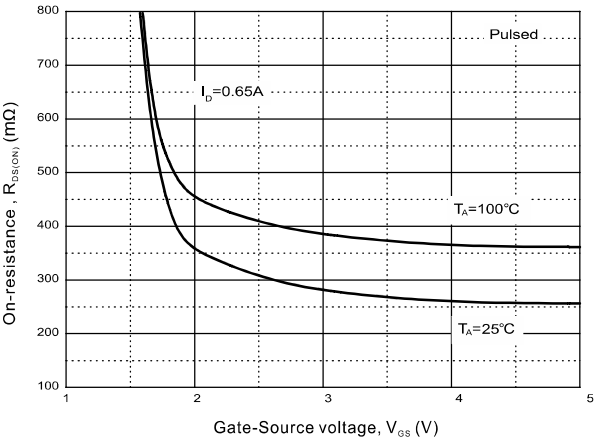
Transfer characteristics



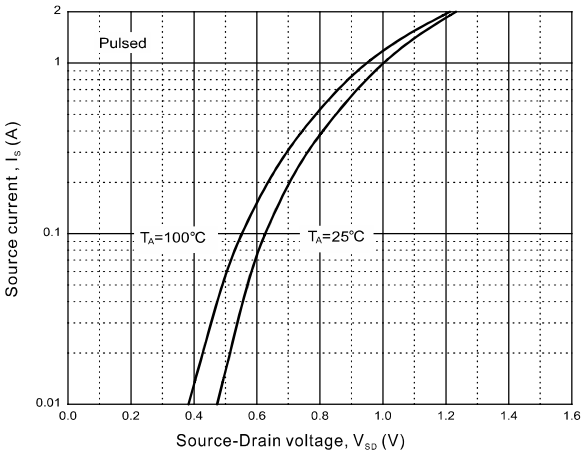
On-resistance vs. Drain current



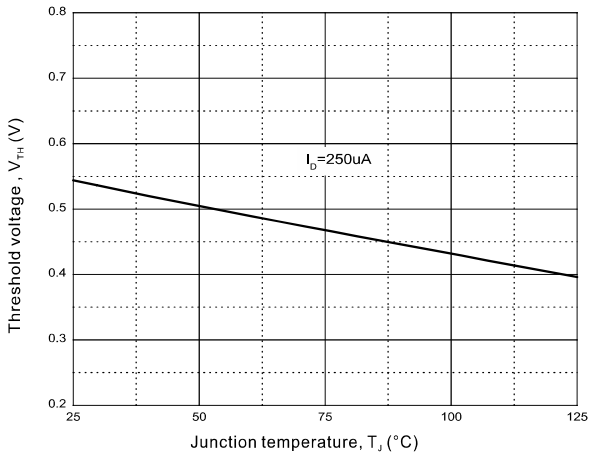
On-resistance vs. Gate-source voltage



Source current vs. Source-drain voltage



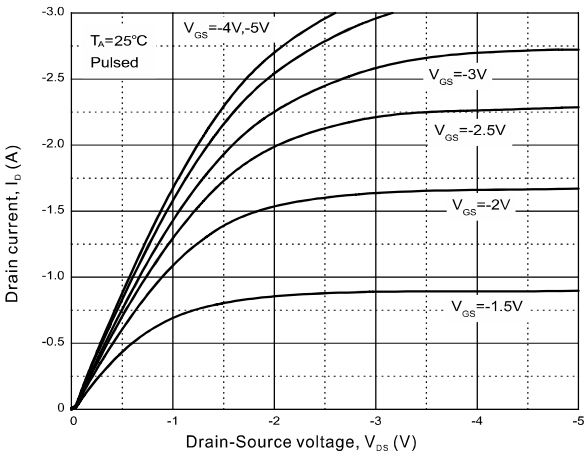
Threshold voltage



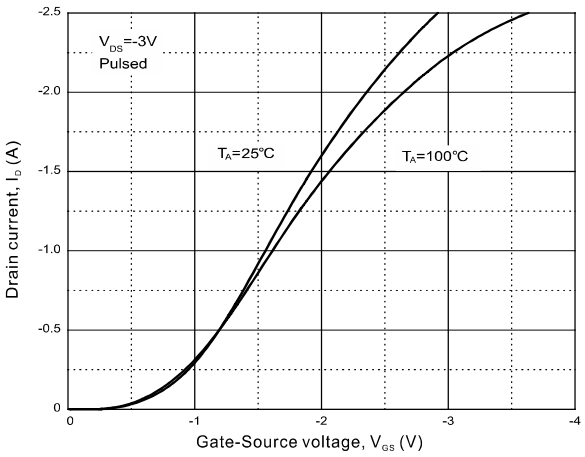
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Rating and characteristic curves (P-channel)

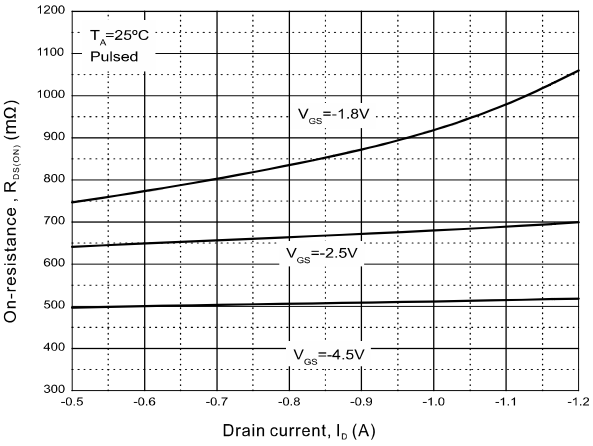
Output characteristics



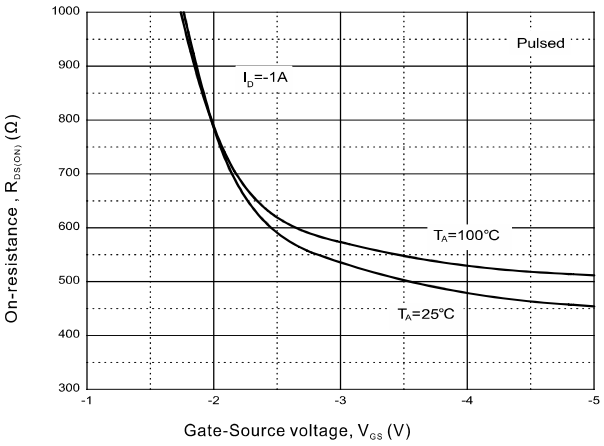
Transfer characteristics



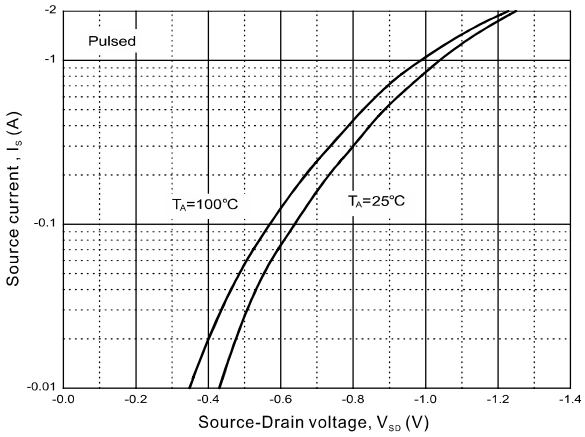
On-resistance vs. Drain current



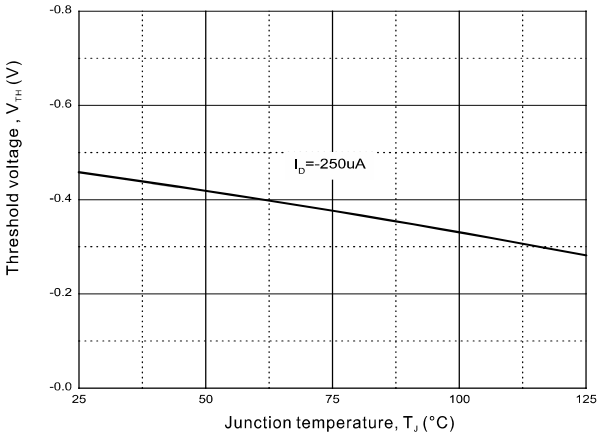
On-resistance vs. Gate-Source volta



Source current vs. Source-drain voltage

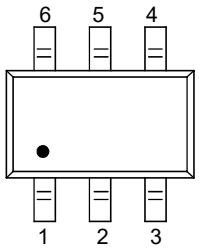
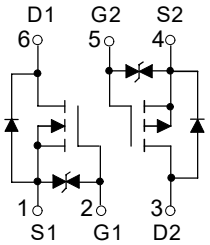


Threshold voltage



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Pinning information

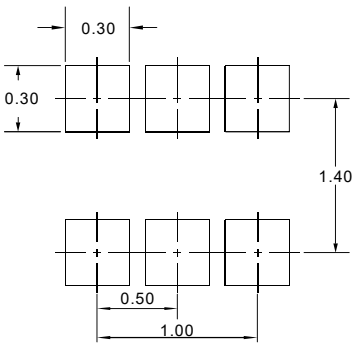
Pin	Simplified outline	Symbol
Pin1 Source1 Pin2 Gate1 Pin3 Drain2 Pin4 Source2 Pin5 Gate2 Pin6 Drain1		

Marking

Type number	Marking code
FMOSVNP3439E-Q1-H	49K

Suggested solder pad layout

SOT-563

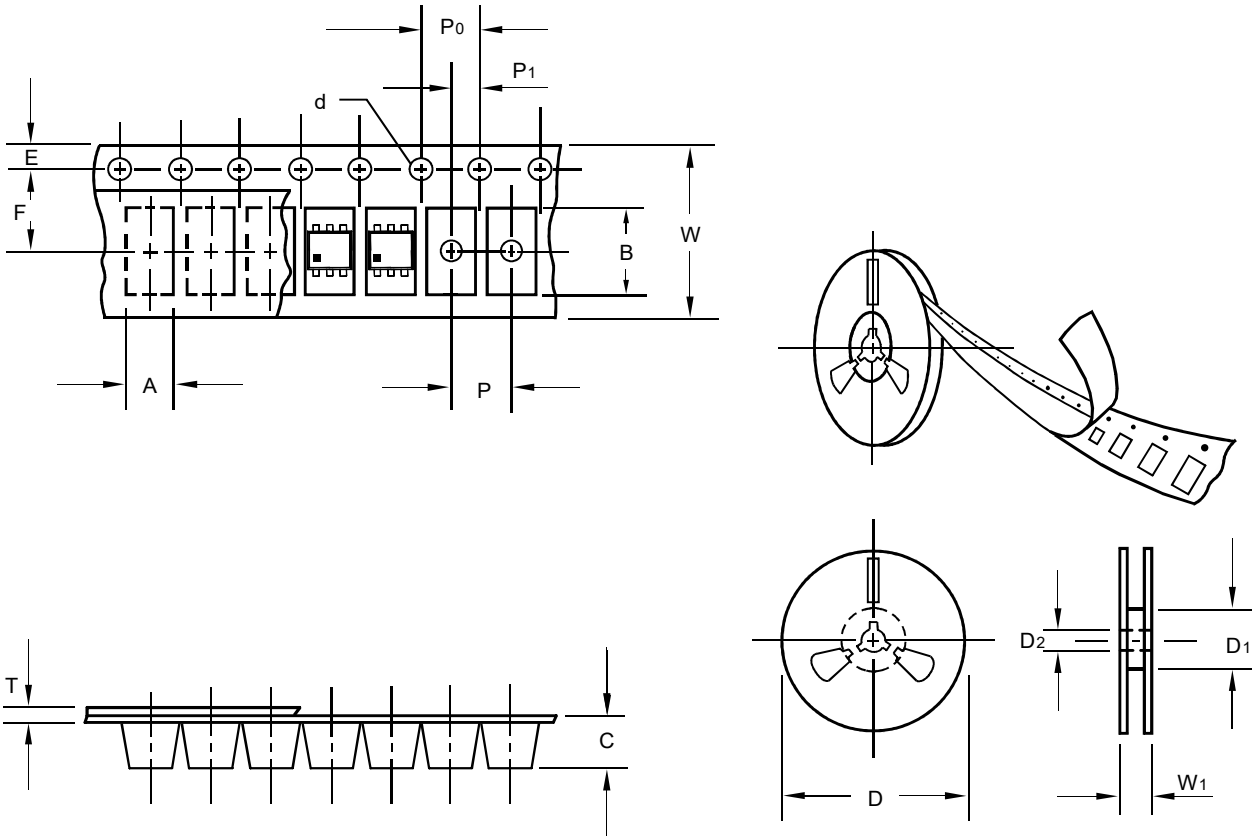


Dimensions in millimeters

Note :
1. Controlling dimension : in millimeters.
2. General tolerance : ± 0.05mm.
3. The pad layout is for reference purposes only.

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Packing information



unit:mm

Item	Symbol	Tolerance	SOT-563
Carrier width	A	0.1	1.78
Carrier length	B	0.1	1.78
Carrier depth	C	0.1	0.69
Sprocket hole	d	0.1	1.50
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D_1	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D_1	min	54.00
Feed hole diameter	D_2	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	P_0	0.1	4.00
Embossment center	P_1	0.1	2.00
Overall tape thickness	T	0.1	0.23
Tape width	W	0.3	8.00
Reel width	W_1	1.0	12.10

Note:Devices are packed in accor dance with EIA standar RS-481-A and specifications listed above.

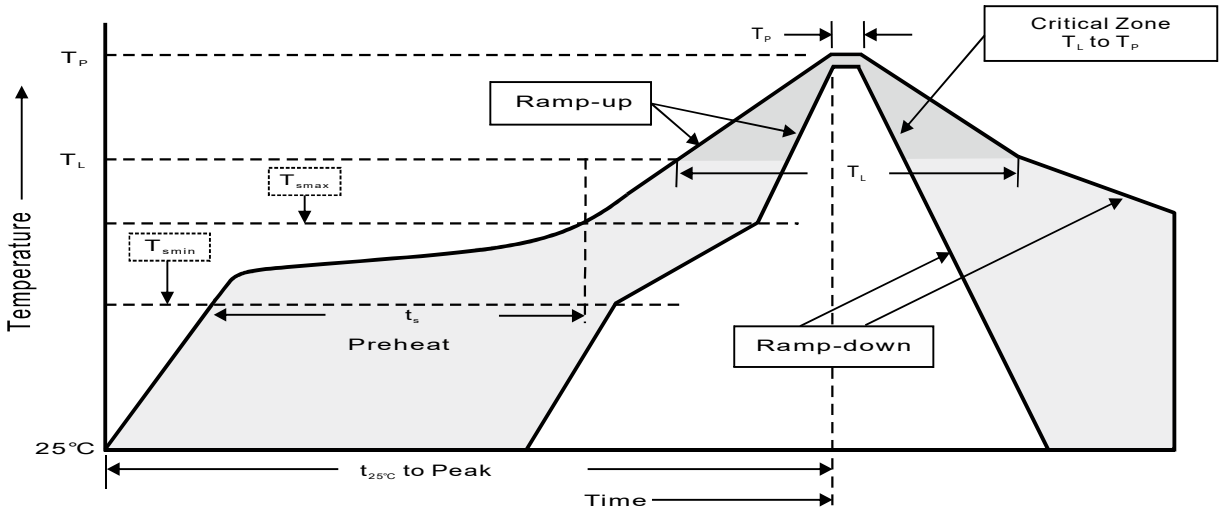
FMOSVNP3439E-Q1-H

Reel packing

TYPE NUMBER	PACKAGE	REEL SIZE	REEL (pcs)	REEL DIA, (m/m)
FMOSVNP3439E-Q1-H	SOT-563	7"	3,000	178

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 ℃/sec
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (Min to Max) (t_s)	 150℃ 200℃ 60 ~ 120 sec
T_{smax} to T_L - Ramp-up rate	 < 3 ℃/sec
Time maintained above : - Temperature (T_L) - Time (T_L)	 217℃ 60 ~ 260 sec
Peak temperature (T_P)	255 ℃ -0/+5℃
Time with 5℃ of actual peak temperature (T_P)	10 ~30 sec
Ramp-down rate	< 6 ℃/sec
Time 25℃ to peak temperature	< 6 minutes

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High reliability test capabilities

Item	Conditions	Reference
1. MSL Preconditioning	24hr bake @125°C+168hrs @85°C / 85%RH + 3 x I_{DSS} @260°C + 1flux Immersion + Alcohol + DI H2O rinse	JESD22-A113
2. High Temperature Reverse Bias	V_{DS} = V_{DS} x 80% (T_J = T_J max.) Test Duration : 1000hrs	JESD22-A108
3. High Temperature Storage Life	T_A = 150°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 = 2Atm T_A = 121°C RH = 100% Test Duration : 96hrs	JESD22 A-102
6. Solder ability	245 ± 5°C for 5sec	J-STD-002
7. Moisture Resistance	T_A = 85°C / 85% Relative Humidity Test Duration : 1000hrs	MIL-STD-750E METHOD 1021.2
8. Resistance To Solder Heat	260±5°C for 10sec	JESD22 B-106
9. High Temperature High Humidity Reverse Bias	T_A = 85°C, 85% RH, V_{DS} = 80% rated V_{DS} Test Duration : 1000hrs	JESD22-A101