

FMOSAB59N04-Q1

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FMOSAB59N04-Q1

59A 40V N-Channel Enhancement Mode Power MOSFET

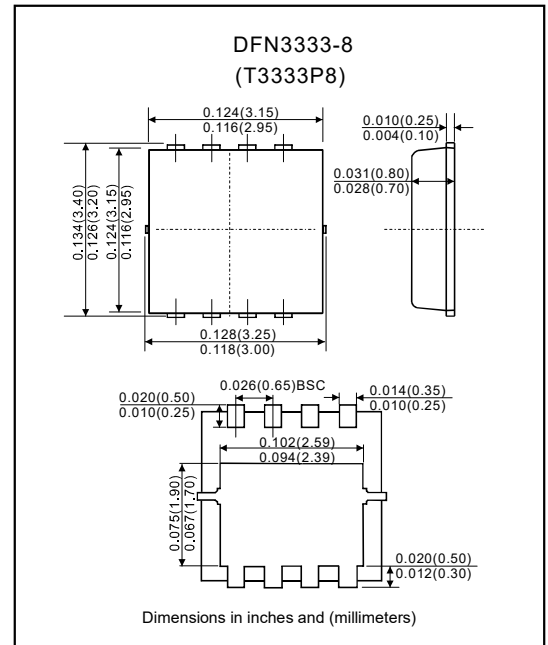
Features

- $V_{DS}=40V$, $I_D=59A$.
- $R_{DS(ON)} \leq 6.0m\Omega$ @ $V_{GS}=10V$, $I_D=20A$.
- Ultra-low on-resistance.
- Low gate charge.
- 100% UIS and R_g tested.
- Qualified to AEC-Q101 standards for high reliability.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" dinicates Halogen-free part, ex.FMOSAB59N04-Q1-H.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, DFN3333-8 (T3333P8).
- 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 (Note 1)	I_D	59	A
		42	
Pulsed drain current (Note 2)	I_{DM}	235	A
Avalanche energy (Note 3)	E_{AS}	96	mJ
Power dissipation (Note 4)	P_D	37	W
		18.3	
Thermal resistance, junction to ambient	$R_{\theta JA}$	74	$^\circ C/W$
Thermal resistance Junction to case	$R_{\theta JC}$	5.0	$^\circ C/W$
Operating Junction temperature	T_J	+175	$^\circ C$
Storage temperature range	T_{STG}	-55 to +175	$^\circ C$

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

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Static parameters						
Drain-source breakdown voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	BV_{DSS}	40			V
Drain-source leakage current	$V_{DS}=32\text{V}$, $V_{GS}=0\text{V}$	I_{DSS}			1	μA
	$V_{DS}=32\text{V}$, $V_{GS}=0\text{V}$, $T_J=55^{\circ}\text{C}$				5	
Gate-source leakage current	$V_{GS}=\pm 20\text{V}$, $V_{DS}=0\text{V}$	I_{GSS}			± 100	nA
Gate threshold voltage	$V_{GS}=V_{DS}$, $I_D=250\mu\text{A}$	$V_{GS(TH)}$	2.2	2.8	3.4	V
Static drain-source on-resistance	$V_{GS}=10\text{V}$, $I_D=20\text{A}$	$R_{DS(ON)}$		4.8	6	m Ω
Forward transconductance	$V_{DS}=5\text{V}$, $I_D=20\text{A}$	g_{FS}		84		S

Dynamic parameters (Note 5)

Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1.0\text{MHz}$	R_g		2.5		Ω
Input capacitance	$V_{GS}=0\text{V}$, $V_{DS}=20\text{V}$, $f=1.0\text{MHz}$	C_{iss}		1032		pF
Out capacitance		C_{oss}		630		
Reverse transfer capacitance		C_{rss}		34		

Switching parameters (Note 5)

Total gate charge	$V_{GS}=10\text{V}$, $V_{DS}=20\text{V}$, $I_D=20\text{A}$	Q_g		15.4		nC
	$V_{GS}=6\text{V}$, $V_{DS}=20\text{V}$, $I_D=20\text{A}$			9.4		
Gate to source charge	$V_{GS}=0$ to 10V , $V_{DS}=20\text{V}$, $I_D=20\text{A}$	Q_{gs}		5.4		nC
Gate to drain charge		Q_{gd}		2.7		
Turn-on delay time	$V_{DS}=20\text{V}$, $V_{GS}=10\text{V}$, $R_L=1\Omega$, $R_{GEN}=6\Omega$	$t_{d(on)}$		8.3		ns
Rise time		t_r		16.3		
Turn-off delay time		$t_{d(off)}$		15.4		
Fall time		t_f		4.4		

Source-drain diode ratings and characteristics

Maximum body diode continuous current	$T_C=25^{\circ}\text{C}$	I_S			37	A
Drain-source diode forward voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$	V_{SD}		0.68	1.0	V
Body diode reverse recovery time	$I_F=20\text{A}$, $dI_F/dt=100\text{A}/\mu\text{s}$	t_{rr}		26		ns
Body diode reverse recovery charge	$I_F=20\text{A}$, $dI_F/dt=100\text{A}/\mu\text{s}$	Q_{rr}		11		nC

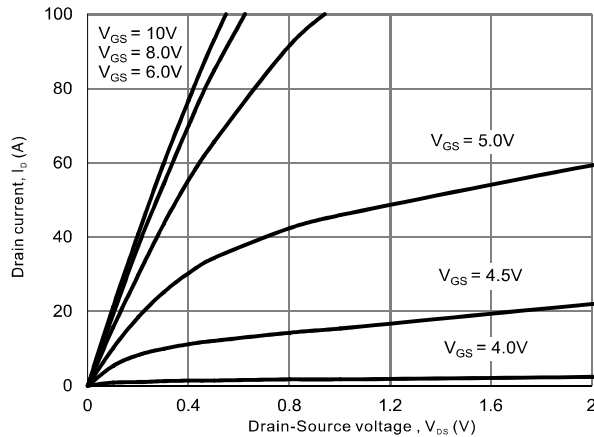
Note :

1. Computed continuous current assumes the condition of T_{J_Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under $T_{J_Max}=175^{\circ}\text{C}$.
3. E_{AS} of 96 mJ is based on starting $T_J=25^{\circ}\text{C}$, $L=3.0\text{mH}$, $I_{AS}=8\text{A}$, $V_{GS}=10\text{V}$, $V_{DD}=20\text{V}$; 100% test at $L=0.1\text{mH}$, $I_{AS}=27\text{A}$.
4. The power dissipation P_D is based on $T_{J_Max}=175^{\circ}\text{C}$.
5. This value is guaranteed by design hence it is not included in the production test.

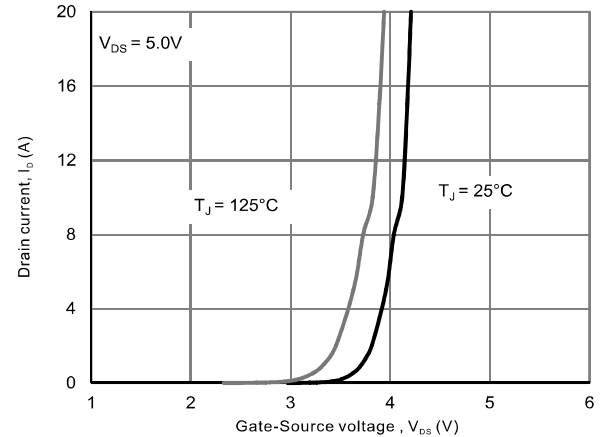
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Rating and characteristic curves

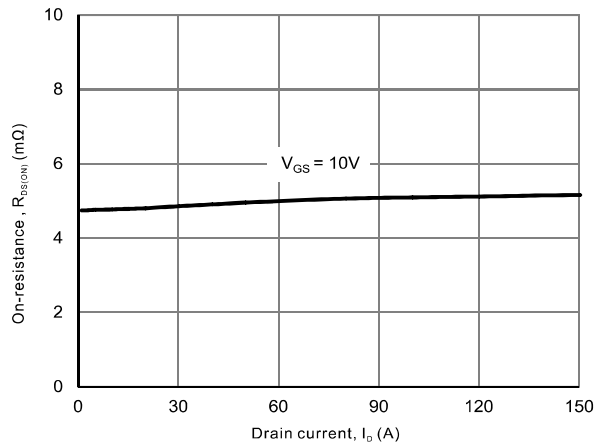
Saturation characteristics



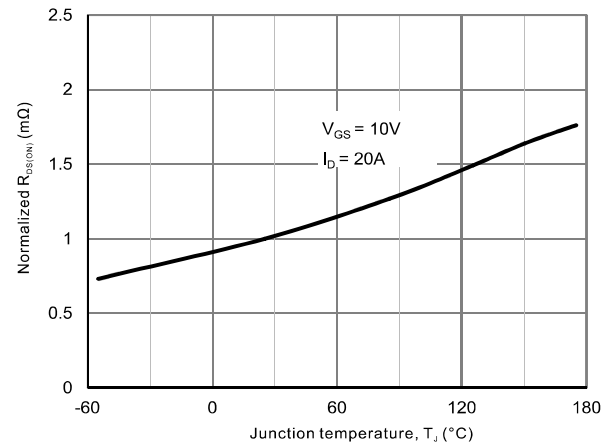
Transfer characteristics



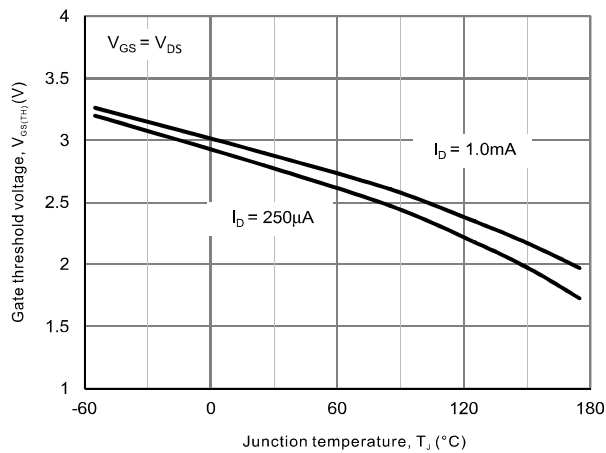
On-resistance vs. Drain current



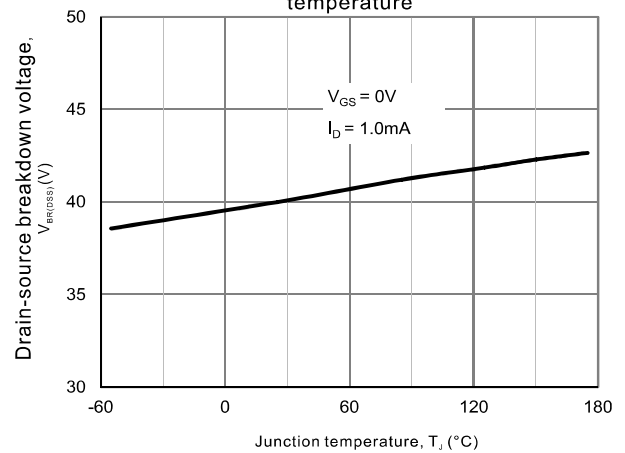
On-resistance vs. Junction temperature



Gate threshold voltage vs. Junction temperature



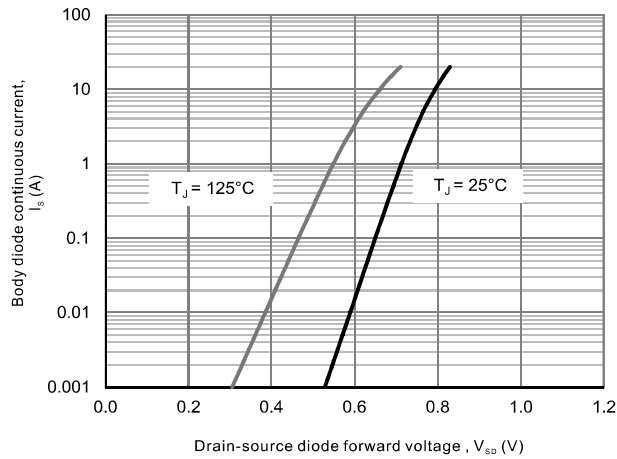
Drain-source breakdown voltage vs. Junction temperature



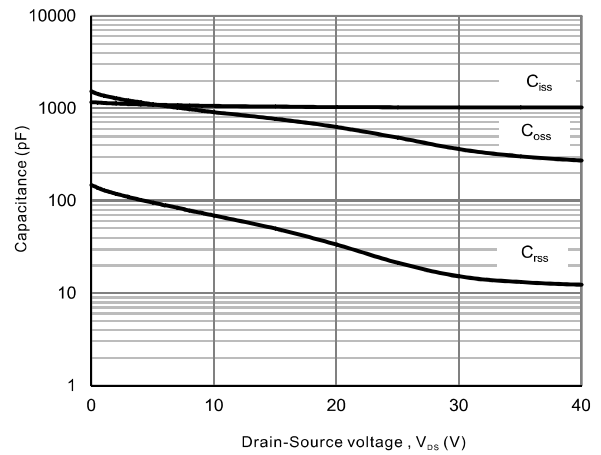
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Rating and characteristic curves

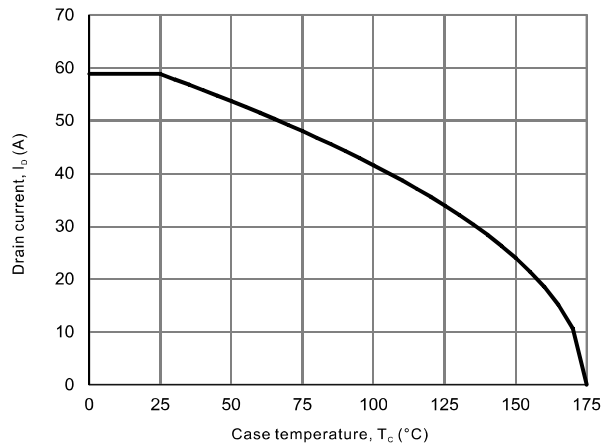
Body-diode characteristics



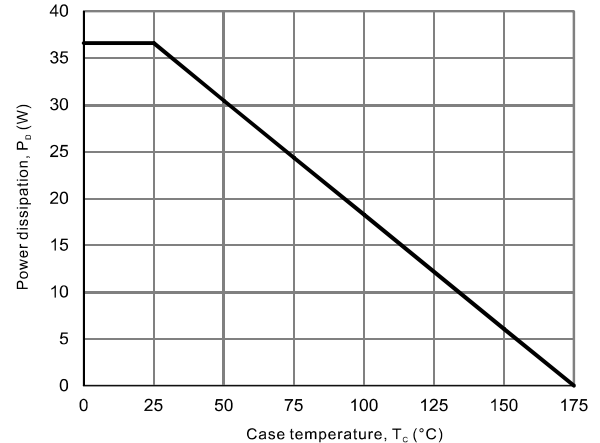
Capacitance characteristics



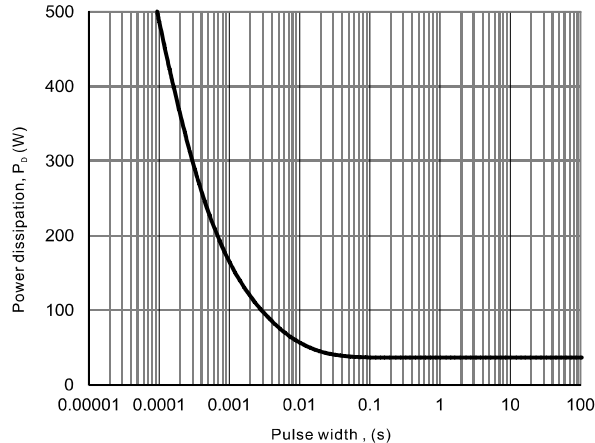
Current de-rating



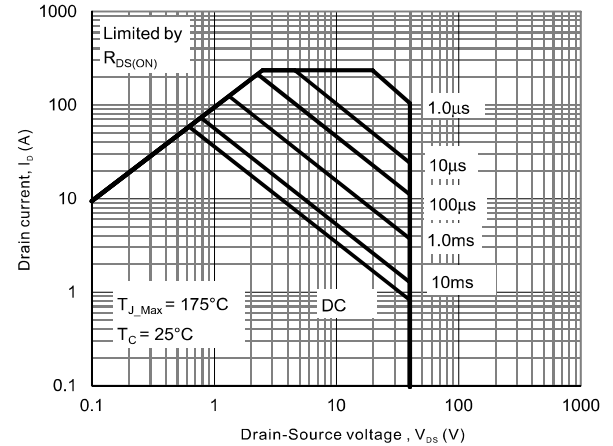
Power de-rating



Single pulse power rating, junction-case

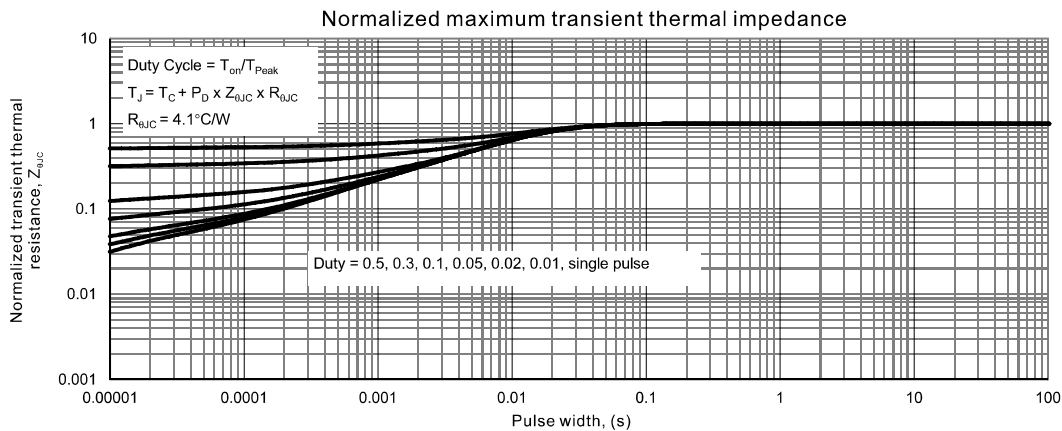


Maximum safe operating area



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Rating and characteristic curves



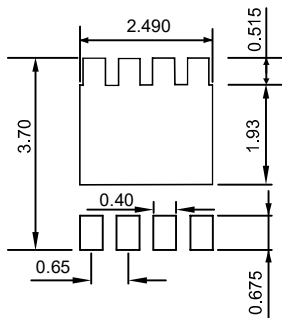
Pinning information

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

Marking

Type number	Marking Code
FMOSAB59N04-Q1	AB59N04

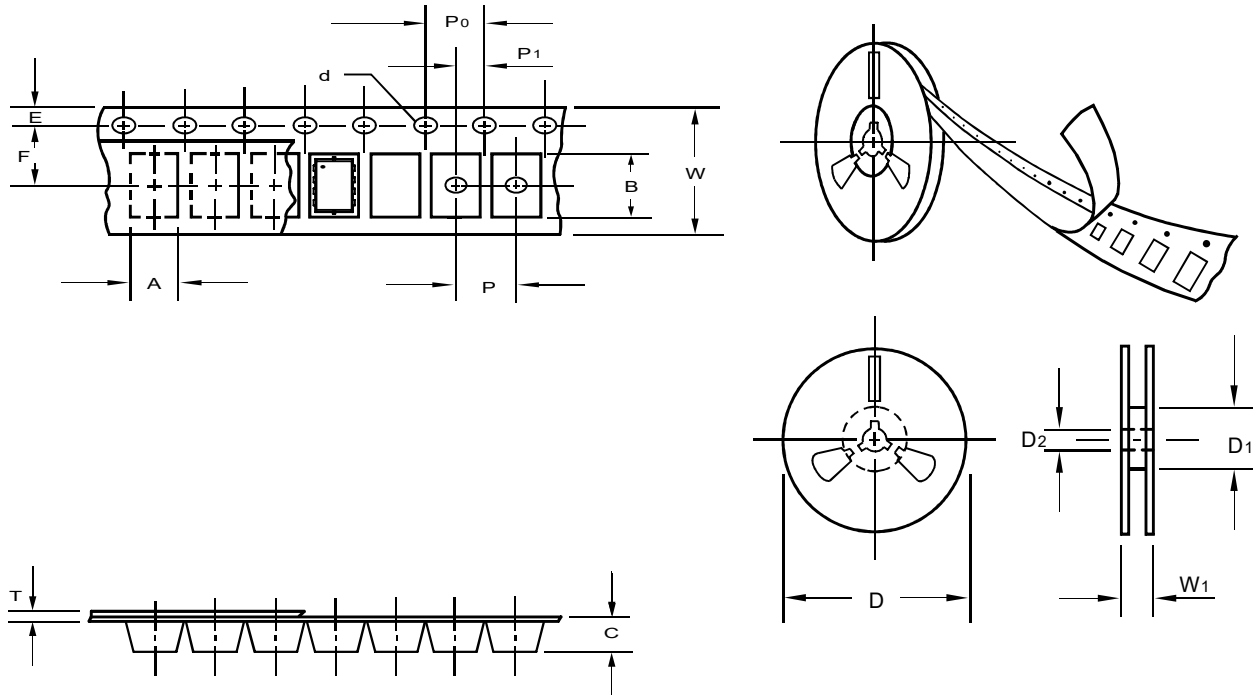
Suggested solder pad layout



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	DFN3333-8 (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
Overall tape thickness	T	0.1	0.23
Tape width	W	0.3	12.00
Reel width	W1	1.0	17.60

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

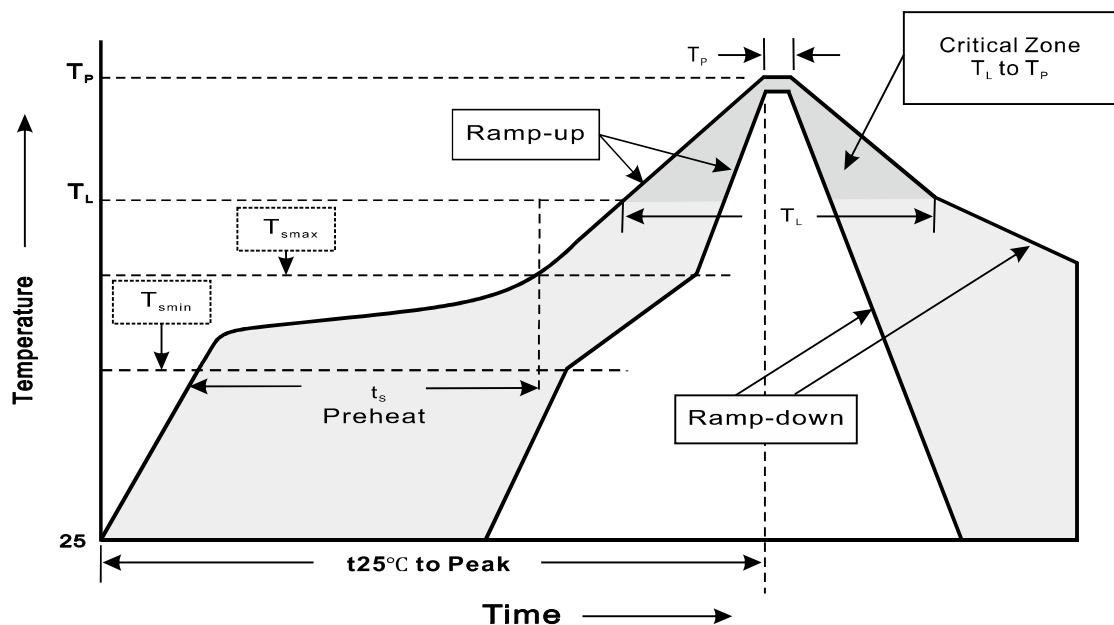
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Reel packing

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