

FMOSAB57N04-Q1

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FMOSAB57N04-Q1

57A 40V N-Channel Enhancement
Mode Power MOSFET

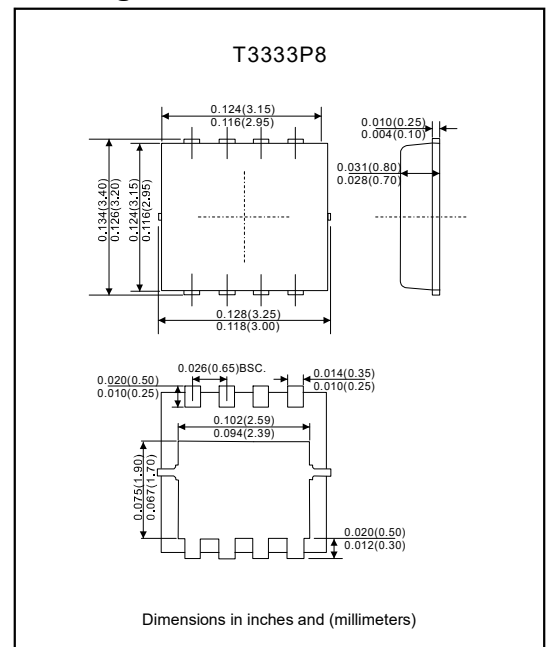
Features

- $V_{DS}=40V$, $I_D=57A$.
- $R_{DS(ON)} \leq 5.6m\Omega$, @ $V_{GS}=10V$, $I_D=20A$.
- $R_{DS(ON)} \leq 7.8m\Omega$, @ $V_{GS}=4.5V$, $I_D=15A$.
- Ultra-low on-resistance and 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" indicates Halogen-free part, ex. FMOSAB57N04-Q1-H.

Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, T3333P8(DFN3333-8).
- Terminals : Solder plated, solder able per MIL-STD-750, Method 2026.
- 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	$T_c=25^\circ C$ 57	A
		$T_c=100^\circ C$ 36	
Pulsed drain current (Note 2)	I_{DM}	230	A
Avalanche current (Note 3)	I_{AS}	27	A
Avalanche energy (Note 3)	E_{AS}	36	mJ
Power dissipation (Note 4)	P_D	$T_c=25^\circ C$ 30	W
		$T_c=100^\circ C$ 12.2	
Thermal resistance, junction to ambient	$R_{\theta JA}$	75	$^\circ C/W$
Thermal resistance Junction to case	$R_{\theta JC}$	4.9	$^\circ C/W$
Operating Junction temperature	T_J	+150	$^\circ C$
Storage temperature range	T_{STG}	-55 to +150	$^\circ C$

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

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Off characteristics						
Drain-source breakdown voltage	I _D =250μA, V _{GS} =0V	BV _{DSS}	40			V
Drain-source leakage current	V _{DS} =32V, V _{GS} =0V	I _{DSS}			1	μA
	V _{DS} =32V, V _{GS} =0V, T _J =55°C				5	
Gate-source leakage current	V _{GS} =±20V, V _{DS} =0V	I _{GSS}			±100	nA
On characteristics						
Gate threshold voltage	V _{GS} =V _{DS} , I _D =250μA	V _{GS(TH)}	1.2	1.6	2.5	V
Static drain-source on-resistance	V _{GS} =10V, I _D =20A	R _{DS(ON)}		4.5	5.6	mΩ
	V _{GS} =4.5V, I _D =15A			5.9	7.8	
Forward transconductance	V _{DS} =5V, I _D =20A	g _{FS}		74		S
Dynamic parameters (Note 5)						
Input capacitance	V _{GS} =0V, V _{DS} =20V, f=1.0MHz	C _{iss}		1204		pF
Out capacitance		C _{oss}		536		
Reverse transfer capacitance		C _{rss}		51		
Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1.0MHz	R _g		1.8		Ω
Switching parameters (Note 5)						
Total gate charge	V _{GS} =10V, V _{DS} =20V, I _D =20A	Q _g		17.9		nC
	V _{GS} =4.5V, V _{DS} =20V, I _D =20A	Q _g		9.7		
Gate to source charge	V _{GS} =0 to 10V, V _{DS} =20V, I _D =20A	Q _{gs}		3.2		
Gate to drain charge		Q _{gd}		4		
Turn-on delay time	V _{DS} =20V, V _{GS} =10V, R _L =1Ω, R _{GEN} =6Ω	t _{d(on)}		4.8		ns
Rise time		t _r		8.6		
Turn-off delay time		t _{d(off)}		23		
Fall time		t _f		15.2		
Source-drain diode ratings and characteristics						
Drain-source diode forward voltage	I _S =1A, V _{GS} =0V	V _{SD}		0.69	1	A
Maximum body diode continuous current	T _C =25°C	I _S			30	V
Body diode reverse recovery time	I _F =20A, dI _F /dt=100A/μs	t _{rr}		50		nS
Body diode reverse recovery charge	I _F =20A, dI _F /dt=100A/μs	Q _{rr}		42		nC

Notes : 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 $T_{J_{max}}=150^{\circ}\text{C}$.

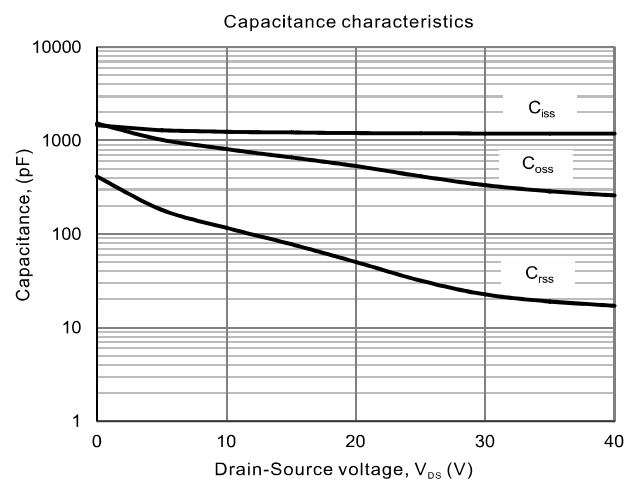
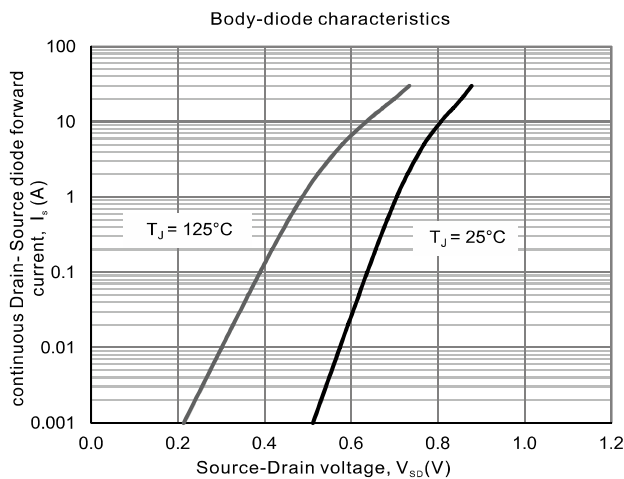
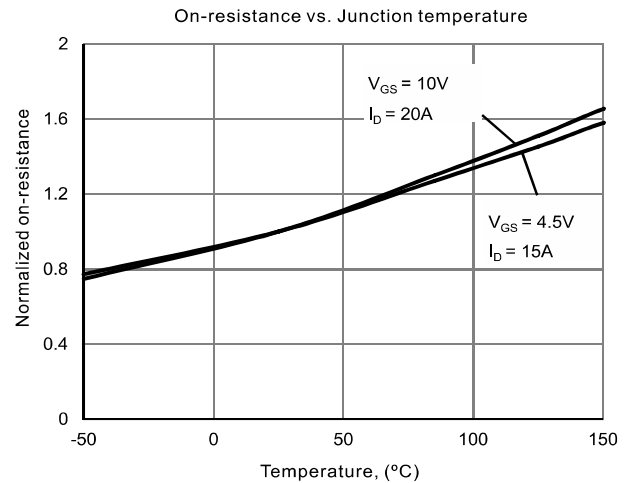
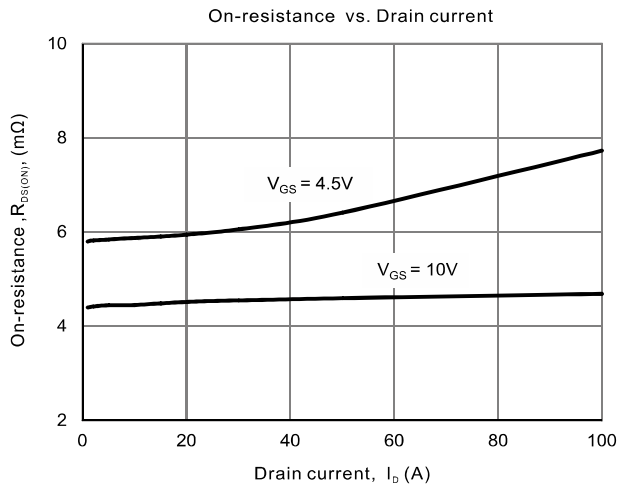
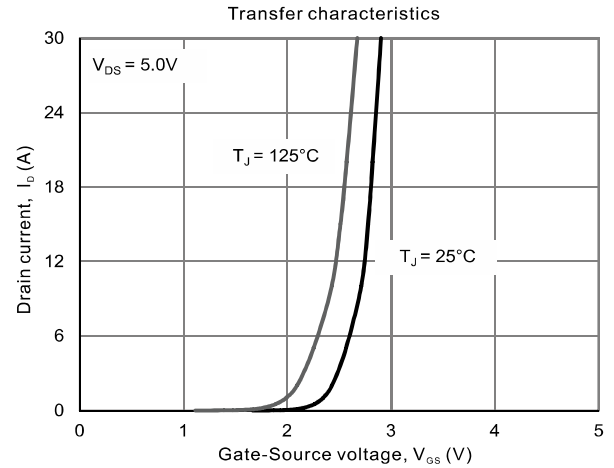
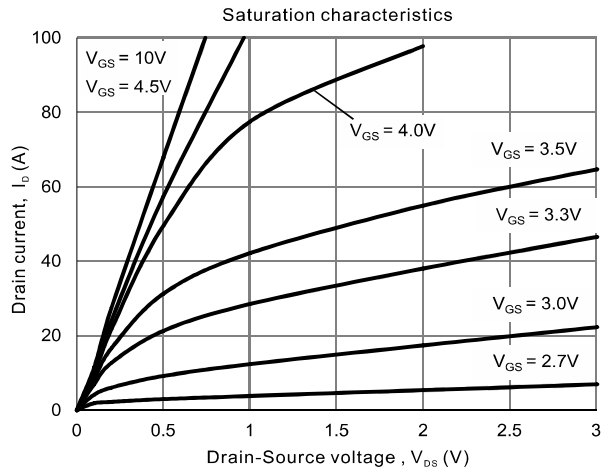
3. This single-pulse measurement was taken under the following condition [$L=100\mu\text{H}$, $V_{GS}=10\text{V}$, $V_{DS}=20\text{V}$] while its value is limited by $T_{J_{max}}=150^{\circ}\text{C}$.

4. The power dissipation P_D is based on $T_{J_{max}}=150^{\circ}\text{C}$.

5. This value is guaranteed by design hence it is not included in the production test.

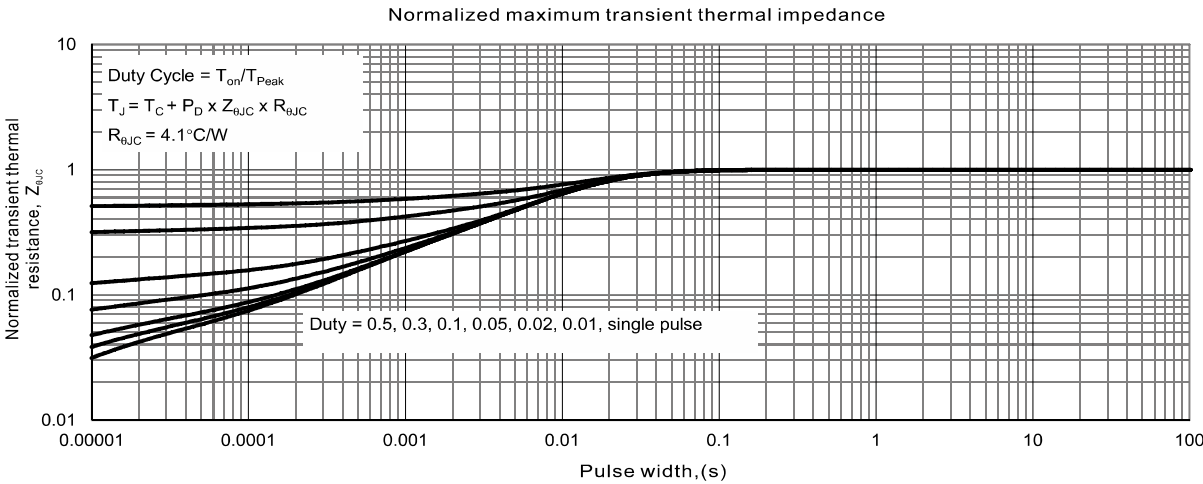
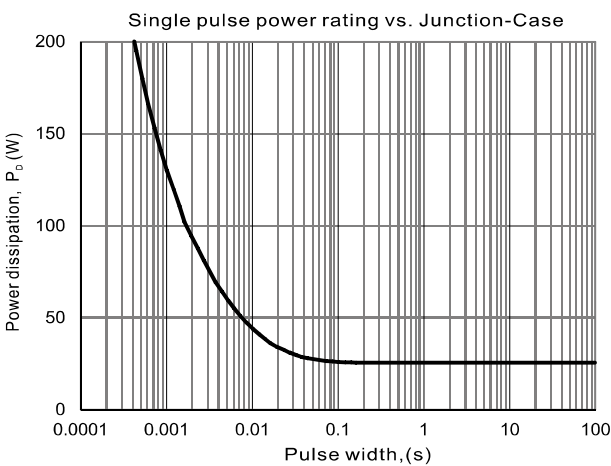
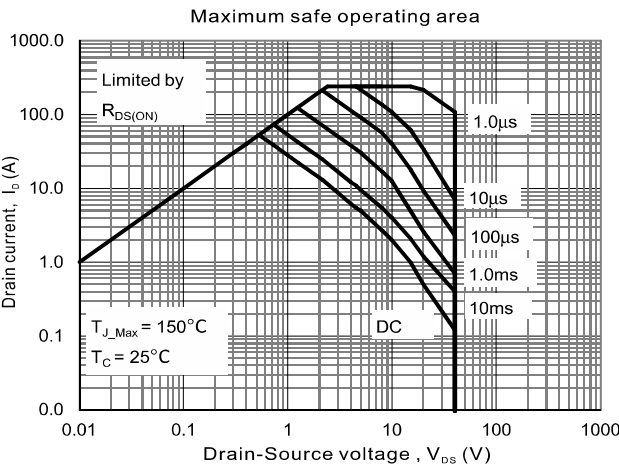
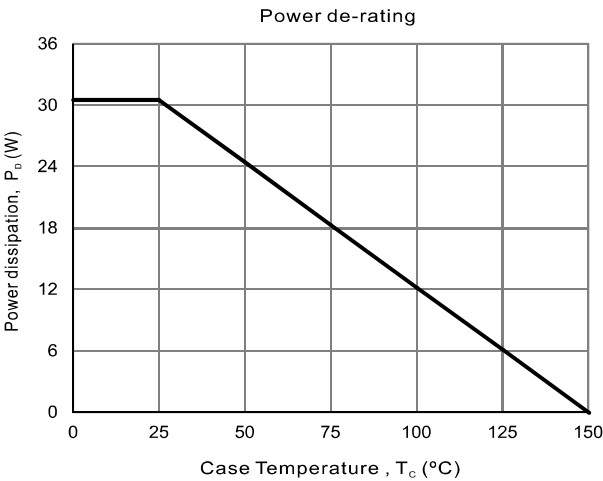
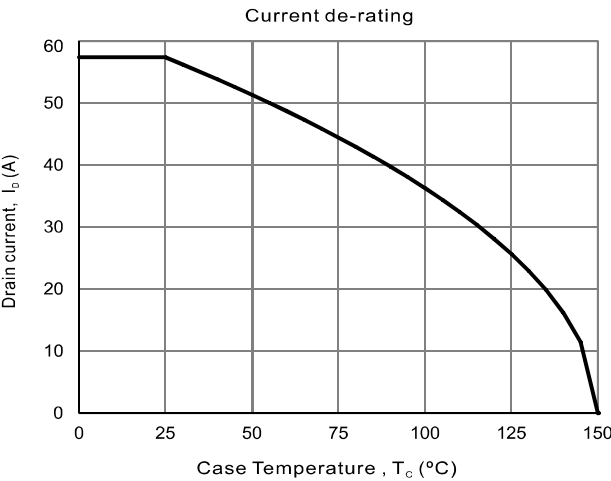
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Rating and characteristic curves



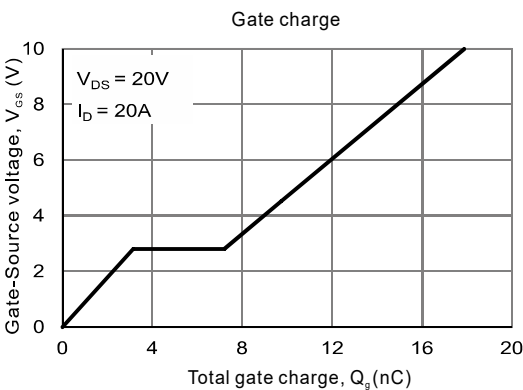
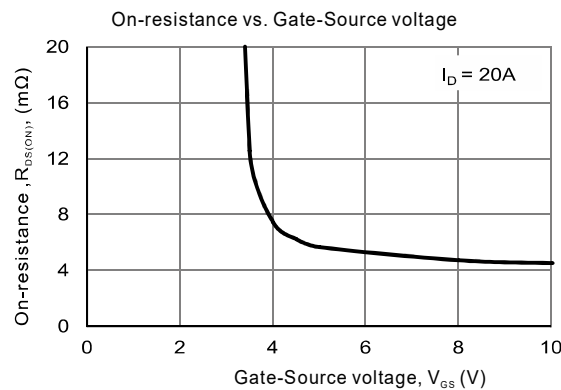
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Rating and characteristic curves



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Rating and characteristic curves



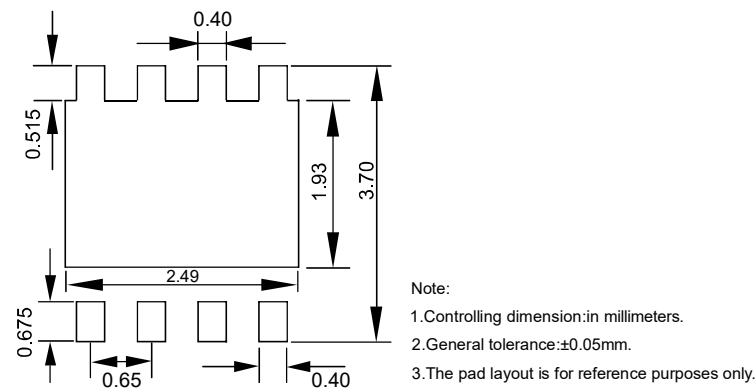
Pinning information

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

Marking

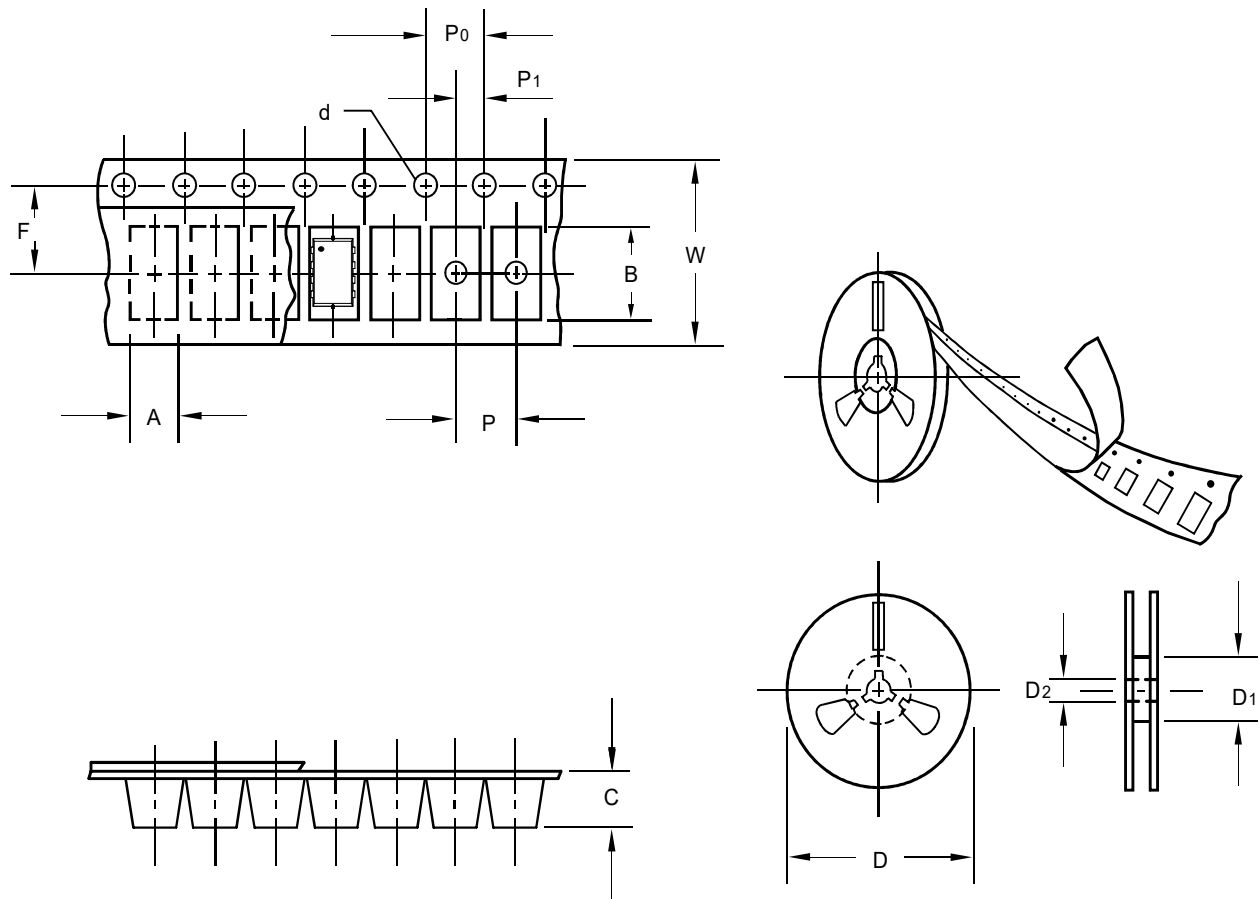
Type number	Marking Code
FMOSAB57N04-Q1	SL0406A

Suggested solder pad layout



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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	98.00
7" Reel outside diameter	D	2.0	-
7" Reel inner diameter	D1	min	-
Feed hole diameter	D2	0.5	13.00
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

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

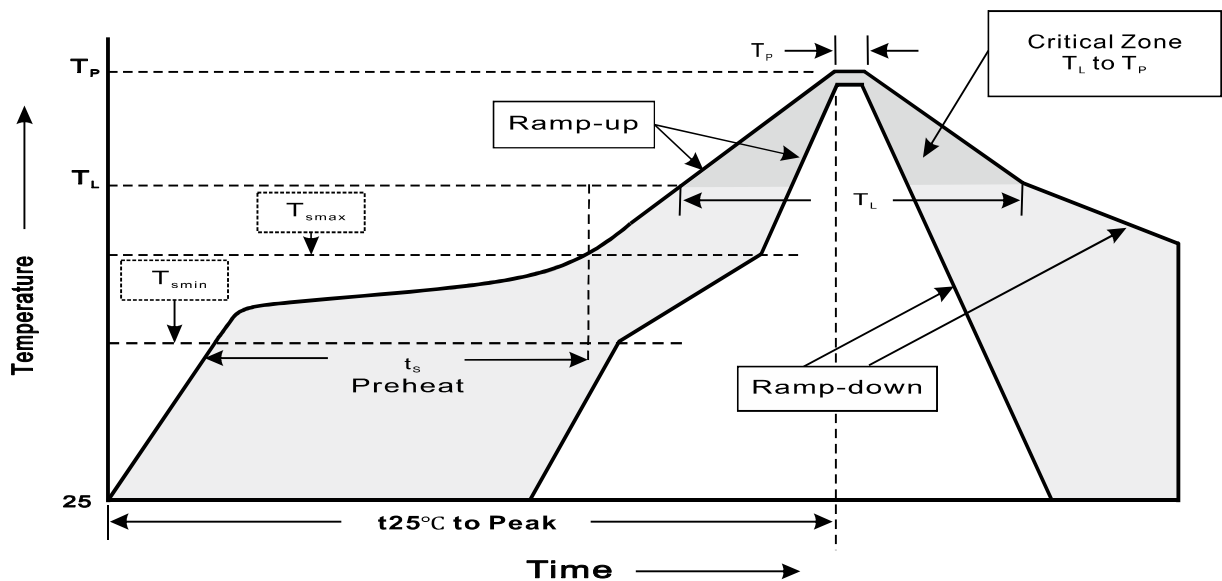
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Reel packing

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

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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