

FMOSAB59N06-Q1-H

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FMOSAB59N06-Q1-H

57A 60V N-Channel
Enhancement Mode Power MOSFET

Features

- $V_{DS}=60V$, $I_D=57A$.
- $R_{DS(ON)} \leq 5.5m\Omega$, @ $V_{GS}=10V$, $I_D=20A$.
- 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.
- Halogen-free (IEC61249-2-21).

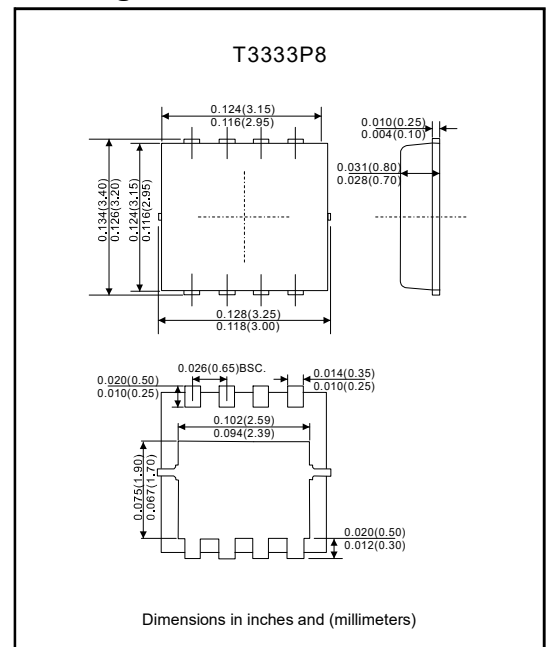
Applications

- Load switch.
- PWM application.
- General automotive application.

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.
- Weight : Approximated 25mg.

Package outline

Maximum ratings (At $T_J=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Ratings	Unit
Drain-source voltage	V_{DS}	60	V
Gate-source voltage	V_{GS}	± 20	V
Continuous drain current	I_D	57	A
		41	
Pulsed drain current (Note 1)	I_{DM}	Refer to Fig. Normalized Maximum Transient Thermal Impedance	A
Avalanche current (Note 2)	I_{AS}	10.5	A
Avalanche energy (Note 2)	E_{AS}	165	mJ
Power dissipation	P_D	36	W
		18	
Thermal resistance, junction to ambient (Note 3)	$R_{\theta JA}$	41	$^\circ C/W$
Thermal resistance Junction to case	$R_{\theta JC}$	4.2	$^\circ C/W$
Operating Junction temperature range	T_J	-55 to +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
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Off characteristics

Drain-source breakdown voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	BV_{DSS}	60			V
Drain-source leakage current	$V_{DS}=48\text{V}$, $V_{GS}=0\text{V}$	I_{DSS}			1	μA
Gate-source leakage current	$V_{GS}=\pm 20\text{V}$, $V_{DS}=0\text{V}$	I_{GSS}			± 100	nA

On characteristics

Gate threshold voltage	$V_{GS}=V_{DS}$, $I_D=250\mu\text{A}$	$V_{GS(TH)}$	1.0	1.6	2.1	V
Static drain-source on-resistance (Note 4)	$V_{GS}=10\text{V}$, $I_D=20\text{A}$	$R_{DS(ON)}$		4.0	5.5	m Ω
Forward transconductance	$V_{DS}=5\text{V}$, $I_D=16\text{A}$	g_{FS}		77		S

Dynamic parameters

Input capacitance	$V_{GS}=0\text{V}$, $V_{DS}=30\text{V}$, $f=1.0\text{MHz}$	C_{iss}	1498	2097	2830	pF
Out capacitance		C_{oss}	594	832	1123	
Reverse transfer capacitance		C_{rss}	38	53	71	
Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1.0\text{MHz}$	R_g		2.2		Ω

Switching parameters

Total gate charge	$V_{GS}=0$ to 10V , $V_{DS}=30\text{V}$, $I_D=20\text{A}$	Q_g	26	37	50	nC
Gate to source charge		Q_{gs}		6.6		
Gate to drain charge		Q_{gd}		7.9		
Turn-on delay time	$V_{DS}=30\text{V}$, $V_{GS}=10\text{V}$, $I_D=20\text{A}$, $R_{GEN}=3\Omega$	$t_{d(on)}$		8.9		ns
Rise time		t_r		28		
Turn-off delay time		$t_{d(off)}$		35		
Fall time		t_f		12		

Source-drain diode ratings and characteristics

Source-drain forward voltage drop	$I_S=20\text{A}$, $V_{GS}=0\text{V}$	V_{SD}			1.2	A
Source-drain continuous current	$T_C=25^{\circ}\text{C}$	I_S			57	V
Body diode reverse recovery time	$I_F=20\text{A}$, $dI_F/dt=100\text{A}/\mu\text{s}$	t_{rr}	28	39	53	nS
Body diode reverse recovery charge	$I_F=20\text{A}$, $dI_F/dt=100\text{A}/\mu\text{s}$	Q_{rr}		36		nC

Note : 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.

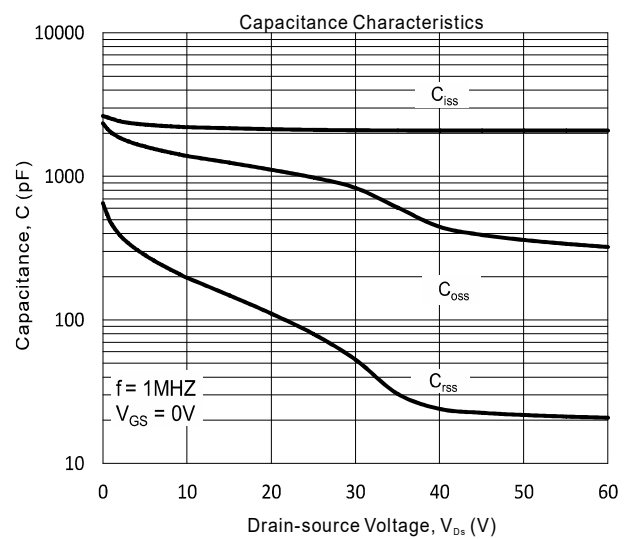
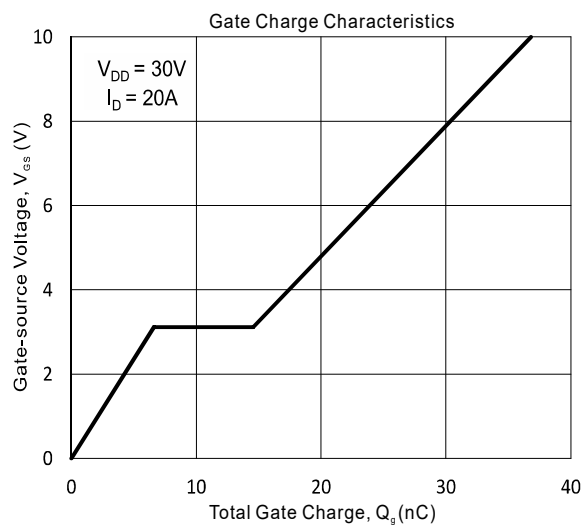
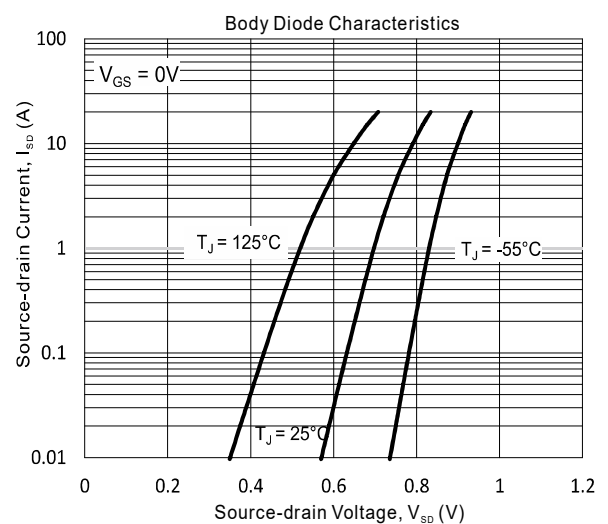
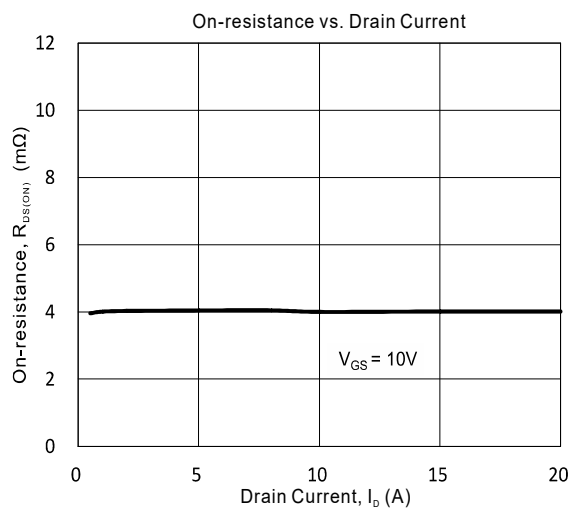
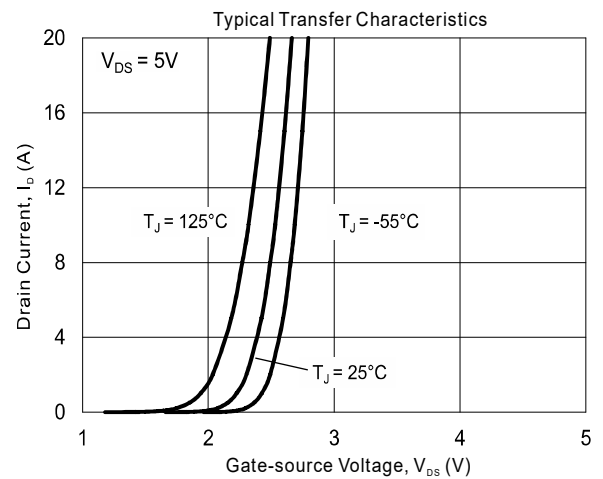
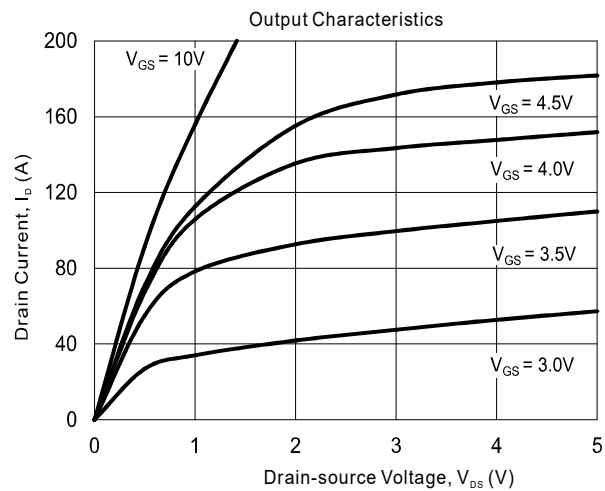
2. E_{AS} condition: Starting $T_J=25^{\circ}\text{C}$, $V_{DS}=30\text{V}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$, $L=3\text{mH}$, $I_{AS}=10.5\text{A}$, $V_{DS}=0\text{V}$ during time in avalanche.

3. $R_{\theta JA}$ is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB.

4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.

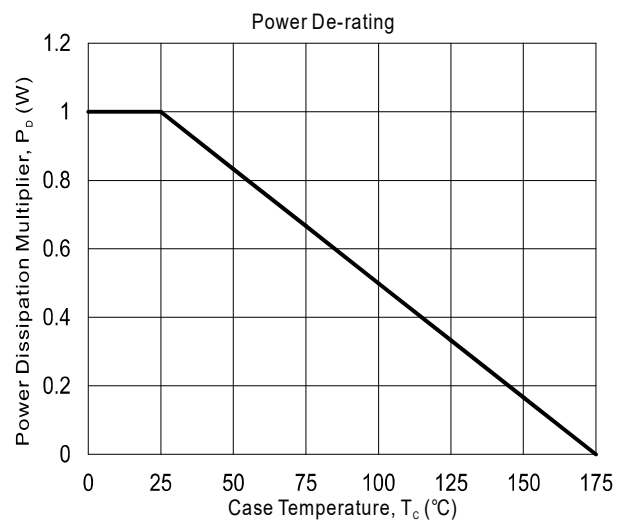
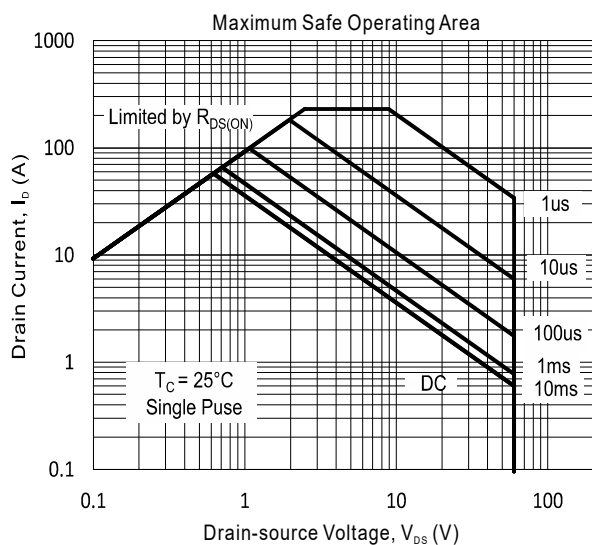
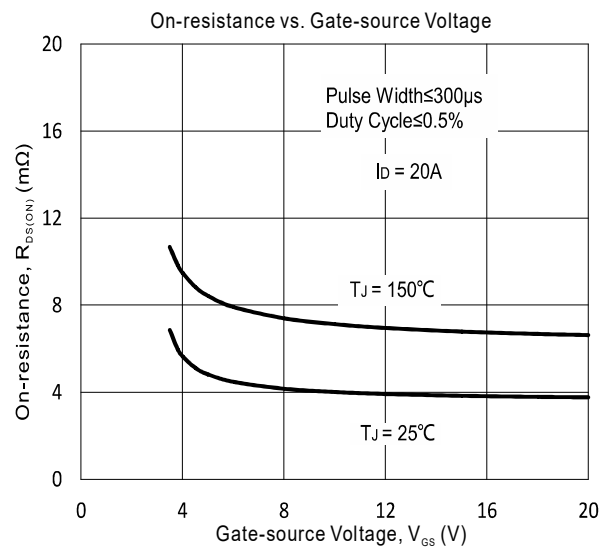
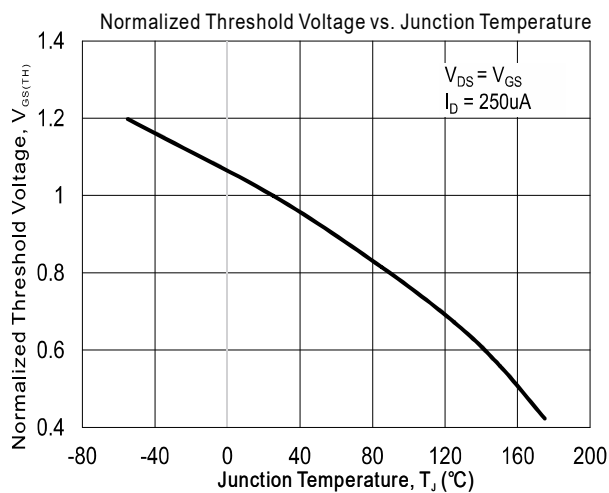
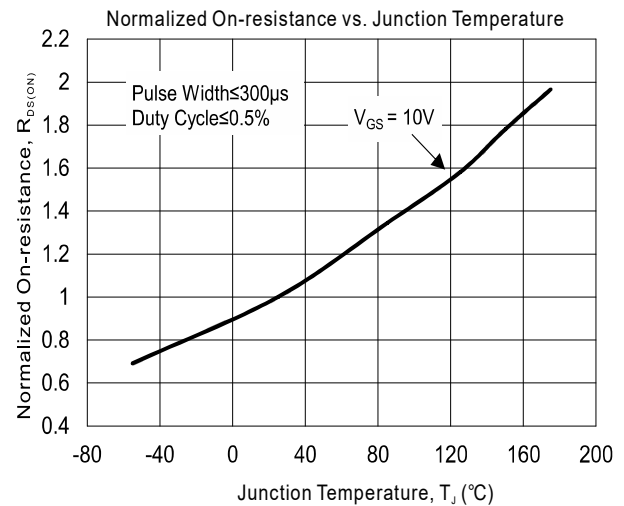
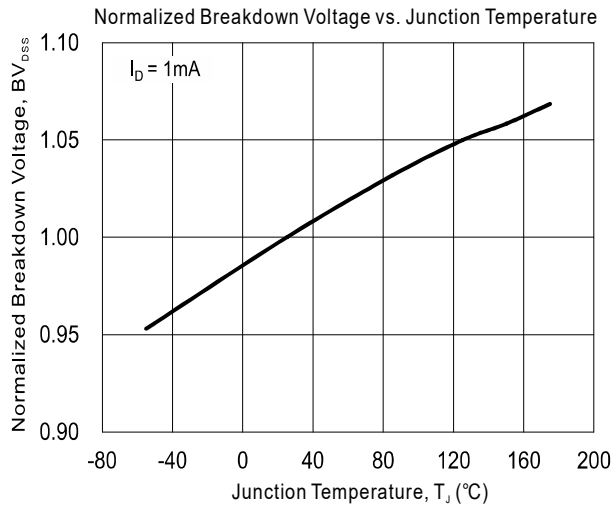
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Rating and characteristic curves



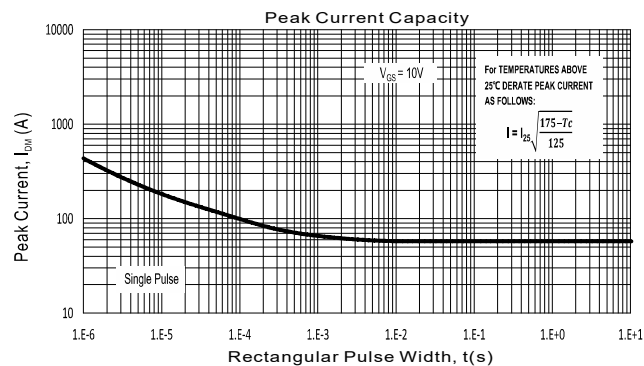
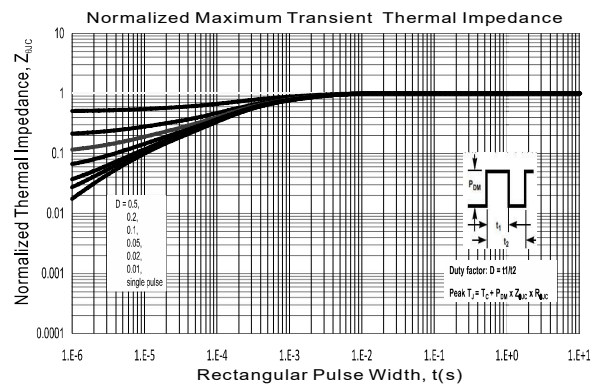
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Rating and characteristic curves

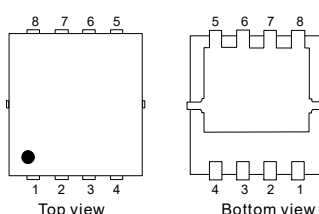
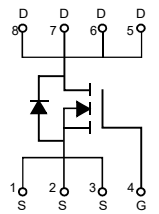


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Rating and characteristic curves



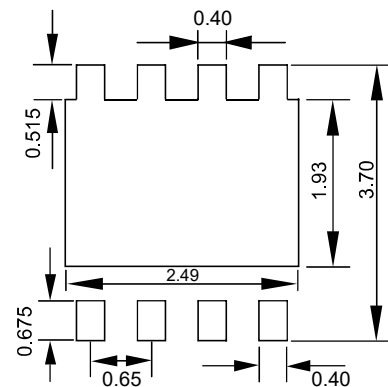
Pinning information

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

Marking

Type number	Marking Code
FMOSAB59N06-Q1-H	AB59N06

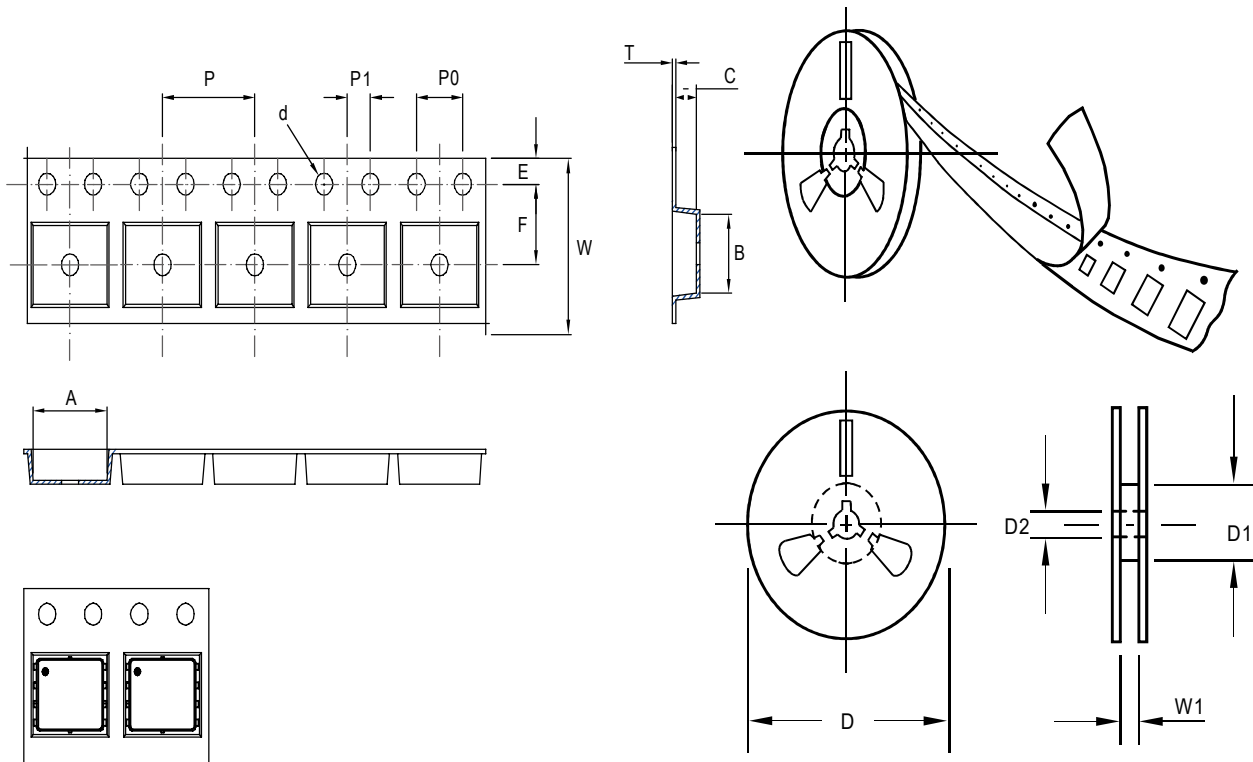
Suggested solder pad layout



- Note:
- Controlling dimension: in millimeters.
 - General tolerance: ± 0.05 mm.
 - 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	±1.0	330.0
13" Reel inner diameter	D1	±0.5	100.0
Feed hole diameter	D2	±0.3	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
Over all tape thickness	T	±0.1	0.23
Tape width	W	±0.2	12.00
Reel width	W1	±0.2	17.60

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

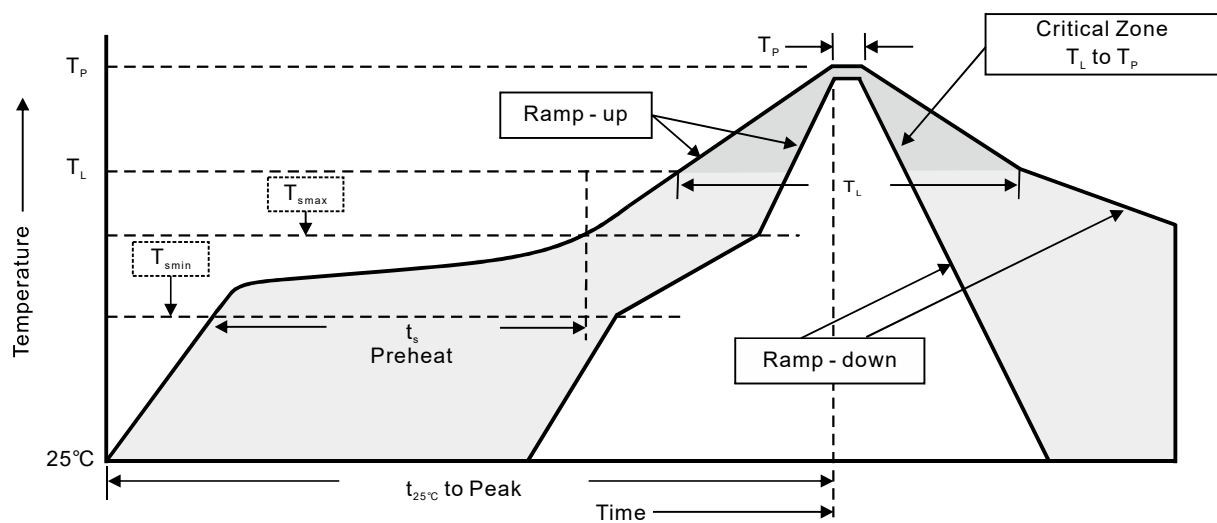
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Reel packing

Package	Units (pcs)			Dimension (Unit : mm ³)		
	Reel	Inner Box	Outer Box	Reel DIA,	Inner Box	Outer Box
T3333P8	5,000	10,000	80,000	330 (13")	355 x 335 x 38	350 x 330 x 360

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

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High reliability test capabilities

Item Test	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 _{Jmax}) 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