MSG061P03G

P-Channel Enhancement Mode MOSFET

■ Features

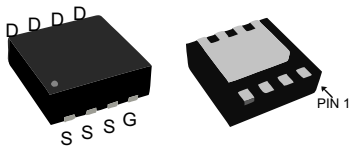
- -30V/-40A
  $R_{DS(ON)}$ = 6.1mΩ (max.) @ V_{GS}= -10V
  $R_{DS(ON)}$ = 11mΩ (max.) @ V_{GS}= -4.5V
- HBM ESD protection level pass 8KV.
- 100% UIS+R_g tested.
- Reliable and Rugged.
- Lead free and green device available (RoHS compliant).

Note: The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

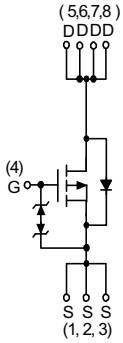
■ Application

- Power management in notebook computer portable equipment and battery powered system.

■ Pin Description



DFN3.3x3.3-8(Saw-EP)



P-Channel MOSFET

■ Absolute Maximum Ratings (T_A = 25°C unless otherwise specified)

PARAMETER	CONDITIONS	Symbol	MSL120N06G	UNIT
Drain-Source Voltage		V_{DSS}	-30	V
Continuous Drain Current(Note:2)	T_C = 25°C	I_D	-40	A
	T_C = 100°C		-40	
Pulsed Drain Current(Note:2)	T_C = 25°C	I_{DM}	-160	
Gate-Source Voltage		V_{GSS}	±25	V
Diode Continuous Forward Current(Note:2)	T_C = 25°C	I_S	-40	A
Avalanche Current, single pulse (Note:1)	L=0.5mH	I_{AS}	27	A
Avalanche Energy, single pulse (Note:1)	L=0.5mH	E_{AS}	182	mJ
Maximum Power Dissipation	T_C = 25°C	P_D	62.5	W
	T_C = 100°C		25	
Thermal Resistance-Junction to Ambient	t ≤ 10s	$R_{\theta JA}$	30	°C/W
	Steady State		75	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 ~ +150	°C
Maximum Power Dissipation	T_A = 25°C	P_D	4.2	W
	T_A = 70°C		2.7	
Continuous Drain Current	T_A = 25°C	I_D	-21.3	A
	T_A = 70°C		-17.1	
Thermal Resistance-Junction to case	Steady State	$R_{\theta JC}$	2	°C/W

NOTE : 1.UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T_J =25°C).
2.Package limited.

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■ Electrical characteristics(T_A = 25°C unless otherwise specified)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_{DS} = -250μA	BV_{DSS}	-30			V
Gate Threshold Voltage	V_{DS} = V_{GS}, I_{DS} = -250μA	$V_{GS(th)}$	-1.3	-1.8	-2.3	
Zero Gate Voltage Drain Current	V_{DS} = -24V, V_{GS} = 0V	I_{DSS}			-1	μA
	V_{DS} = -24V, V_{GS} = 0V, T_J = 85°C				-30	
Gate Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	I_{GSS}			±10	
Drain-Source On-state Resistance(Note:3)	V_{GS} = -10V, I_{DS} =-20A	$R_{DS(on)}$		4.9	6.1	mΩ
	V_{GS} = -4.5V, I_{DS} =-10A			8	11	

■ Diode Characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Diode Forward Voltage(Note:3)	I_{SD} = -1A, V_{GS} = 0V	V_{SD}		-0.7	-1	V
Reverse Recovery Time(Note:4)	I_{SD} = -20A, dI_{SD}/dt = 100A/μs	t_{RR}		19		ns
Reverse Recovery Charge(Note:4)		Q_{RR}		6		nC

■ Dynamic Characteristics(Note:4)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Gate Resistance	V_{GS} = 0V, V_{DS} = 0V F = 1.0MHz	R_G		3		Ω
Input Capacitance	V_{DS} = -15V, V_{GS} = 0V, F = 1.0MHz	C_{iss}		2862		pF
Output Capacitance		C_{oss}		593		
Reverse Transfer Capacitance		C_{rss}		470		
Turn on Delay Time	V_{DD} = -15V, R_L = 15Ω, I_{DS} = -1A V_{GEN}=-10V, R_G = 6Ω	$t_{d(on)}$		20		ns
Turn on Rise Time		t_r		19		
Turn off Delay Time		$t_{d(off)}$		93		
Turn off Fall Time		t_f		56		

■ Gate-Charge Characteristics(Note:4)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Total Gate Charge	V_{DS} = -15V, V_{GS}=-4.5V, I_{DS} =-20A	Q_g		30		nC
Total Gate Charge	V_{DS} = -15V, V_{GS}=-10V, I_{DS} =-20A	Q_g		60		
Gate-Source Charge		Q_{gs}		2.8		
Gate-Drain Charge		Q_{gd}		20		

NOTE : 3.Pulse test; pulse width ≤ 300μs, duty cycle ≤ 2%.
4.Guranteed by design, not subject to production testing.

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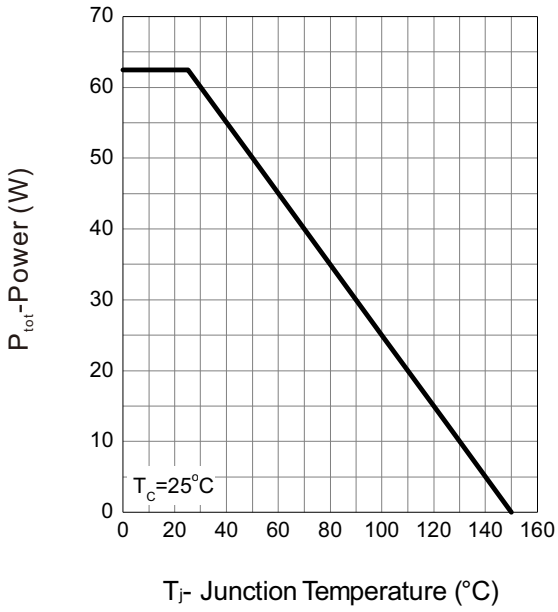
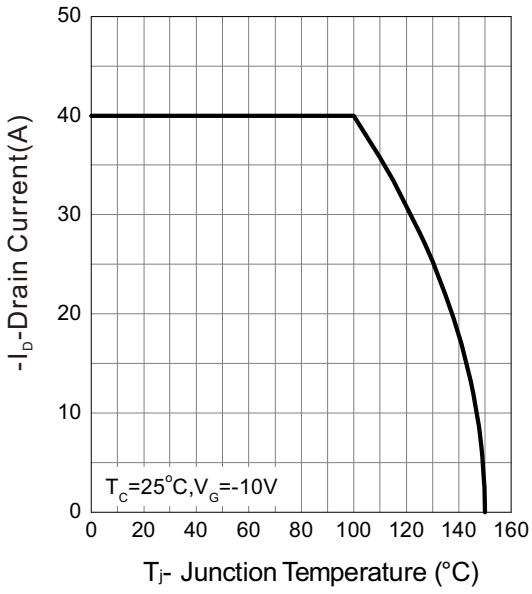
■ Rating and characteristic curves

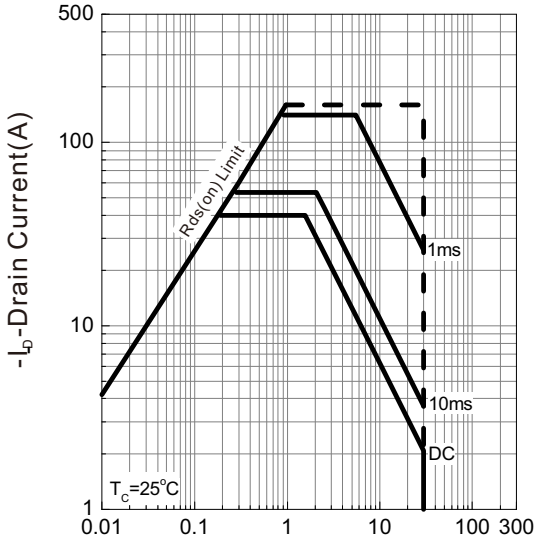
Power Dissipation



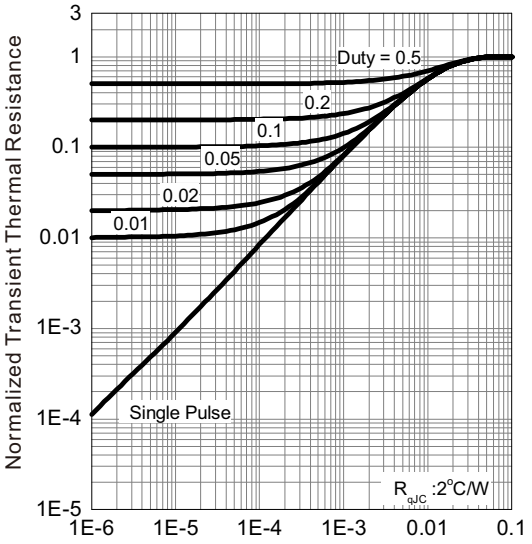
Drain Current



Safe Operation Area



Thermal Transient Impedance



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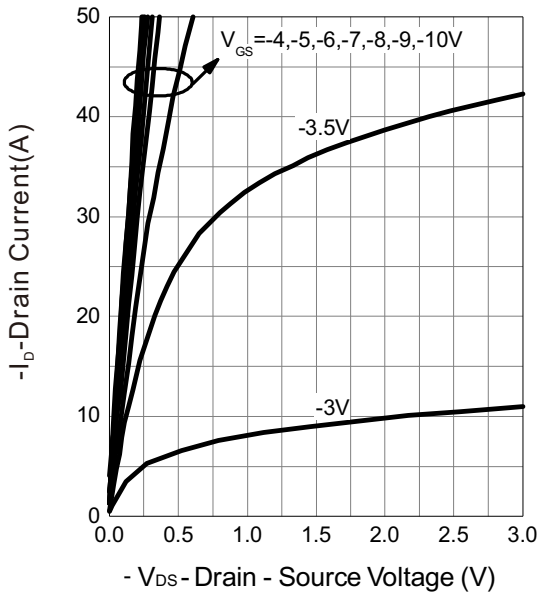
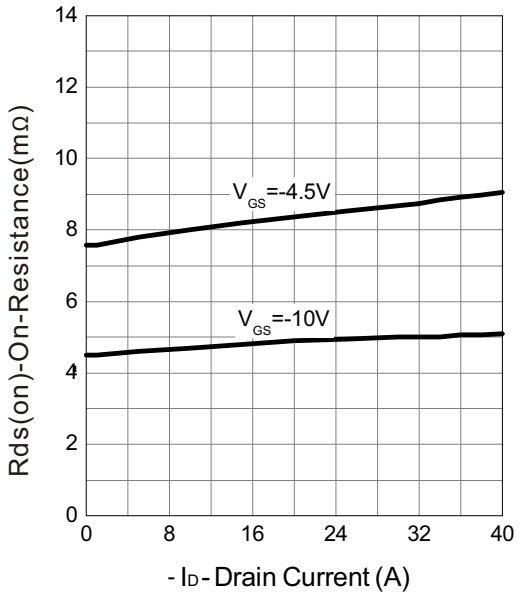
■ Rating and characteristic curves

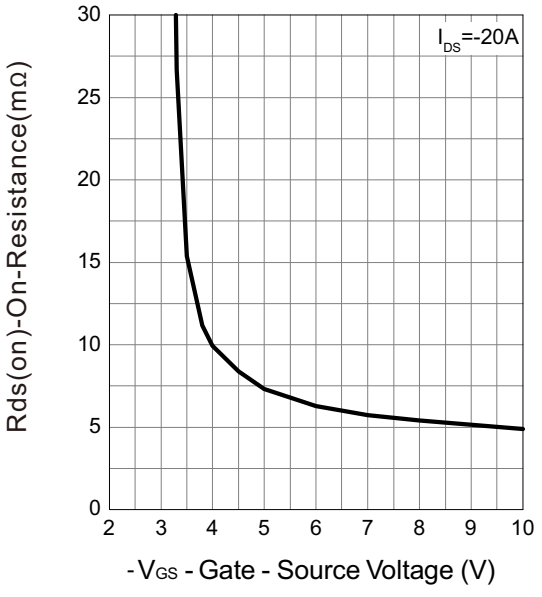
Output Characteristics



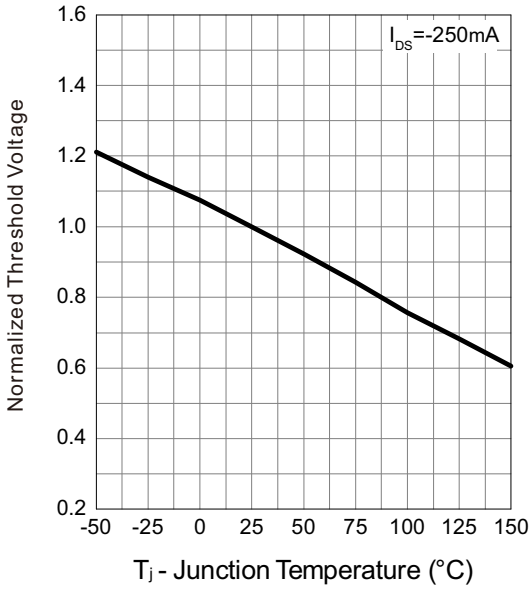
Drain-Source On Resistance



Gate-Source On Resistance



Gate Threshold Voltage



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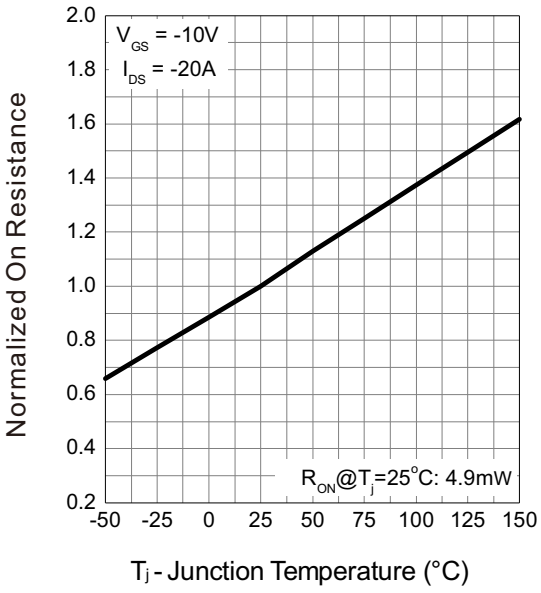
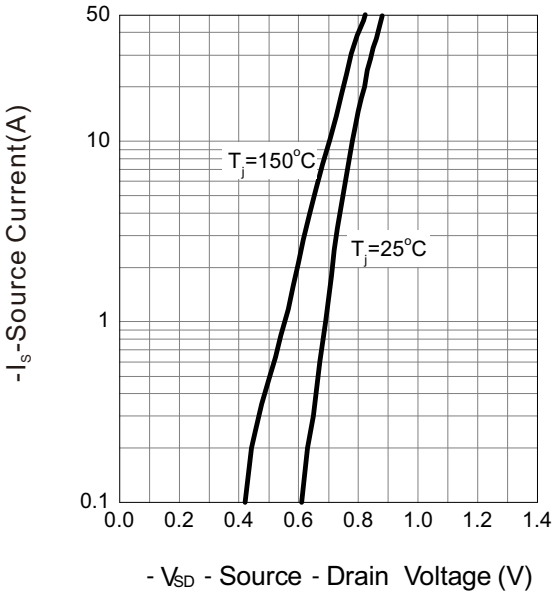
■ Rating and characteristic curves

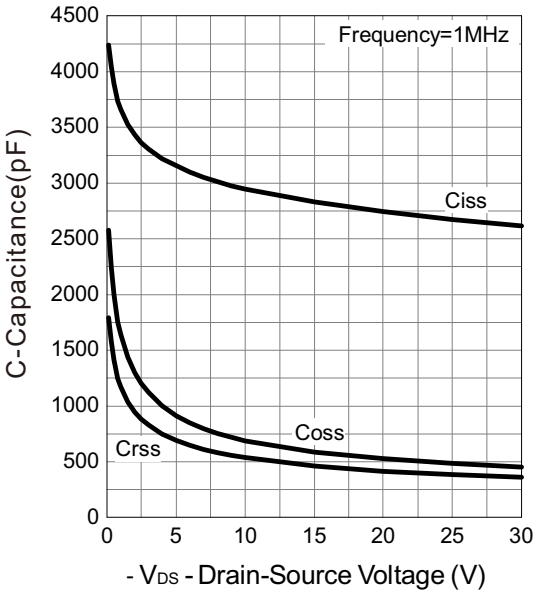
Drain-Source On Resistance



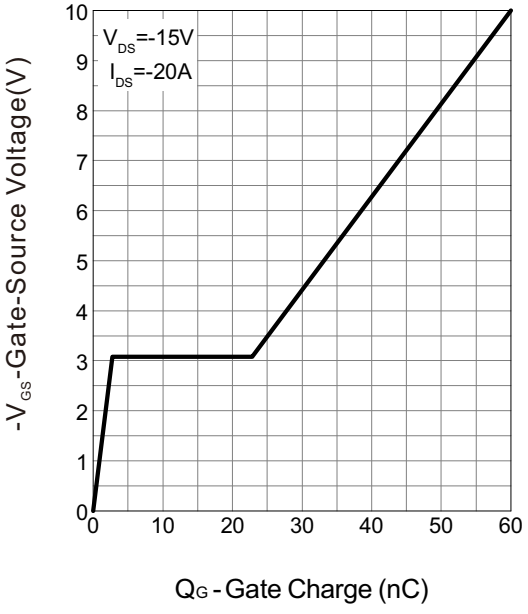
Source-Drain Diode Forward



Capacitance



Gate Charge



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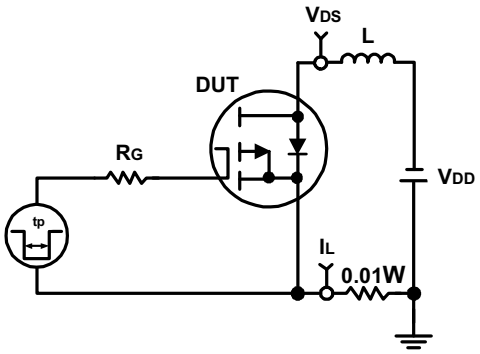
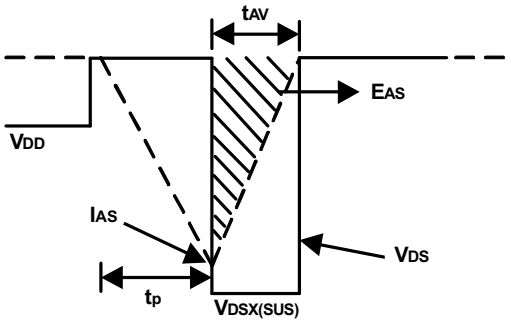
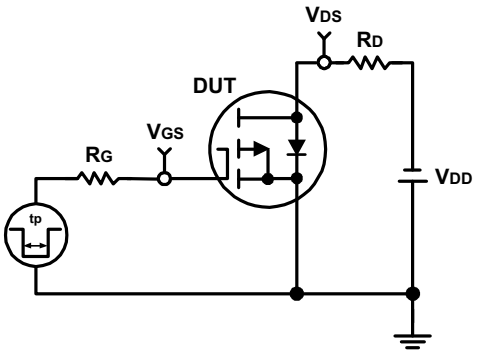
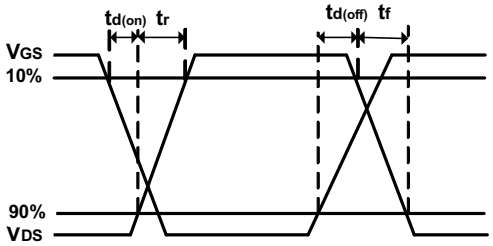
■ Avalanche Test circuit and waveform





■ Switching Time Test circuit and waveform





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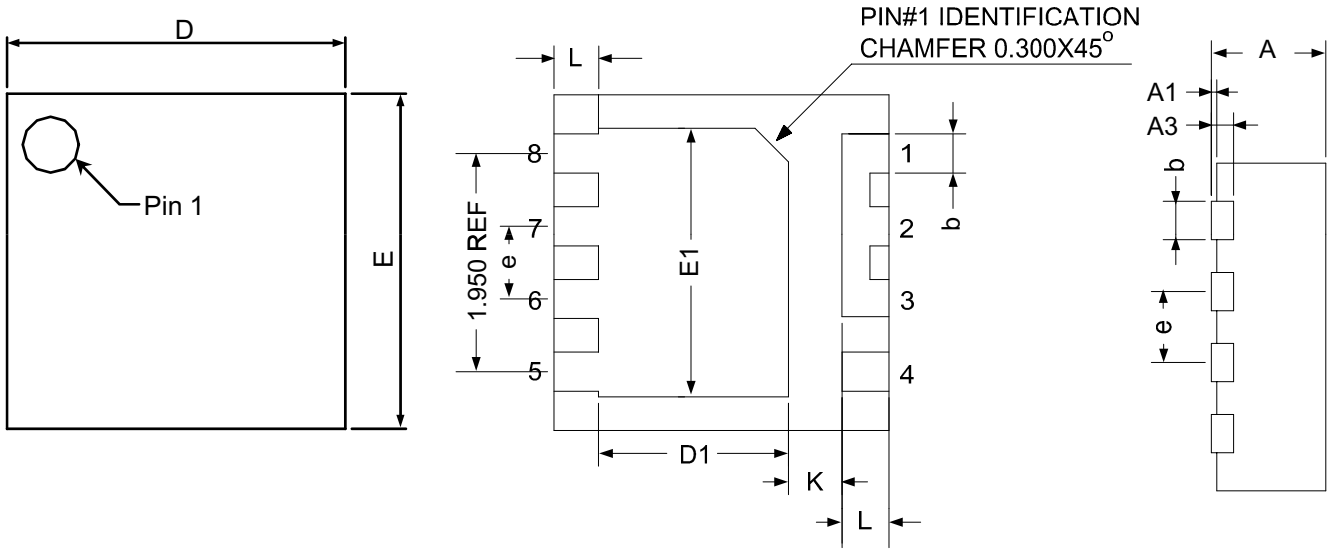
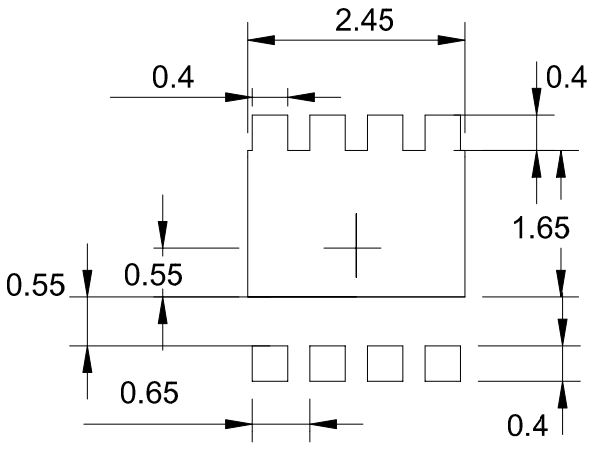
■ Package Information



SYMBOL	DFN3.3x3.3B-8_EP1_S			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	1.00	0.028	0.039
A1	0.00	0.05	0.000	0.002
A3	0.203 REF		0.008 REF	
b	0.25	0.40	0.010	0.016
D	2.90	3.10	0.114	0.122
E1	2.25	2.55	0.089	0.1
E	2.90	3.10	0.114	0.122
D1	1.65	1.9	0.065	0.075
e	0.65 BSC		0.026 BSC	
L	0.30	0.50	0.012	0.020
K	0.43		0.017	

RECOMMENDED LAND PATTERN



UNIT: mm

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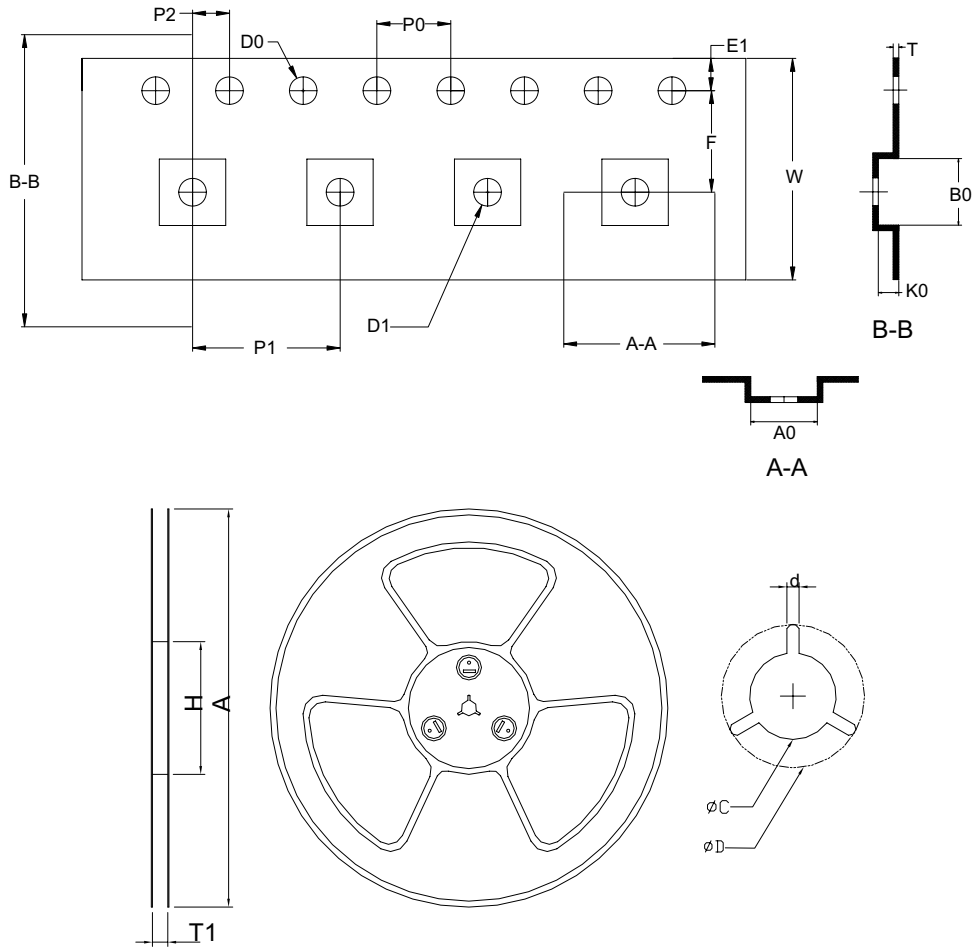
■ Carrier Tape & Reel Dimensions



Application	A	H	T1	C	d	D	W	E1	F
DFN3.3x3.3B-8_EP	330.0±2.00	50 MIN.	12.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	12.0±0.30	1.75±0.10	5.5±0.10
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0±0.10	8.0±0.10	2.0±0.10	1.5+0.10 -0.00	1.5 MIN.	0.3±0.10	3.6±0.20	3.6±0.20	1.2±0.10

(mm)

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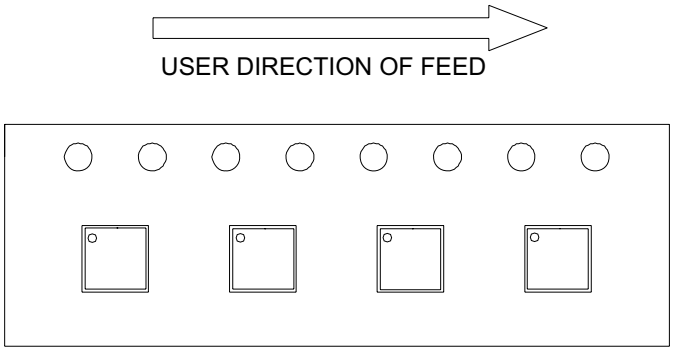
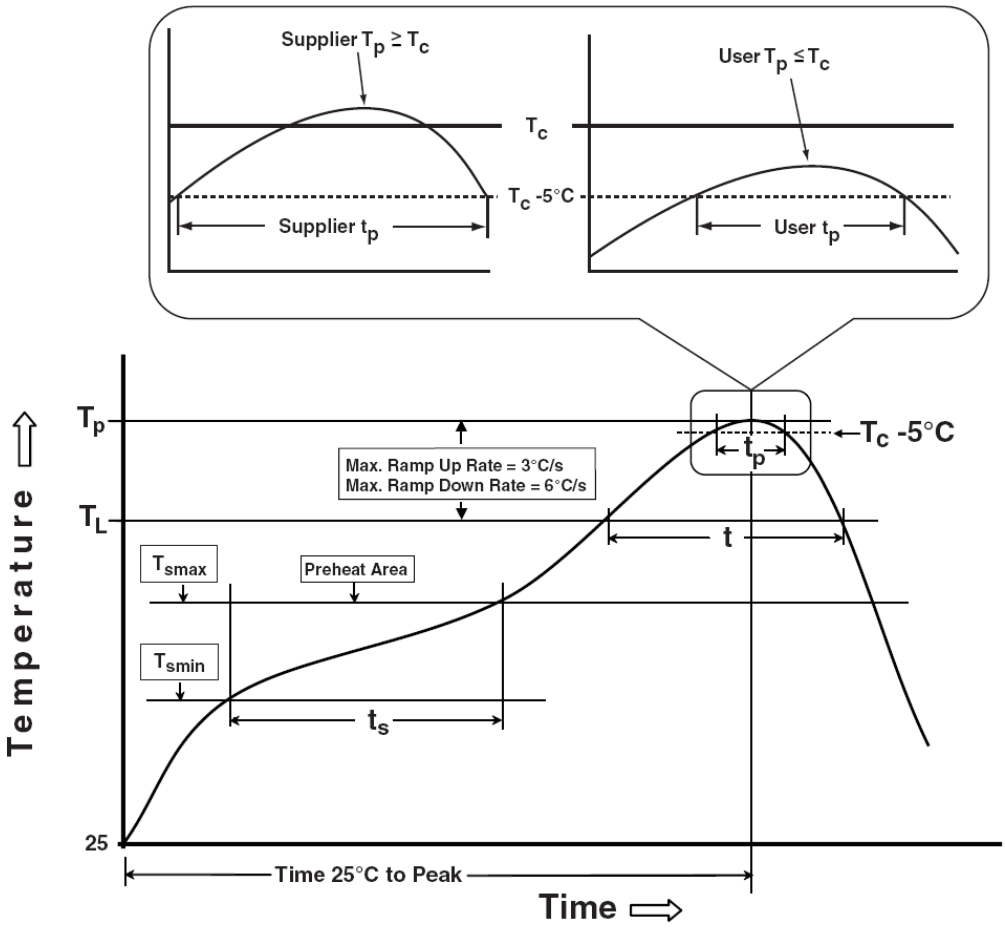
■ Taping Direction Information



■ Device per reel

Package Type	Unit	Quantity
DFN3.3x3.3B-8_EP	Tape & Reel	3000

■ Classification Profile



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■ Classification Reflow Profile

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (T_{smin}) Temperature max (T_{smax}) Time (T_{smin} to T_{smax}) (t_s)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (T_{smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L) Time at liquidous (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_P)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

■ Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	1000 Hrs, 80% of VDS max @ Tjmax
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ Tjmax
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

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