

N-Channel Trench Power MOSFET

General Description

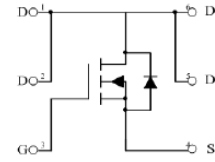
The TNM3020JX uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a battery protection or in other switching application.

Features

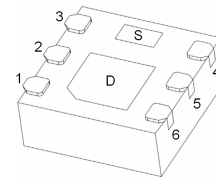
- $V_{DS} = 20V, I_D = 8A$
 $R_{DS(ON)} < 26m\Omega @ V_{GS} = 4.5V$
 $R_{DS(ON)} < 34m\Omega @ V_{GS} = 2.5V$
- High Power and current handing capability
- Lead free product is acquired
- Surface Mount Package

Application

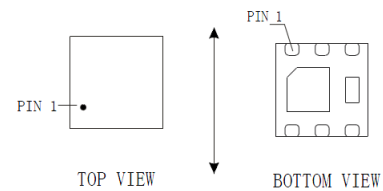
- Battery protection
- Load switch
- Power management



Schematic Diagram



Marking and pin Assignment



Package and Ordering Information

Type	Device	Device Package	Reel Size	Tape width	Quantity
N-MOS	TNM3020JX	DFN2x2-6L	7 Inch	8mm	3000 units

Table 1. Absolute Maximum Ratings ($T_A=25^\circ C$)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage ($V_{GS}=0V$)	20	V
V_{GS}	Gate-Source Voltage ($V_{DS}=0V$)	± 12	V
I_D	Drain Current-Continuous	8	A
$I_{DM (pluse)}$	Drain Current-Continuous@ Current-Pulsed (Note 1)	16	A
P_D	Maximum Power Dissipation	1.3	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150	$^\circ C$

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

Table 2. Thermal Characteristic

Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	60	$^\circ C/W$

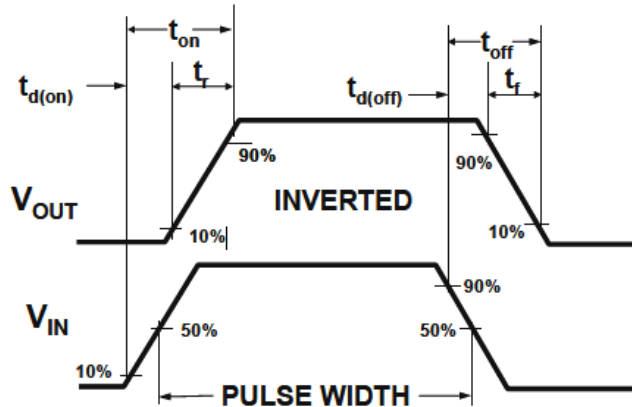
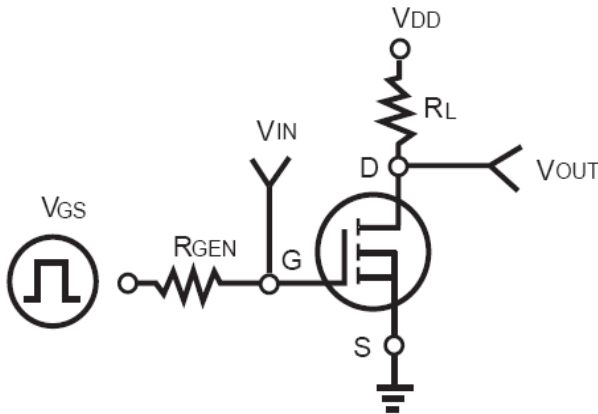


Table 3. Electrical Characteristics (T_A=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
B _V DSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	20	22		V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =20V, V _{GS} =0V			1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±12V, V _{DS} =0V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.5	0.7	1.1	V
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =5A	4	8		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =4.5V, I _D =5A		18	26	mΩ
		V _{GS} =2.5V, I _D =4A		23	34	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f=1.0MHz		500		pF
C _{oss}	Output Capacitance			300		pF
C _{rss}	Reverse Transfer Capacitance			140		pF
Switching Times						
t _{d(on)}	Turn-on Delay Time	V _{DD} =10V, I _D =1A, R _L =2.8Ω V _{GS} =4.5V, R _G =6Ω		20		nS
t _r	Turn-on Rise Time			19		nS
t _{d(off)}	Turn-Off Delay Time			65		nS
t _f	Turn-Off Fall Time			25		nS
Q _g	Total Gate Charge	V _{DS} =10V, I _D =5A, V _{GS} =4.5V		10		nC
Q _{gs}	Gate-Source Charge			2.3		nC
Q _{gd}	Gate-Drain Charge			2.9		nC
Source-Drain Diode Characteristics						
I _{SD}	Source-Drain Current(Body Diode)				5	A
V _{SD}	Forward on Voltage ^(Note 1)	V _{GS} =0V, I _S =5A			1.2	V

Notes 1. Repetitive Rating: Pulse width limited by maximum junction temperature.

Switch Time Test Circuit and Switching Waveforms:



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)

Figure1. Power Dissipation

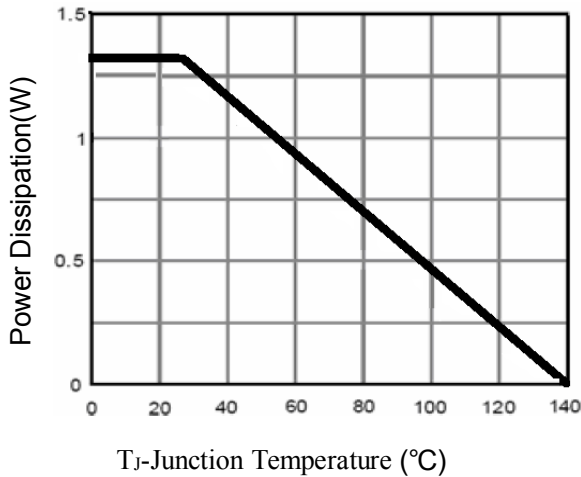


Figure2. Drain Current

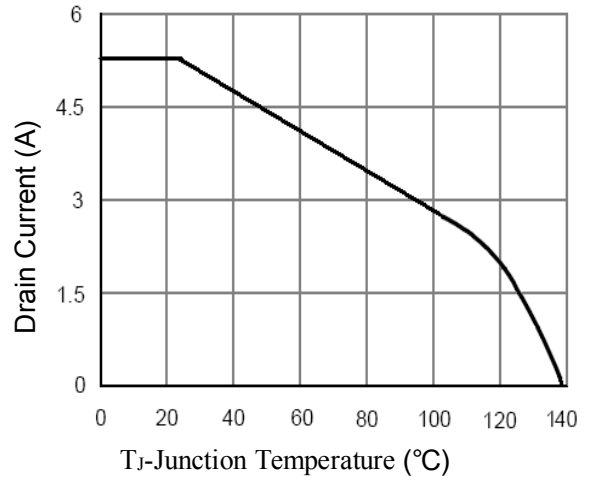


Figure3. Output Characteristics

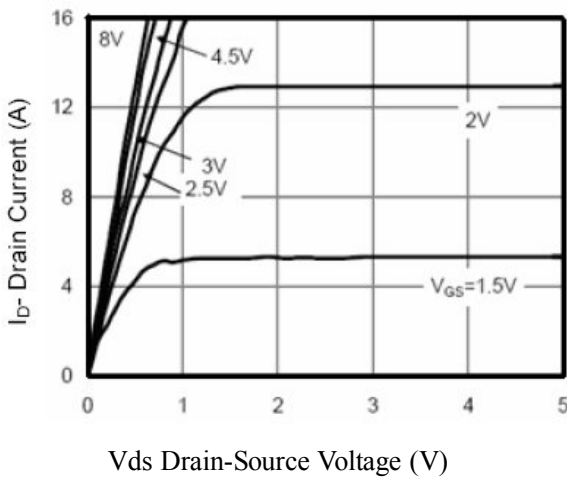


Figure4. Transfer Characteristics

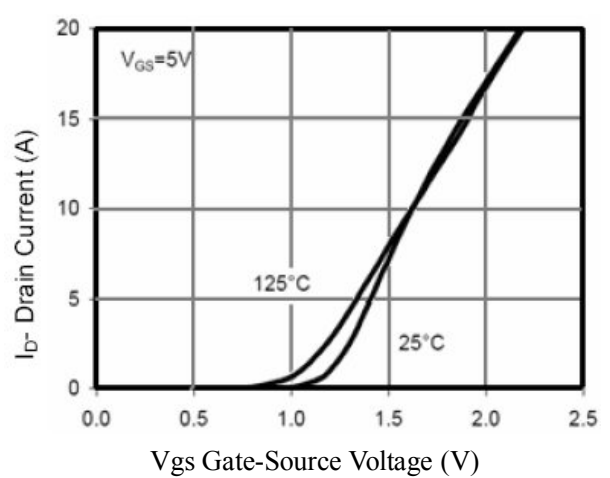




Figure5. Capacitance

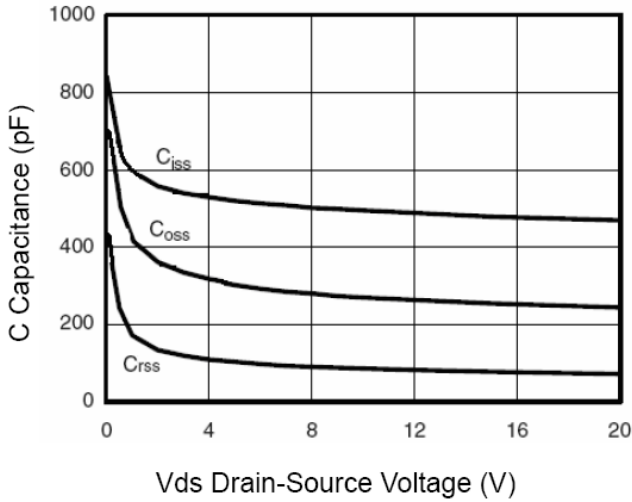


Figure6. $R_{DS(ON)}$ vs Junction Temperature

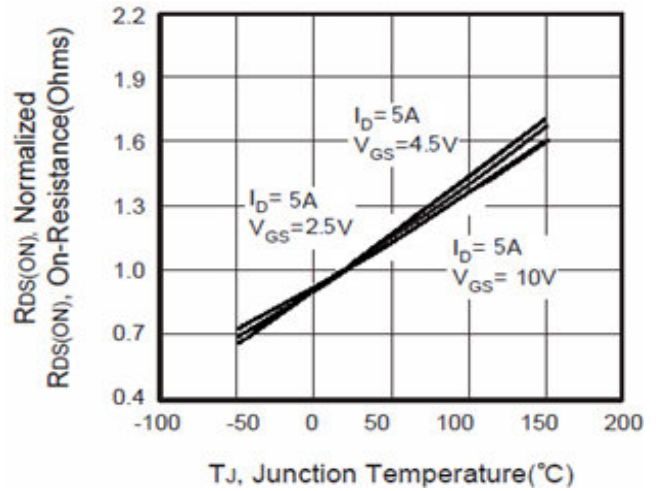


Figure7. Max BV_{DSS} vs Junction Temperature

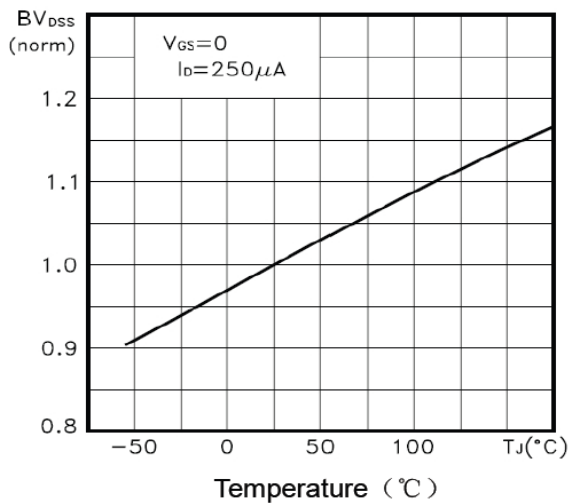


Figure8. $V_{GS(th)}$ vs Junction Temperature

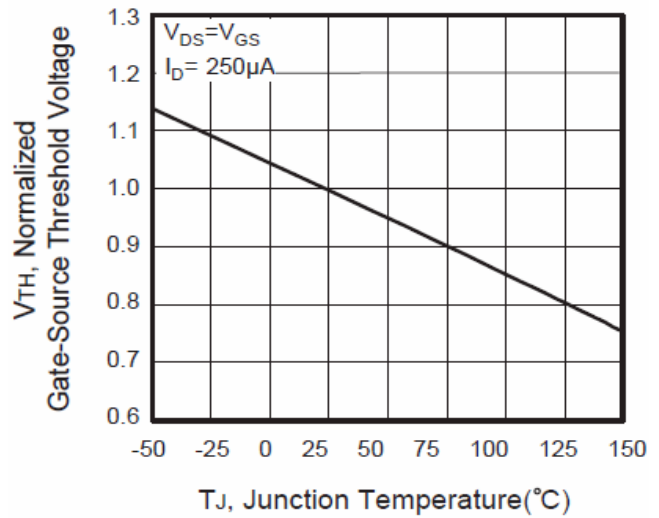


Figure9. Gate Charge Waveforms

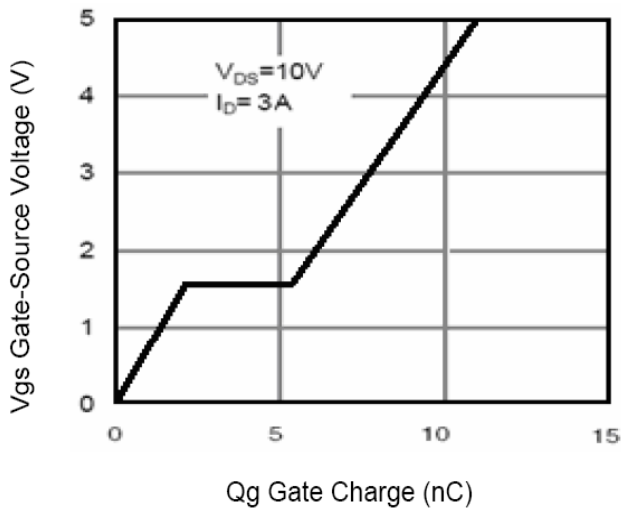


Figure10. Maximum Safe Operating Area

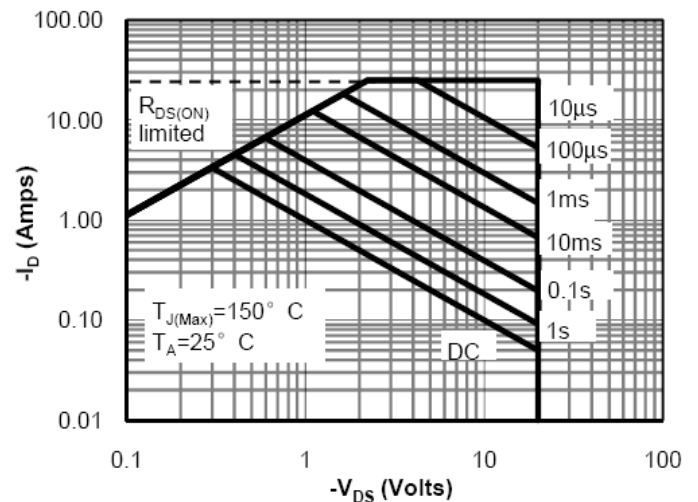
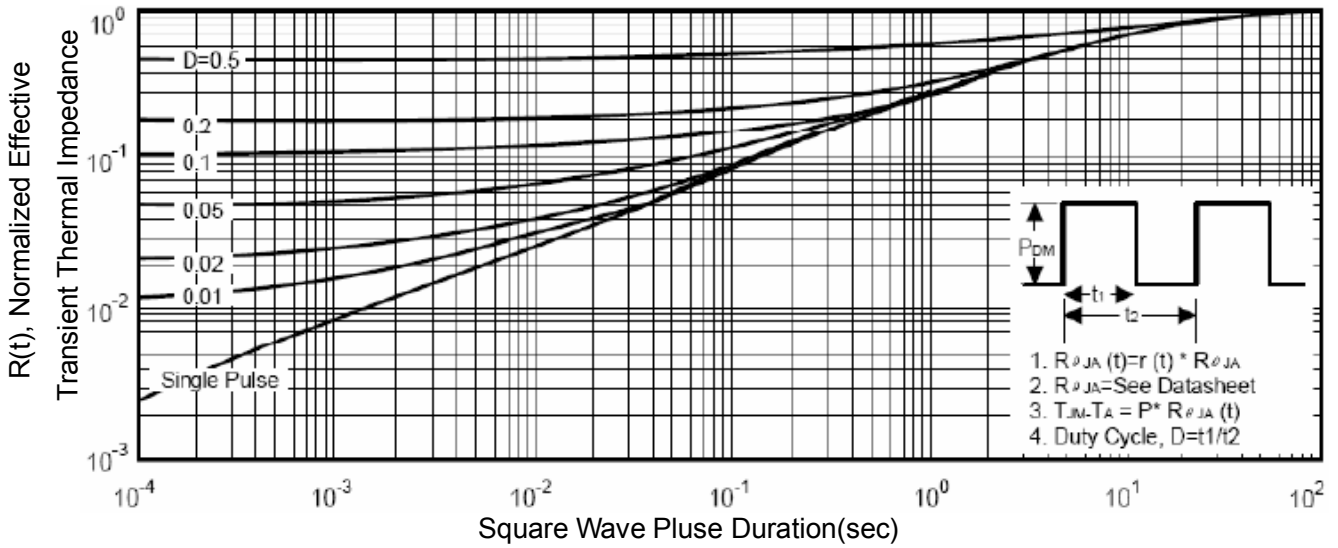
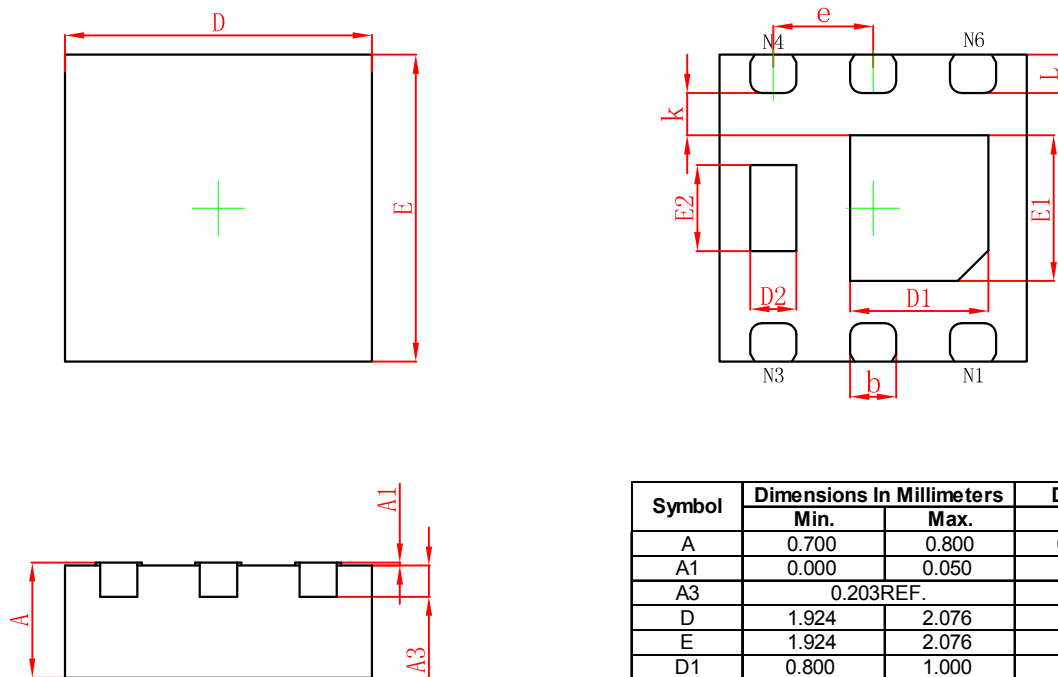


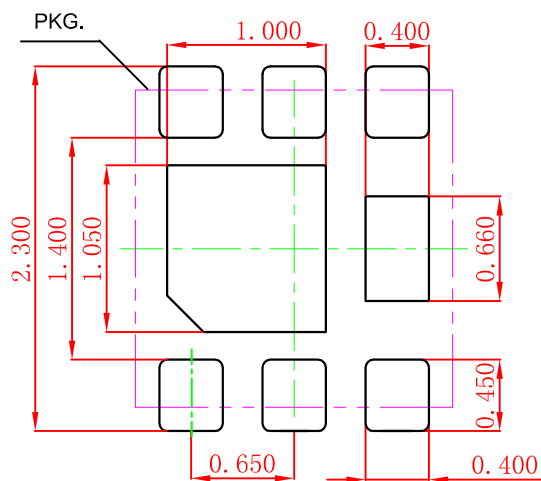


Figure11. Normalized Maximum Transient Thermal Impedance



DFN2X2-6L Package Outline Dimensions


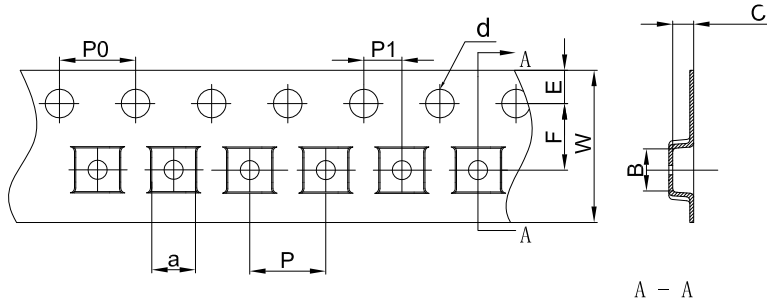
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.032
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	1.924	2.076	0.076	0.082
E	1.924	2.076	0.076	0.082
D1	0.800	1.000	0.031	0.039
E1	0.850	1.050	0.033	0.041
D2	0.200	0.400	0.008	0.016
E2	0.460	0.660	0.018	0.026
k	0.200MIN.		0.008MIN.	
b	0.250	0.350	0.010	0.014
e	0.650TYP.		0.026TYP.	
L	0.174	0.326	0.007	0.013

DFN2X2-6L Suggested Pad Layout

Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ± 0.050 mm.
3. The pad layout is for reference purposes only.

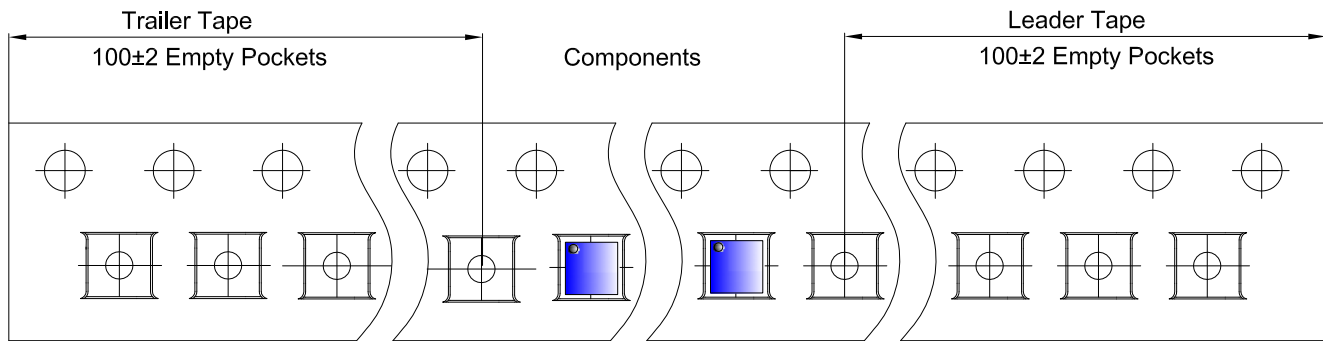


DFN2 2 6L Embossed Carrier Tape

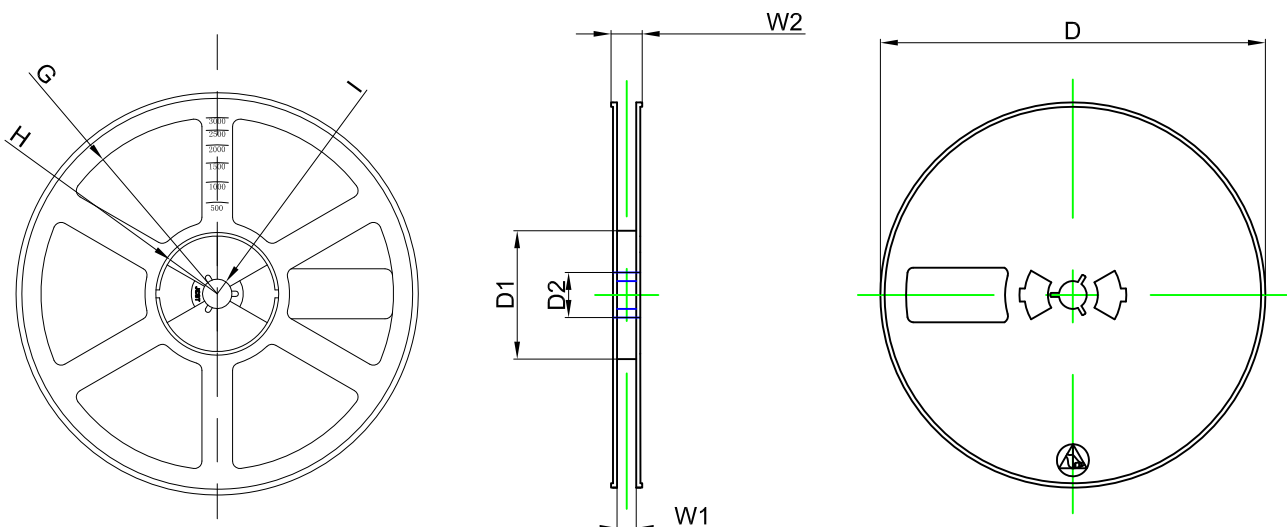


Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
DFNWB2×2-6L	2.30	2.30	1.10	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

DFN2×2-6L Tape Leader and Trailer



DFN2×2-6L Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7" Dia	Ø180.00	60.00	13.00	R78.00	R25.60	R6.50	9.50	13.10

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	30,000 pcs		120,000 pcs		

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