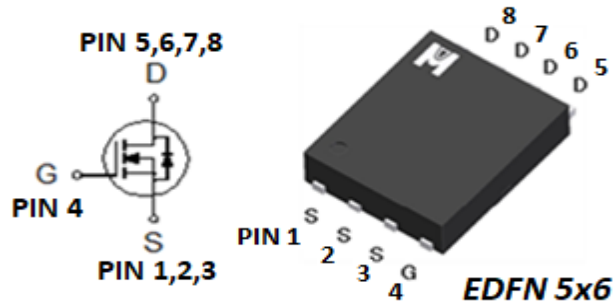


Single N-Channel Logic Level Enhancement Mode Field Effect Transistor

▪ Product Summary:

	N-CH
$BV_{DSS}$	30V
$R_{DSON (MAX.) @ V_{GS}=10V}$	3.1m $\Omega$
$R_{DSON (MAX.) @ V_{GS}=4.5V}$	4.2m $\Omega$
$I_D @ T_C=25^\circ C$	140A

▪ Pin Description:



Single N Channel MOSFET

UIS, Rg 100% Tested

RoHS & Halogen Free & TSCA Compliant



▪ ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ C$  Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS	SYMBOL	LIMITS	UNIT
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C = 25^\circ C$	140
		$T_C = 100^\circ C$	88
Continuous Drain Current	$I_D$	$T_A = 25^\circ C$	22
		$T_A = 70^\circ C$	17
Pulsed Drain Current <sup>1</sup>	$I_{DM}$	350	A
Avalanche Current <sup>1,4</sup>	$I_{AS}$	81	
Avalanche Energy <sup>1,4</sup>	$E_{AS}$	328	
Repetitive Avalanche Energy <sup>2,4</sup>	$E_{AR}$	164	
Power Dissipation <sup>1</sup>	$P_D$	$T_C = 25^\circ C$	96.2
		$T_C = 100^\circ C$	38.5
Power Dissipation <sup>1</sup>	$P_D$	$T_A = 25^\circ C$	2.5
		$T_A = 70^\circ C$	1.6
Operating Junction & Storage Temperature Range	$T_j, T_{stg}$	-55 to 150	$^\circ C$

▪ 100% UIS testing in condition of  $V_D=25V$ ,  $L=0.1mH$ ,  $V_G=10V$ ,  $I_L=49A$ , Rated  $V_{DS}=30V$

▪ THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Case	$R_{\theta JC}$		1.3	$^\circ C / W$
Junction-to-Ambient <sup>3</sup>	$t \leq 10s$	$R_{\theta JA}$	18	
	Steady-State	$R_{\theta JA}$	51	

<sup>1</sup>Pulse width limited by maximum junction temperature.

<sup>2</sup>Duty cycle < 1%

<sup>3</sup>The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ C$ .

<sup>4</sup>Guarantee by Engineering test

**▪ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25 °C, Unless Otherwise Noted)**

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
<b>STATIC</b>						
Drain-Source Breakdown Voltage <sup>4</sup>	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	30			V
Gate Threshold Voltage <sup>4</sup>	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1.2	1.6	2.5	
Gate-Body Leakage <sup>4</sup>	I <sub>GSS</sub>	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V			±100	nA
Zero Gate Voltage Drain Current <sup>4</sup>	I <sub>DSS</sub>	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V			1	μA
		V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125 °C			25	
On-State Drain Current <sup>1</sup>	I <sub>D(ON)</sub>	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 10V	140			A
Drain-Source On-State Resistance <sup>1,4</sup>	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 30A		2.1	3.1	mΩ
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 24A		2.8	4.2	
Forward Transconductance <sup>1</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 1.5V, I <sub>D</sub> = 20A		130		S
<b>DYNAMIC</b>						
Input Capacitance <sup>5</sup>	C <sub>iss</sub>	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 15V, f = 1MHz		5803		pF
Output Capacitance <sup>5</sup>	C <sub>oss</sub>			1363		
Reverse Transfer Capacitance <sup>5</sup>	C <sub>rss</sub>			115		
Gate Resistance <sup>4,5</sup>	R <sub>g</sub>	f = 1MHz		1.0		Ω
Total Gate Charge <sup>1,2,5</sup>	Q <sub>g</sub> (V <sub>GS</sub> =10V)	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 30A		98		nC
	Q <sub>g</sub> (V <sub>GS</sub> =4.5V)			45		
Gate-Source Charge <sup>1,2,5</sup>	Q <sub>gs</sub>			18		
Gate-Drain Charge <sup>1,2,5</sup>	Q <sub>gd</sub>			9.5		
Turn-On Delay Time <sup>1,2,5</sup>	t <sub>d(on)</sub>	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 5A, R <sub>g</sub> = 3Ω		11		nS
Rise Time <sup>1,2,5</sup>	t <sub>r</sub>			11		
Turn-Off Delay Time <sup>1,2,5</sup>	t <sub>d(off)</sub>			68		
Fall Time <sup>1,2,5</sup>	t <sub>f</sub>			22		
<b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Continuous Current	I <sub>S</sub>				80	A
Pulsed Current <sup>3</sup>	I <sub>SM</sub>				350	
Forward Voltage <sup>1,4</sup>	V <sub>SD</sub>	I <sub>F</sub> = 30A, V <sub>GS</sub> = 0V			1.2	V
Reverse Recovery Time <sup>5</sup>	t <sub>rr</sub>	I <sub>F</sub> = 30A, di <sub>F</sub> /dt = 400A / μS		36		nS
Peak Reverse Recovery Current <sup>5</sup>	I <sub>RM(REC)</sub>			4		A
Reverse Recovery Charge <sup>5</sup>	Q <sub>rr</sub>			79		nC

<sup>1</sup>Pulse test : Pulse Width ≤ 300 usec, Duty Cycle ≤ 2%.

<sup>2</sup>Independent of operating temperature.

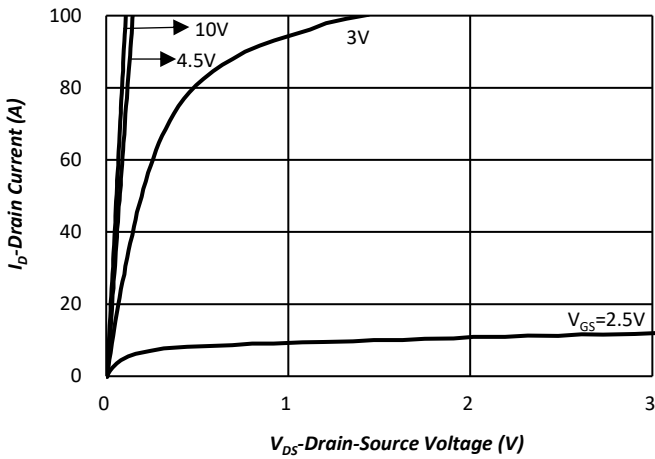
<sup>3</sup>Pulse width limited by maximum junction temperature.

<sup>4</sup>Guarantee by FT test Item

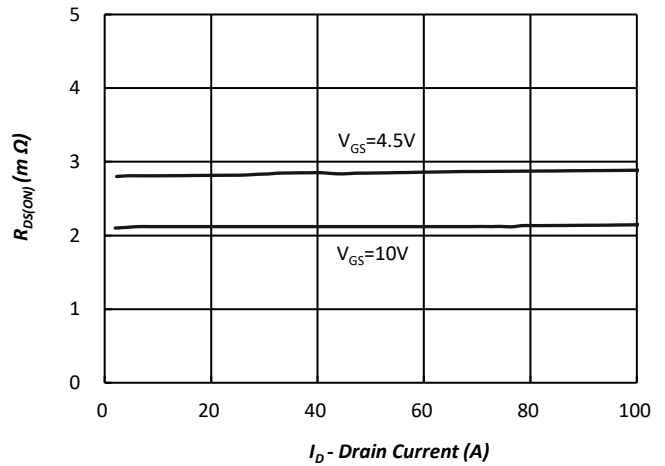
<sup>5</sup>Guarantee by Engineering test

**EMC will review datasheet by quarter, and update new version.**

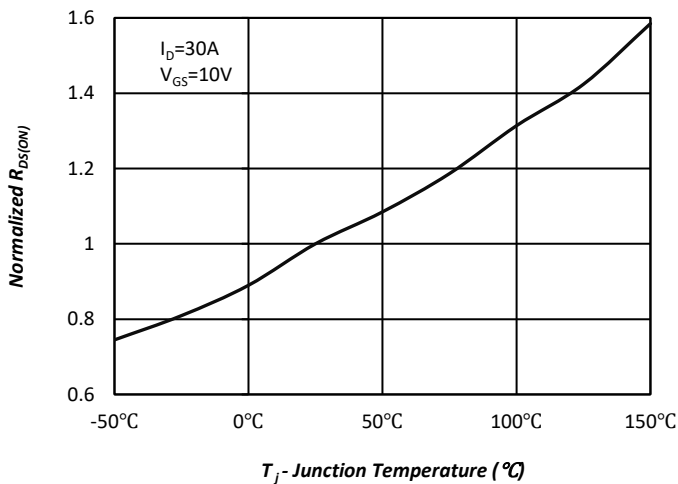
**TYPICAL CHARACTERISTICS**



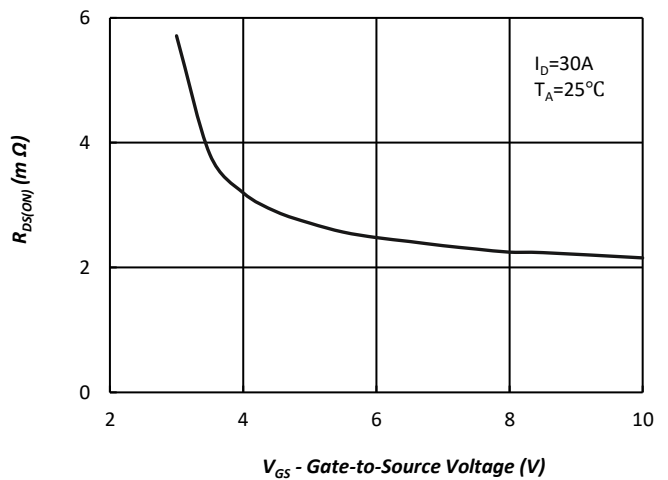
**Fig.1 Typical Output Characteristics**



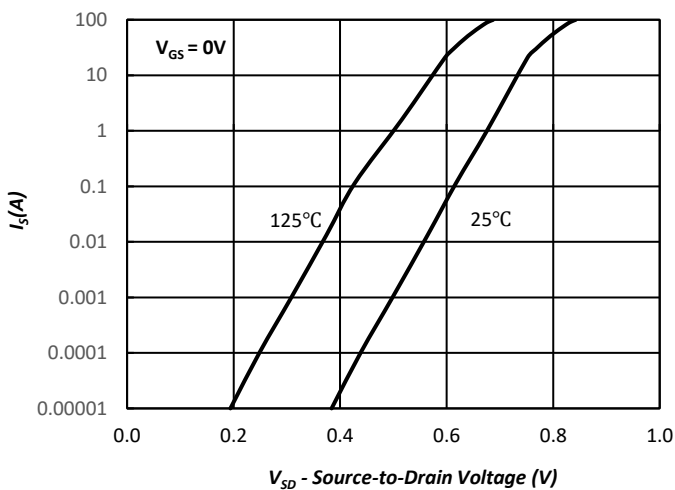
**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**



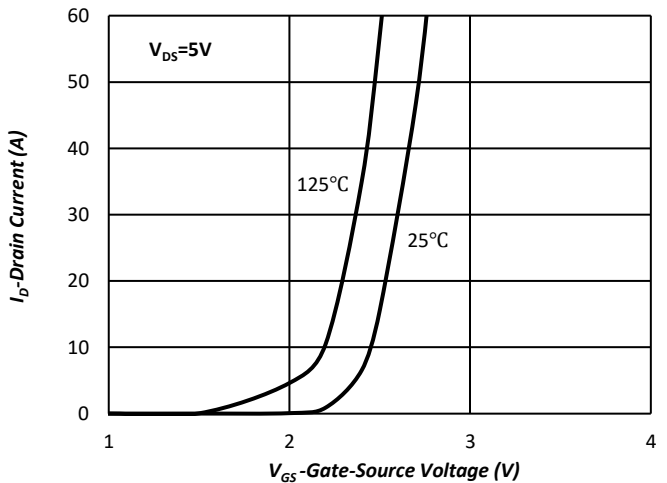
**Fig.3 Normalized On-Resistance v.s. Junction Temperature**



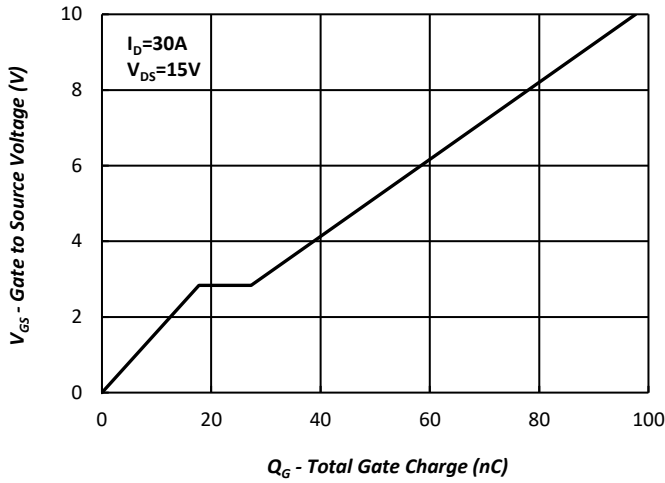
**Fig.4 On-Resistance v.s. Gate Voltage**



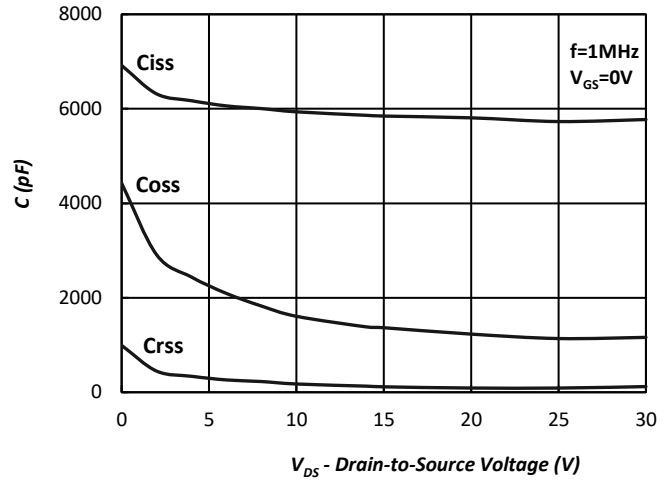
**Fig.5 Forward Characteristic of Reverse Diode**



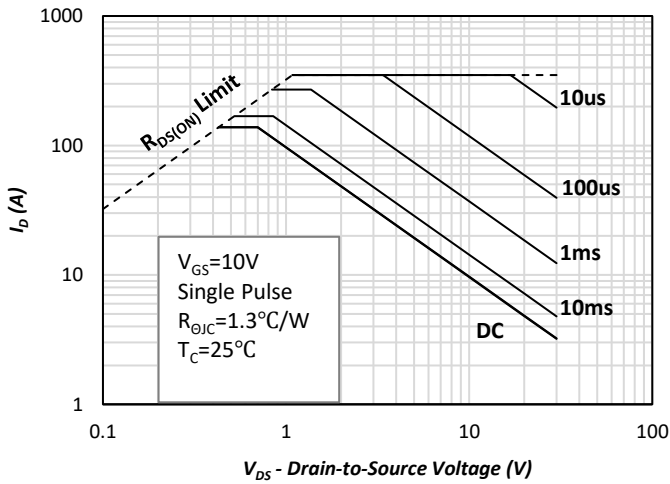
**Fig.6 Transfer Characteristics**



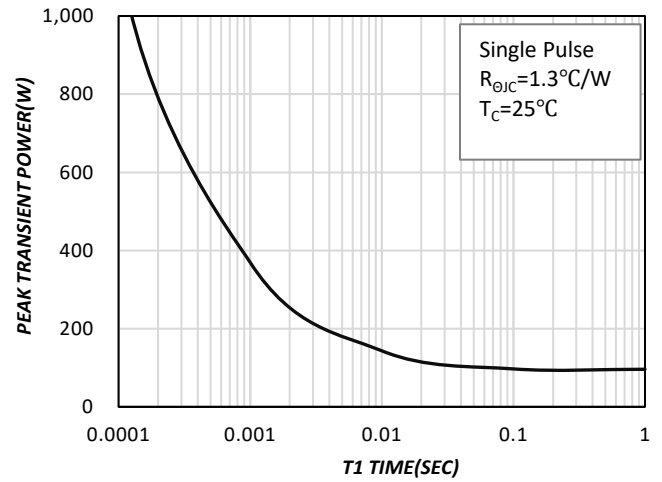
**Fig.7 Gate Charge Characteristics**



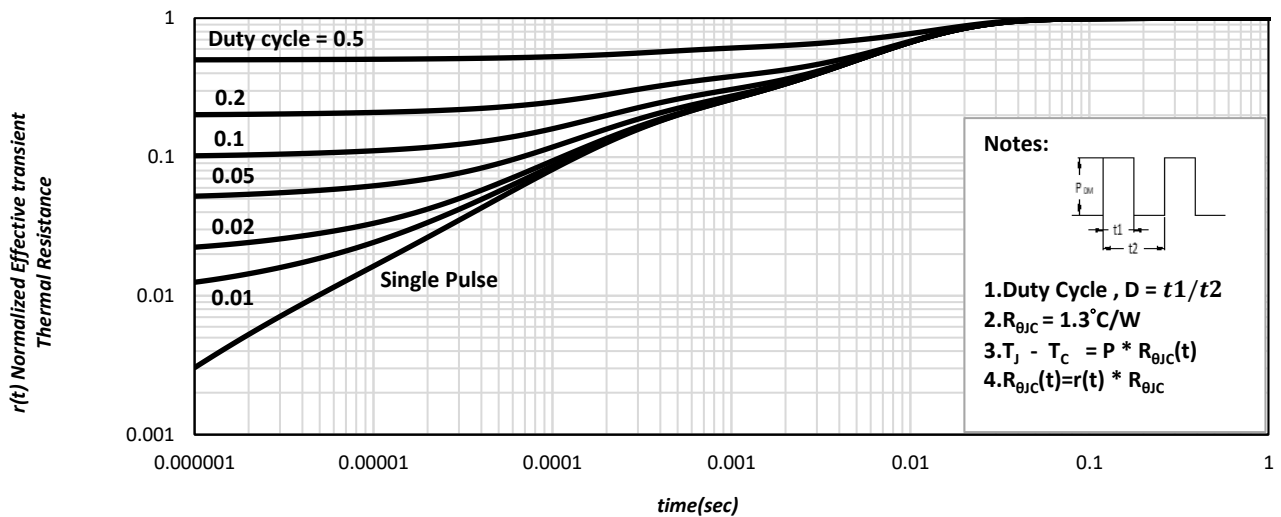
**Fig.8 Typical Capacitance Characteristics**



**Fig.9. Maximum Safe Operating Area**



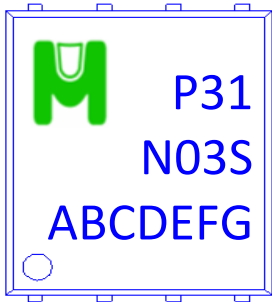
**Fig.10. Single Pulse Maximum Power Dissipation**



**Fig.11. Effective Transient Thermal Impedance**

**Ordering & Marking Information:**

Device Name:EMP31N03HCS for EDFN 5x6



→ P31N03S: Device Name

→ ABCDEFGH: Date Code

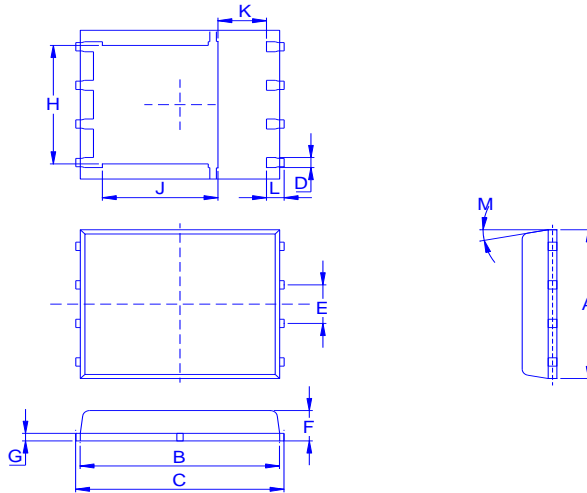
A: Assembly House

B: Year(A:2008 B:2009 C:2010....)

C: Month(A:01 B:02 C:03 D:04 E:05 F:06 G:07 H:08 I:09 J:10 K:11 L:12)

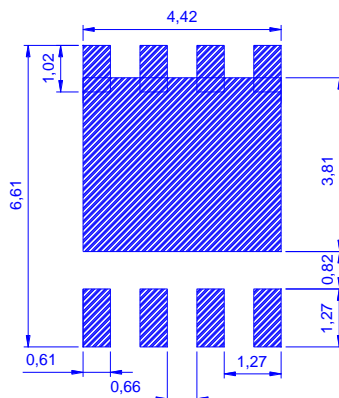
DEFG: Serial No.

**Outline Drawing**

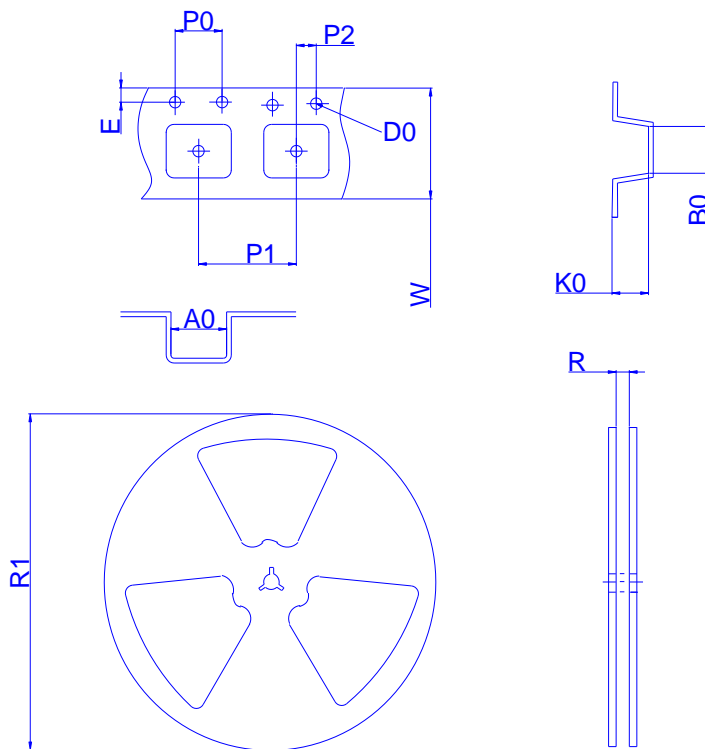


Dimension	A	B	C	D	E	F	G	H	J	K	L	M
Min	4.8	5.55	5.9	0.3	1.17	0.85	0.15	3.61	3.18	1	0.38	0°
Typ.	4.9	5.7	6	0.4	1.27	0.95	0.2	3.87	3.44	1.2	0.4	
Max	5.4	5.85	6.15	0.51	1.37	1.17	0.34	4.31	3.78	1.39	0.71	12°

**Footprint**



◆ Tape&Reel Information:2500pcs/Reel



Package	EDFN5X6
Reel	13"
Device orientation	<p>FEED DIRECTION</p> <p>→</p>

Dimension in mm

Dimension	Carrier tape									Reel	
	A0	B0	D0	E	K0	P0	P1	P2	W	R	R1
Typ.	6.4	5.3	1.5	1.8	1.6	4	8	2	12	12.4	330
±	0.2	0.2	0.1	0.1	0.6	0.1	0.1	0.1	0.3	2	2