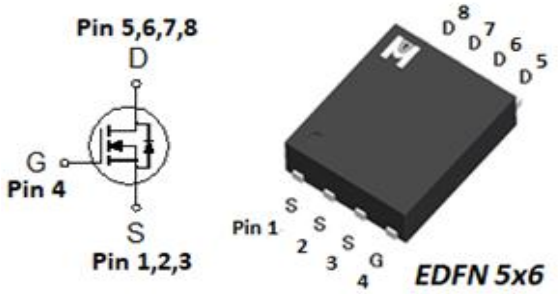
# Single N-Channel Logic Level Enhancement Mode Field Effect Transistor

## ▪Product Summary:

| | N-CH |
|---|---|
| $BV_{DSS}$ | 30V |
| $R_{DSON(MAX)} V_{GS}=10V$ | 3.2mΩ |
| $R_{DSON(MAX)} V_{GS}=4.5V$ | 4.2mΩ |
| $I_D$ @$T_C=25°C$ | 120A |
| $I_D$ @$T_A=25°C$ | 37A |

**▪ Pin Description:**



Single N Channel MOSFET
UIS, Rg 100% Tested
RoHS & Halogen Free & TSCA Compliant

## ▪ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25 °C Unless Otherwise Noted)

| PARAMETERS/TEST CONDITIONS | | SYMBOL | LIMITS | UNIT |
|---|---|---|---|---|
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $T_C$ = 25 °C | $I_D$ | 120 | A |
| | $T_C$ = 100 °C | | 76 | |
| Continuous Drain Current | $T_A$ = 25 °C | $I_D$ | 37 | |
| | $T_A$ = 70 °C | | 29 | |
| Pulsed Drain Current[1] | | $I_{DM}$ | 271 | |
| Avalanche Current | | $I_{AS}$ | 45 | |
| Avalanche Energy | L = 0.1mH | EAS | 101 | mJ |
| Avalanche Energy | L = 0.01mH | EAS | 55 | |
| Repetitive Avalanche Energy[2] | L = 0.05mH | EAR | 28 | |
| Power Dissipation | $T_C$ = 25 °C | $P_D$ | 74 | W |
| | $T_C$ = 100 °C | | 29 | |
| Power Dissipation | $T_A$ = 25 °C | $P_D$ | 7.1 | W |
| | $T_A$ = 70 °C | | 5 | |
| Operating Junction & Storage Temperature Range | | $T_j$, $T_{stg}$ | -55 to 150 | °C |

▪ 100% UIS testing in condition of VD=25V, L=0.1mH, VG=10V, IL= 27A,RG=25Ω,Rated VDS=30V N-CH

## ▪THERMAL RESISTANCE RATINGS

| THERMAL RESISTANCE | | SYMBOL | TYPICAL | MAXIMUM | UNIT |
|---|---|---|---|---|---|
| Junction-to-Case | | $R_{θJC}$ | | 1.7 | °C/W |
| Junction-to-Ambient[3,4] | t≦10s | $R_{θJA}$ | | 18 | |
| | Steady-State | $R_{θJA}$ | | 51 | |

[1] Pulse width limited by maximum junction temperature.

[2] Duty cycle < 1%

[3] The value of $R_{θJA}$ is measured with the device mounted on $1in^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25°C.

[4] Guarantee by Engineering test

## ▪ ELECTRICAL CHARACTERISTICS ($T_J$ = 25 °C, Unless Otherwise Noted)

| PARAMETER | SYMBOL | TEST CONDITIONS | LIMITS | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| **STATIC** | | | | | | |
| Drain-Source Breakdown Voltage[4] | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250uA | 30 | | | V |
| Gate Threshold Voltage[4] | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA | 1.2 | 1.6 | 2.5 | |
| Gate-Body Leakage[4] | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | | | ±100 | nA |
| Zero Gate Voltage Drain Current[4] | $I_{DSS}$ | $V_{DS}$ = 30V, $V_{GS}$ = 0V | | | 1 | µA |
| | | $V_{DS}$ =30V, $V_{GS}$ =0V, $T_J$ = 125 °C | | | 25 | |
| On-State Drain Current[1] | $I_{D(ON)}$ | $V_{DS}$ = 10V, $V_{GS}$ = 10V | 120 | | | A |
| Drain-Source On-State Resistance[1,4] | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 20A | | 2.3 | 3.2 | mΩ |
| Drain-Source On-State Resistance[1,4] | $R_{DS(ON)}$ | $V_{GS}$ = 4.5V, $I_D$ = 20A | | 3.5 | 4.2 | mΩ |
| Forward Transconductance[1] | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 20A | | 71 | | S |
| DYNAMIC | | | | | | |
| Input Capacitance[5] | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 15V, f = 1MHz | | 1445 | | pF |
| Output Capacitance[5] | $C_{oss}$ | | | 503 | | |
| Reverse Transfer Capacitance[5] | $C_{rss}$ | | | 58 | | |
| Gate Resistance[4,5] | $R_g$ | f = 1MHz | | 0.8 | | Ω |
| Total Gate Charge[1,2,5] | $Q_g(V_{GS}=10V)$ | $V_{DS}$ = 15V, $V_{GS}$ = 10V,<br>$I_D$ = 20A | | 28 | | nC |
| Total Gate Charge[1,2,5] | $Q_g(V_{GS}=4.5V)$ | | | 13 | | |
| Gate-Source Charge[1,2,5] | $Q_{gs}$ | | | 5 | | |
| Gate-Drain Charge[1,2,5] | $Q_{gd}$ | | | 5 | | |
| Turn-On Delay Time[1,2,5] | $t_{d(on)}$ | $V_{DS}$ = 15V, $V_{GS}$ = 10V,<br>$I_D$ = 5A , Rg = 3Ω | | 7 | | nS |
| Rise Time[1,2,5] | $t_r$ | | | 10 | | |
| Turn-Off Delay Time[1,2,5] | $t_{d(off)}$ | | | 22 | | |
| Fall Time[1,2,5] | $t_f$ | | | 9 | | |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | |
| Continuous Current | $I_S$ | | | | 61 | A |
| Pulsed Current[3] | $I_{SM}$ | | | | 188 | |
| Forward Voltage[1,4] | $V_{SD}$ | $I_F$ = 20A, $V_{GS}$ = 0V | | | 1.2 | V |
| Reverse Recovery Time[5] | $t_{rr}$ | $I_F$ = 20A, $dI_F/dt$ = 400A / µS | | 16 | | nS |
| Peak Reverse Recovery Current[5] | $I_{RM(REC)}$ | | | 3 | | A |
| Reverse Recovery Charge[5] | $Q_{rr}$ | | | 24 | | nC |

[1] Pulse test : Pulse Width ≦ 300 usec, Duty Cycle ≦ 2％.

[2] Independent of operating temperature.

[3] Pulse width limited by maximum junction temperature.

[4] Guarantee by FT test Item

[5] Guarantee by Engineering test

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

## ▪ N-CH_TYPICAL CHARACTERISTICS

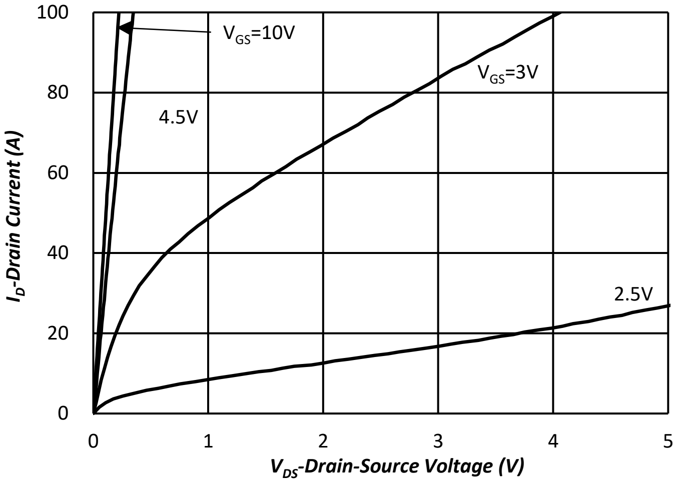


**Fig.1 Typical Output Characteristics**

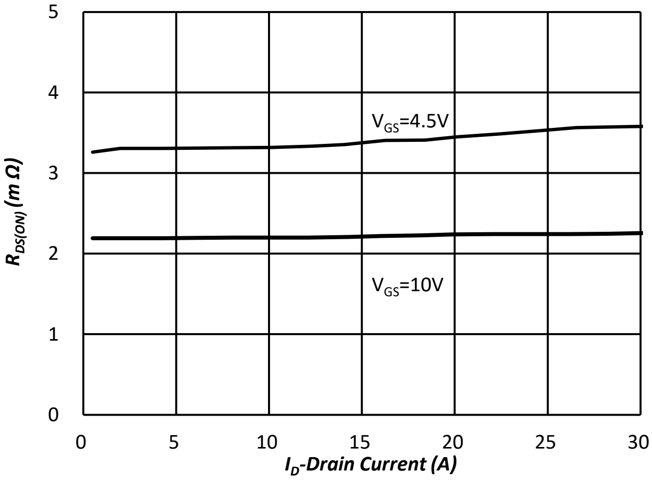


**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**

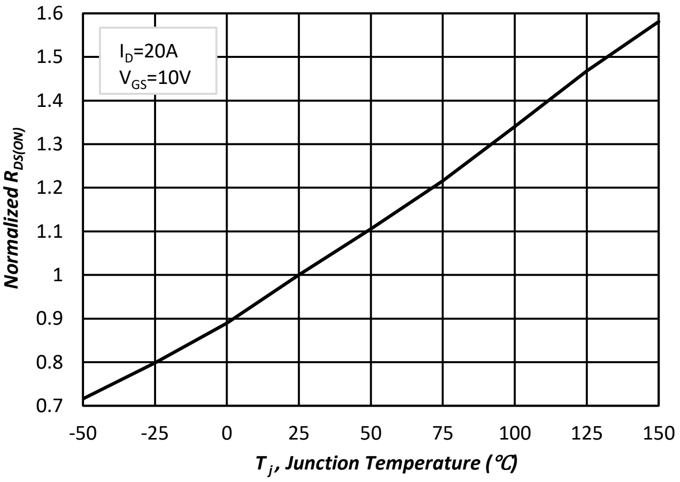


**Fig.3 Normalized On-Resistance v.s. Junction Temperature**

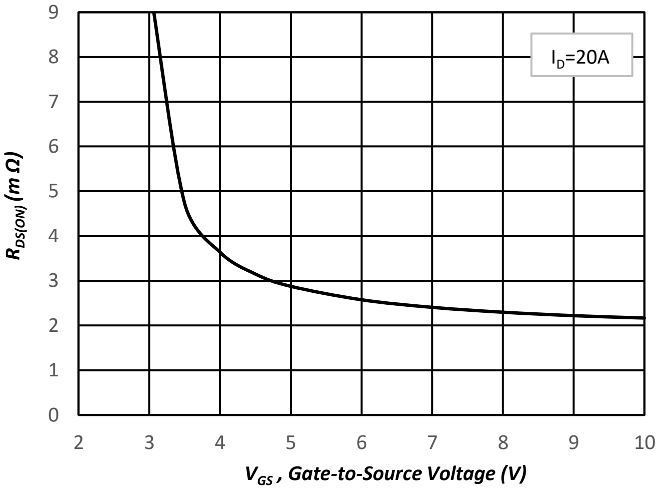


**Fig.4 On-Resistance v.s. Gate Voltage**

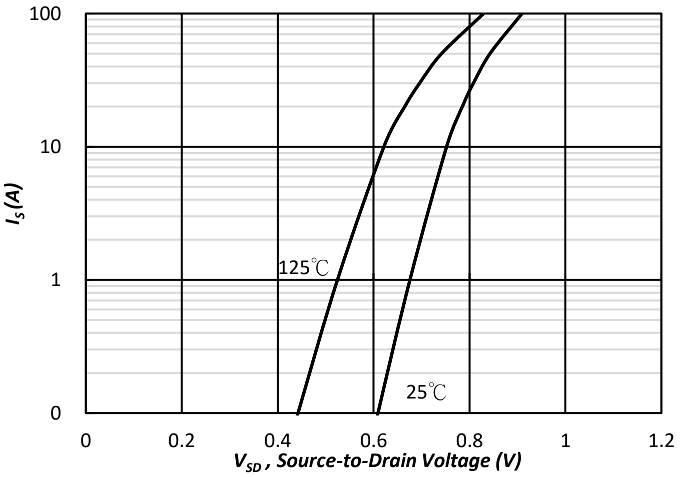


**Fig.5 Forward Characteristic of Reverse Diode**

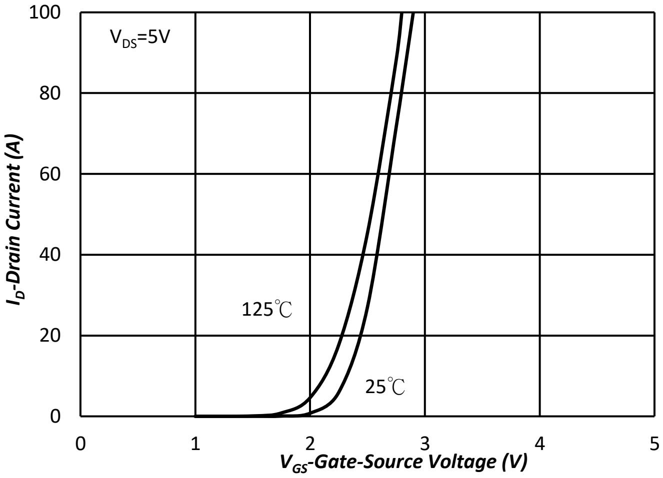


**Fig.6 Transfer Characteristics**

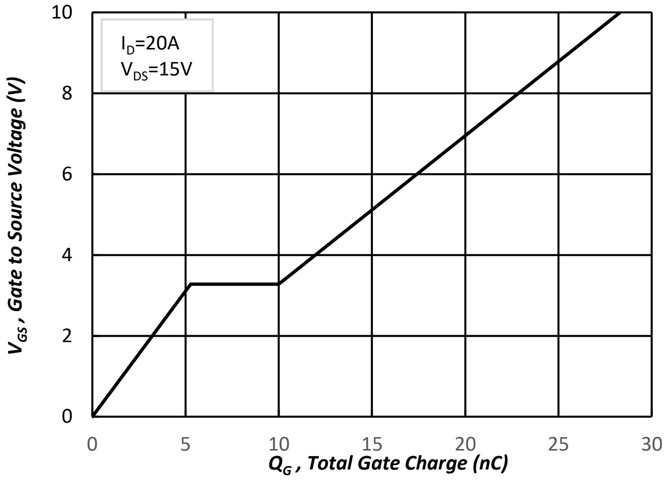


**Fig.7 Gate Charge Characteristics**

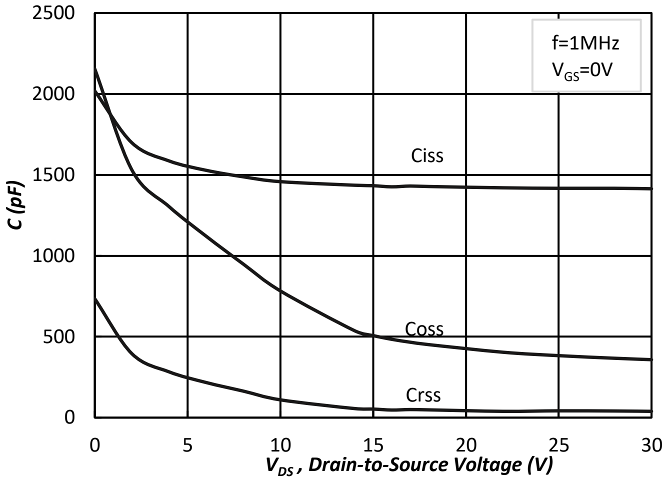


**Fig.8 Typical Capacitance Characteristics**

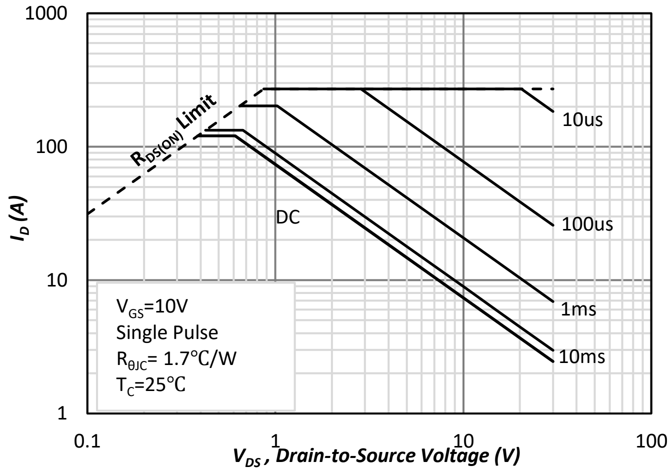


**Fig 9. Maximum Safe Operating Area**

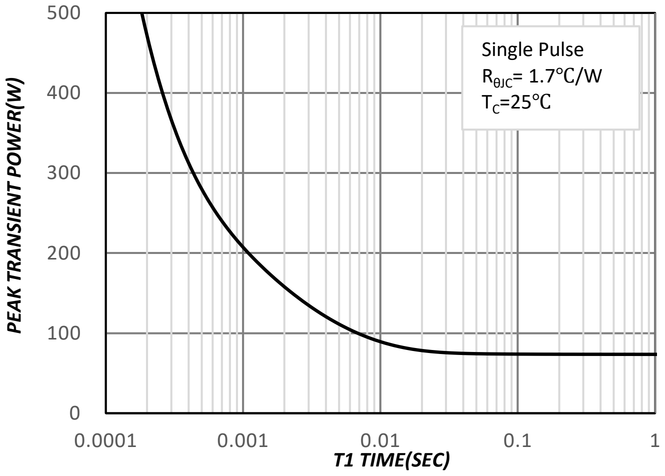


**Fig 10. Single Pulse Maximum Power Dissipation**

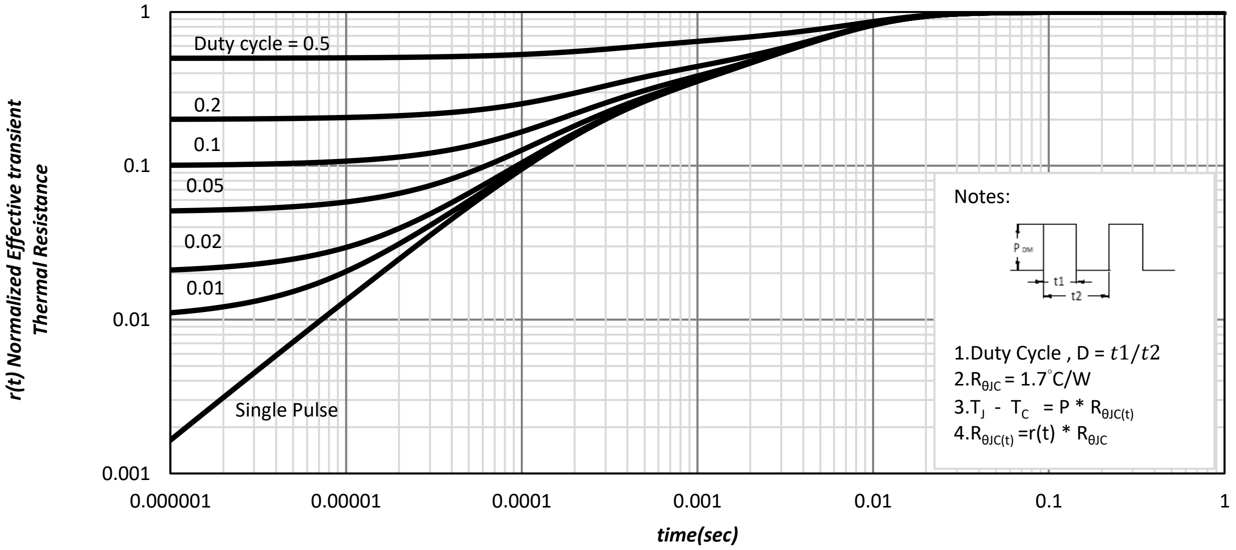
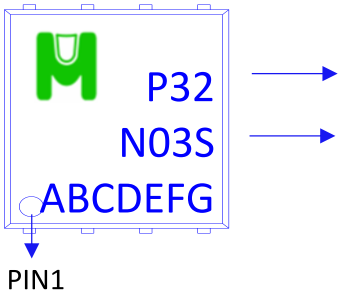


**Fig 11. Effective Transient Thermal Impedance**

## Ordering & Marking Information:

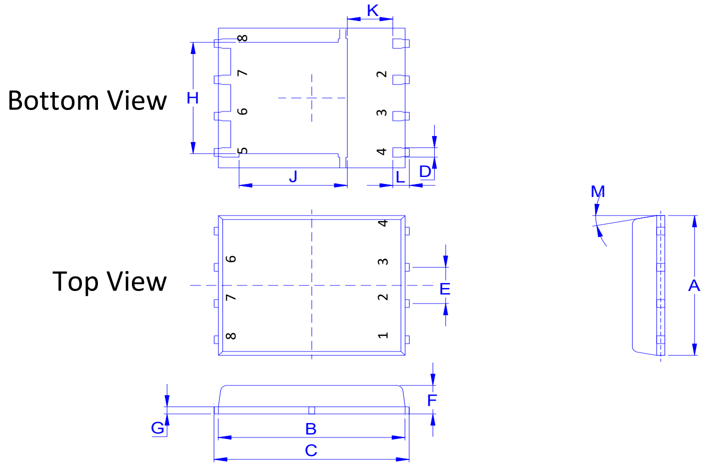
Device Name: EMP32N03HCS for EDFN 5x6



P32N03S: Device Name

ABCDEFG: 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.

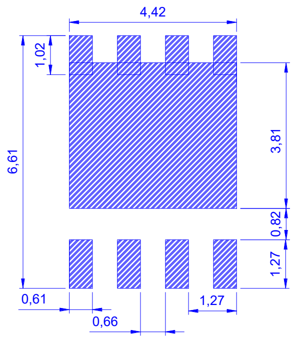
## Outline Drawing



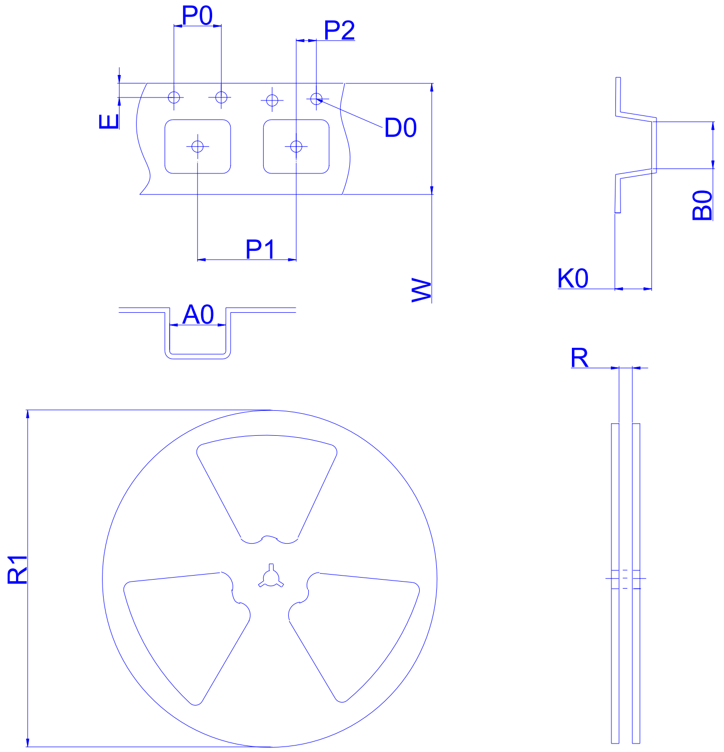
Dimension in mm

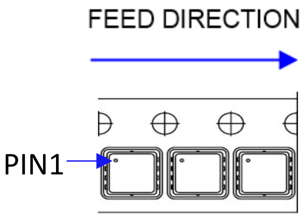
| Dimension | A | B | C | D | E | F | G | H | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Min | 4.80 | 5.65 | 5.90 | 0.33 | - | 0.90 | 0.20 | 3.61 | 3.38 | 1.00 | 0.42 | 0° |
| Typ. | 4.90 | 5.70 | 6.00 | 0.40 | 1.27 | 0.95 | 0.25 | 3.87 | 3.44 | 1.20 | 0.60 | - |
| Max | 5.10 | 5.85 | 6.15 | 0.51 | - | 1.10 | 0.35 | 4.11 | 3.78 | 1.39 | 0.71 | 12° |

## Footprint



## ◆ Tape&Reel Information:2500pcs/Reel



| | |
|---|---|
| Package | EDFN5X6 |
| Reel | 13” |
| Device orientation |  |

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 | 1.3 | 4 | 8 | 2 | 12 | 12.4 | 330 |
| ± | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.3 | 2 | 2 |