

Single P-Channel Logic Level Enhancement Mode Field Effect Transistor

▪ Product Summary:

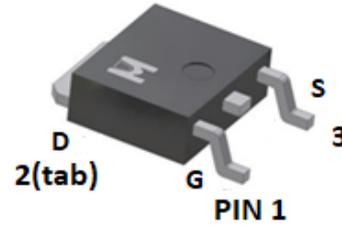
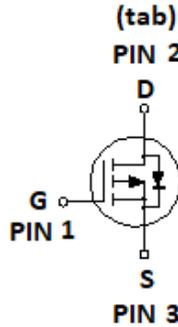
	P-CH
$BV_{DSS}$	-60V
$R_{DSON (MAX.)}@V_{GS}=-10V$	90mΩ
$R_{DSON (MAX.)}@V_{GS}=-4.5V$	140mΩ
$I_D @T_C=25^{\circ}C$	-16A
$I_D @T_A=25^{\circ}C$	-4.2A

Single P Channel MOSFET

UIS, Rg 100% Tested

RoHS & Halogen Free & TSCA Compliant

▪ Pin Description:



TO-252 (DPAK)



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

PARAMETERS/TEST CONDITIONS	SYMBOL	LIMITS	UNIT	
Gate-Source Voltage	$V_{GS}$	±20	V	
Continuous Drain Current <sup>1</sup>	$I_D$	$T_C = 25^{\circ}C$	-16	
		$T_C = 100^{\circ}C$	-9.9	
Continuous Drain Current <sup>1</sup>	$I_D$	$T_A = 25^{\circ}C$	-4.2	
		$T_A = 70^{\circ}C$	-3.3	
Pulsed Drain Current <sup>1</sup>	$I_{DM}$	-35	A	
Avalanche Current <sup>1,4</sup>	$I_{AS}$	-30		
Avalanche Energy <sup>1</sup>	L = 0.1mH	EAS		45
Repetitive Avalanche Energy <sup>2</sup>	L = 0.05mH	EAR		22.5
Power Dissipation <sup>1</sup>	$P_D$	$T_C = 25^{\circ}C$	43	
		$T_C = 100^{\circ}C$	17	
Power Dissipation <sup>1</sup>	$P_D$	$T_A = 25^{\circ}C$	3.0	
		$T_A = 70^{\circ}C$	2.0	
Operating Junction & Storage Temperature Range	$T_j, T_{stg}$	-55 to 150	°C	

▪ 100% UIS testing in condition of  $V_D=40V, L=0.1mH, V_G=10V, I_L=18A, R_G=25\Omega$ , Rated  $V_{DS}=60V$  P-CH

▪ THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Case	$R_{\theta JC}$		2.9	°C / W
Junction-to-Ambient <sup>3</sup>	$t \leq 10s$	$R_{\theta JA}$	13	
	Steady-State	$R_{\theta JA}$	41	

<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	-60			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> = -60V, V <sub>GS</sub> = 0V			-1	μA
		V <sub>DS</sub> = -60V, 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	-16			A
Drain-Source On-State Resistance <sup>1,4</sup>	R <sub>DS(ON)</sub>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A		58	90	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -8A		65	140	
Forward Transconductance <sup>1</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -5V, I <sub>D</sub> = -4A		15		S
<b>DYNAMIC</b>						
Input Capacitance <sup>5</sup>	C <sub>iss</sub>	V <sub>GS</sub> = 0V, V <sub>DS</sub> = -30V, f = 1MHz		1355		pF
Output Capacitance <sup>5</sup>	C <sub>oss</sub>			85		
Reverse Transfer Capacitance <sup>5</sup>	C <sub>rss</sub>			65		
Gate Resistance <sup>4,5</sup>	R <sub>g</sub>	f = 1MHz		6.0		Ω
Total Gate Charge <sup>1,2,5</sup>	Q <sub>g</sub> (V <sub>GS</sub> =-10V)	V <sub>DS</sub> = -30V, V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A		31		nC
	Q <sub>g</sub> (V <sub>GS</sub> =-4.5V)			14		
Gate-Source Charge <sup>1,2,5</sup>	Q <sub>gs</sub>			5.6		
Gate-Drain Charge <sup>1,2,5</sup>	Q <sub>gd</sub>			5.4		
Turn-On Delay Time <sup>1,2,5</sup>	t <sub>d(on)</sub>			6.3		
Rise Time <sup>1,2,5</sup>	t <sub>r</sub>	V <sub>DS</sub> = -30V, V <sub>GS</sub> = -10V, I <sub>D</sub> = -5A, R <sub>g</sub> = 6Ω		11		
Turn-Off Delay Time <sup>1,2,5</sup>	t <sub>d(off)</sub>			74		
Fall Time <sup>1,2,5</sup>	t <sub>f</sub>			30		
<b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Continuous Current	I <sub>S</sub>				-16	A
Pulsed Current <sup>3</sup>	I <sub>SM</sub>				-35	
Forward Voltage <sup>1,4</sup>	V <sub>SD</sub>	I <sub>F</sub> = -10A, V <sub>GS</sub> = 0V			-1.2	V
Reverse Recovery Time <sup>5</sup>	t <sub>rr</sub>	I <sub>F</sub> = -10A, dI <sub>F</sub> /dt = 100A / μS		20		nS
Peak Reverse Recovery Current <sup>5</sup>	I <sub>RM(REC)</sub>			2.0		A
Reverse Recovery Charge <sup>5</sup>	Q <sub>rr</sub>			19		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

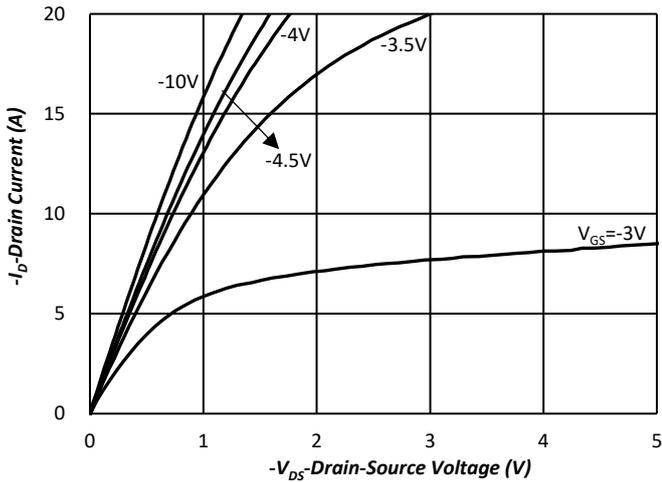


Fig.1 Typical Output Characteristics

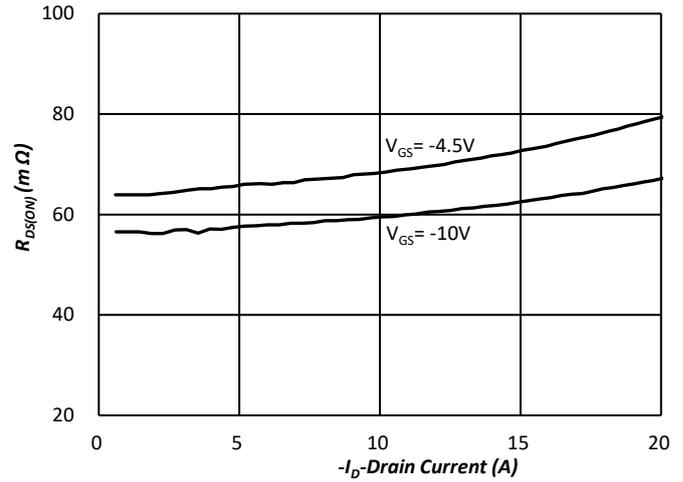


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

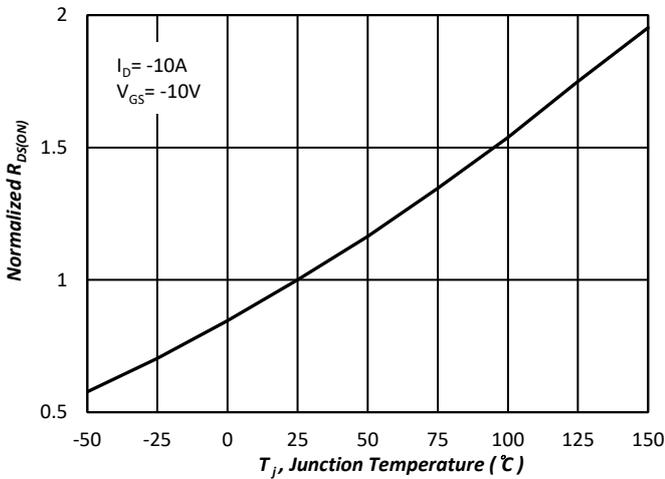


Fig.3 Normalized On-Resistance v.s. Junction Temperature

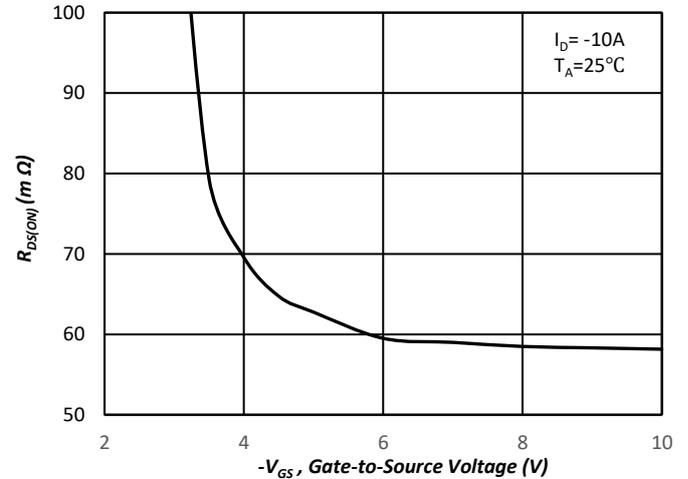


Fig.4 On-Resistance v.s. Gate Voltage

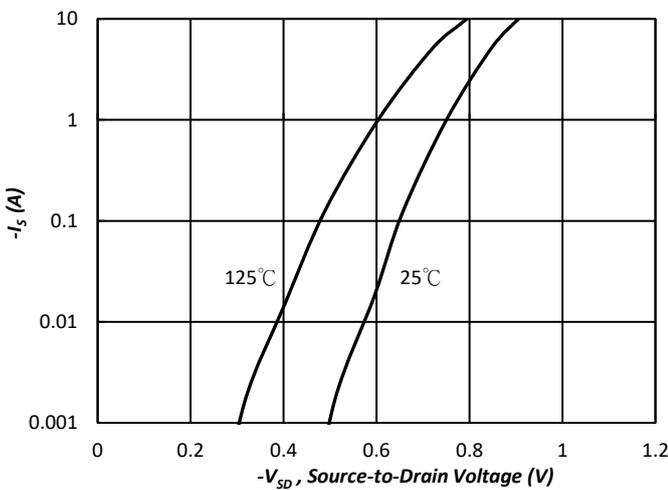


Fig.5 Forward Characteristic of Reverse Diode

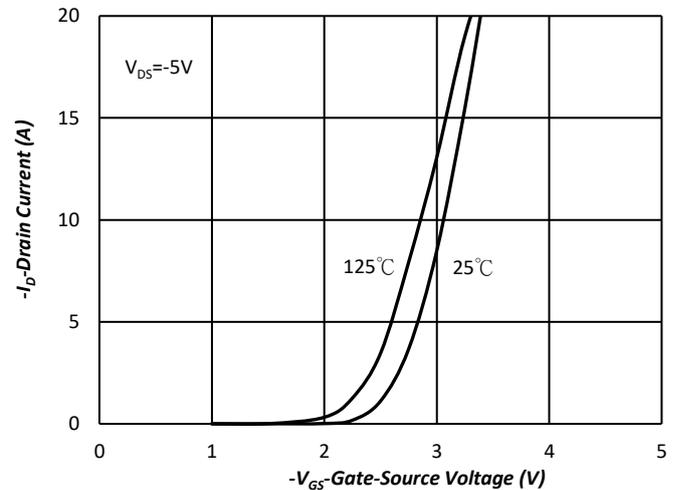
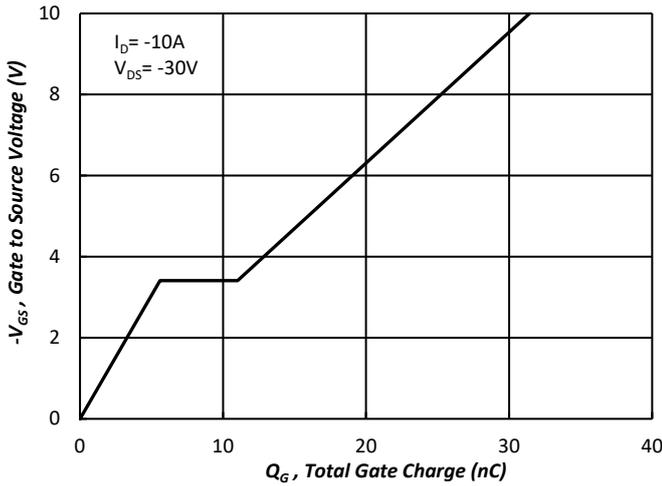
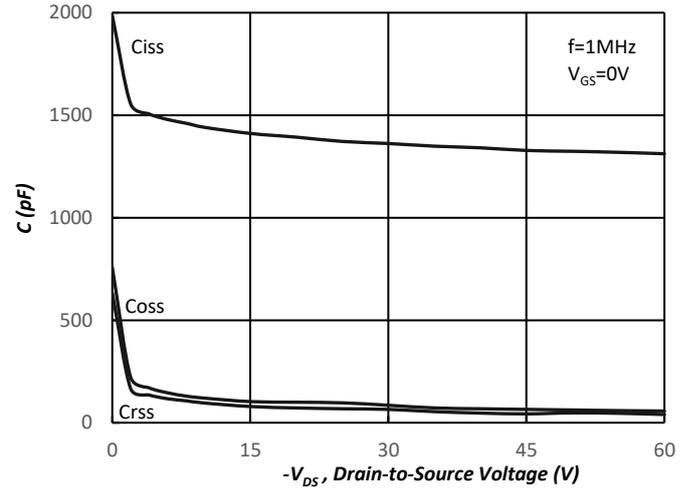


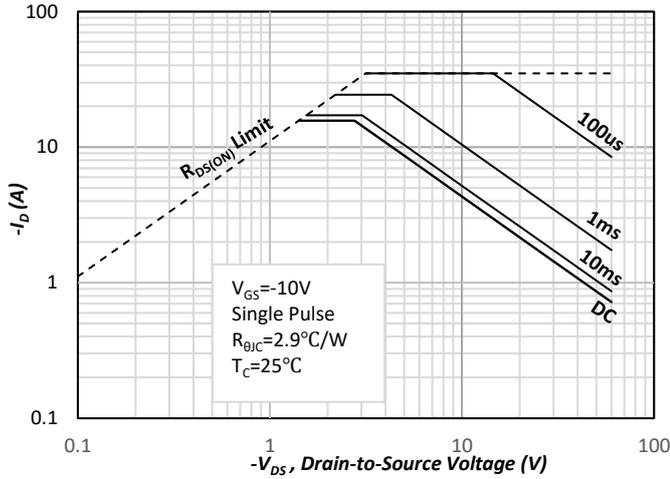
Fig.6 Transfer Characteristics



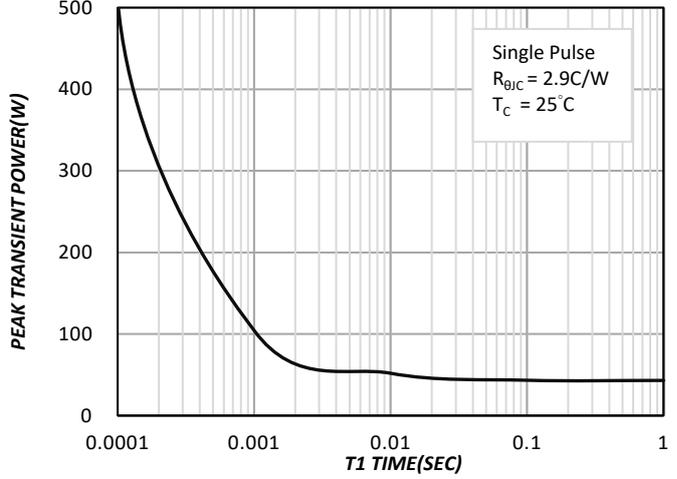
**Fig.7 Gate Charge Characteristics**



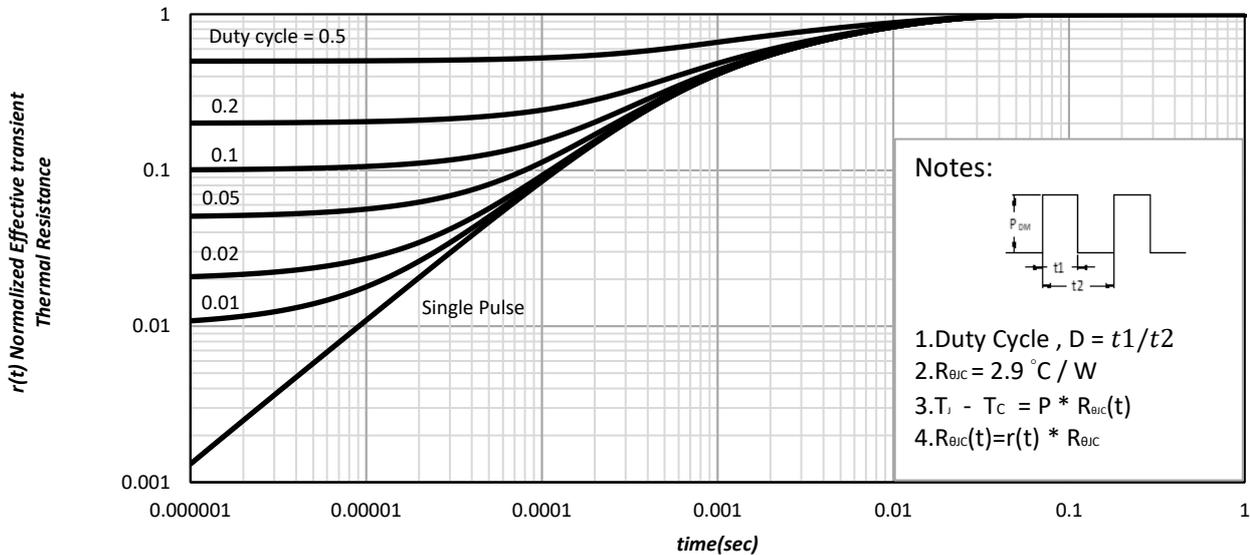
**Fig.8 Typical Capacitance Characteristics**



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



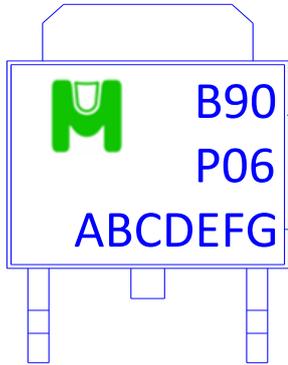
**Fig.10. Single Pulse Maximum Power Dissipation**



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

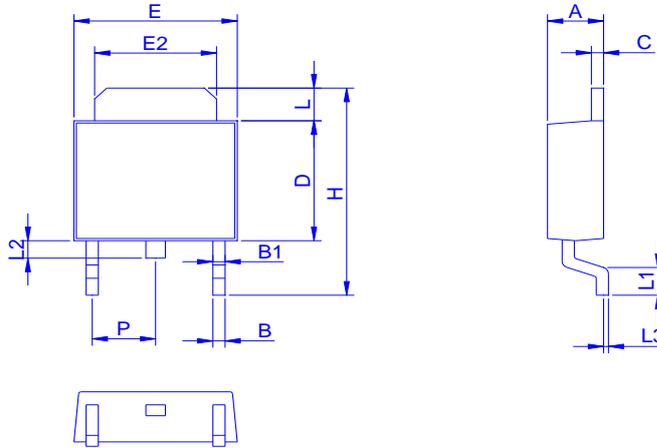
**Ordering & Marking Information:**

Device Name:EMB90P06A for TO-252 [DPAK]



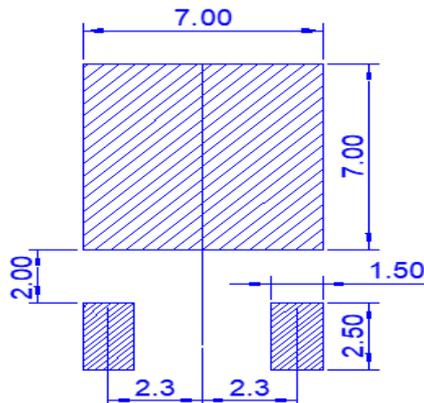
B90P06: Device Name  
 ABCDEFGH: Date Code  
 A: Assembly House  
 B: Year(A:2008 B:2009 C:2010....)  
 C: Month(A:01 B:02 C:03 D:04 E:05 F:06 G:07 H:08 I:09 J:10 K:11 L:12)  
 DEFG: Serial No.

**Outline Drawing**

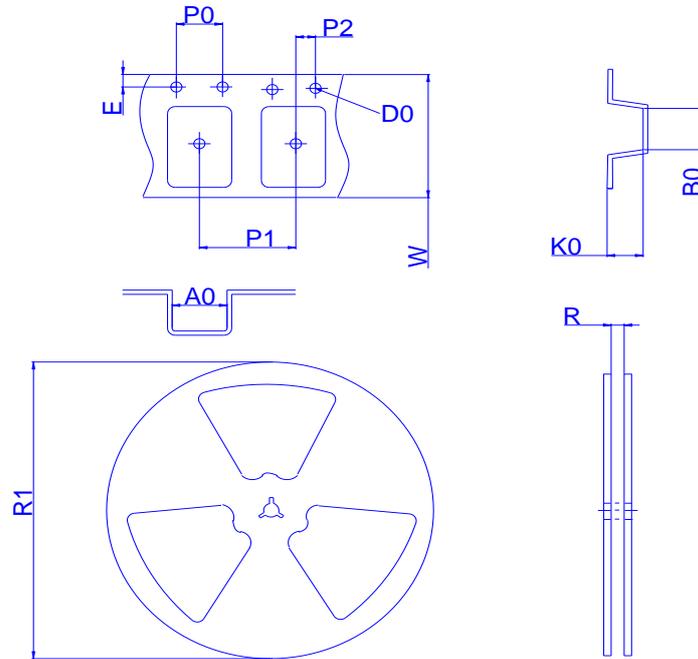


Dimension	A	B	B1	C	D	E	E2	H	L	L1	L2	L3	P
Min.	2.184	0.635	0.711	0.460	5.969	6.350	4.953	9.398	0.889	1.397	0.600	-	2.186
Typ.	2.300	0.760	0.840	0.500	6.100	6.600	-	10.000	1.012	1.520	-	0.127	2.286
Max.	2.400	0.890	1.143	0.889	6.223	6.731	5.461	10.414	1.270	1.778	1.010	-	2.386

**Footprint**



◆ Tape&Reel Information:2500pcs/Reel



Package	TO252-2
Reel	13"
Device orientation	<p>FEEED DIRECTION</p> <p>→</p>

**Dimension in mm**

Dimension	Carrier tape									Reel	
	A0	B0	D0	E	K0	P0	P1	P2	W	R	R1
Typ.	6.9	10.5	1.55	1.75	2.7	4	8	2	16	17	330
±	1	1	0.2	0.1	0.2	0.2	0.1	0.1	0.3	2	2