

### General Description

The MA2401C1 is the highest performance trench P-ch MOSFETs with extreme high cell density, which provide excellent RDSON and gate charge for most of the small power switching and load switch applications.

The MA2401C1 meet the RoHS and Green Product requirement, with full function reliability approved.

### Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Green Device Available

### Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D@T_A=25$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-1.9	A
$I_D@T_A=70$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-1.5	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-7.6	A
$P_D@T_A=25$	Total Power Dissipation <sup>3</sup>	0.33	W
$T_{STG}$	Storage Temperature Range	-55 to 150	
$T_J$	Operating Junction Temperature Range	-55 to 150	

### Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	---	375	/W
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	240	/W

### Product Summary

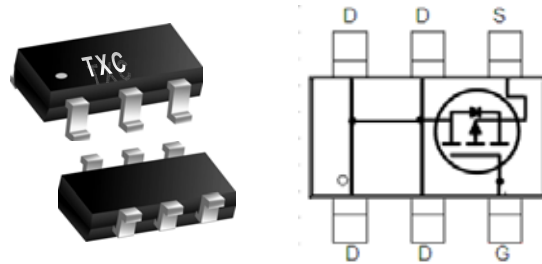


BVDSS	RDSON	ID
-20V	65mΩ	-1.9A

### Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- Load Switch

### SOT 363 Pin Configuration



## P-Ch 20V Fast Switching MOSFETs

### Electrical Characteristics ( $T_J=25$ , unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-20	---	---	V
$BV_{DSS}/T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to 25 , $I_D=-1mA$	---	-0.014	---	V/
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-4.5V, I_D=-2A$	---	50	65	m $\Omega$
		$V_{GS}=-2.5V, I_D=-1A$	---	75	95	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-0.5	-0.8	-1.2	V
$V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	3.95	---	mV/
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-16V, V_{GS}=0V, T_J=25$	---	---	-1	$\mu A$
		$V_{DS}=-16V, V_{GS}=0V, T_J=55$	---	---	-5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0V$	---	---	$\pm 100$	nA
$g_{fs}$	Forward Transconductance	$V_{DS}=-5V, I_D=-2A$	---	11.2	---	S
$Q_g$	Total Gate Charge (-4.5V)	$V_{DS}=-15V, V_{GS}=-4.5V, I_D=-2A$	---	10	14.0	nC
$Q_{gs}$	Gate-Source Charge		---	1.75	2.5	
$Q_{gd}$	Gate-Drain Charge		---	3	4.2	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-10V, V_{GS}=-4.5V, R_G=3.3\Omega, I_D=-2A$	---	5.8	11.6	ns
$T_r$	Rise Time		---	36.6	66	
$T_{d(off)}$	Turn-Off Delay Time		---	35.2	70	
$T_f$	Fall Time		---	19.6	39.2	
$C_{iss}$	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1MHz$	---	857	1200	pF
$C_{oss}$	Output Capacitance		---	114	160	
$C_{rss}$	Reverse Transfer Capacitance		---	108	151	

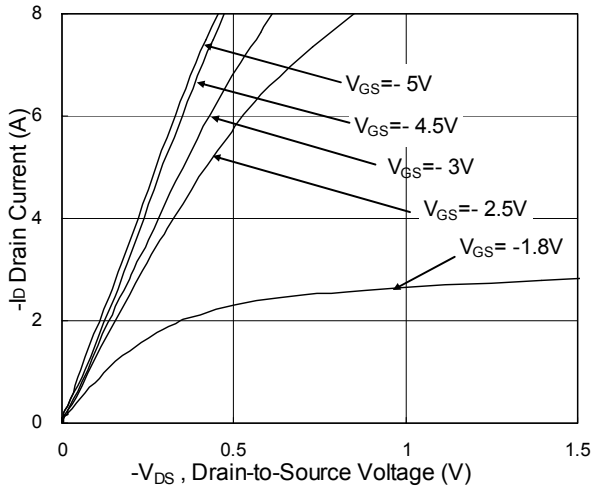
### Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current <sup>1,4</sup>	$V_G=V_D=0V, \text{ Force Current}$	---	---	-1.9	A
$I_{SM}$	Pulsed Source Current <sup>2,4</sup>		---	---	-7.6	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=-1A, T_J=25$	---	---	-1	V
$t_{rr}$	Reverse Recovery Time	$I_F=-2A, dI/dt=100A/\mu s, T_J=25$	---	24.7	---	nS
$Q_{rr}$	Reverse Recovery Charge		---	6.8	---	nC

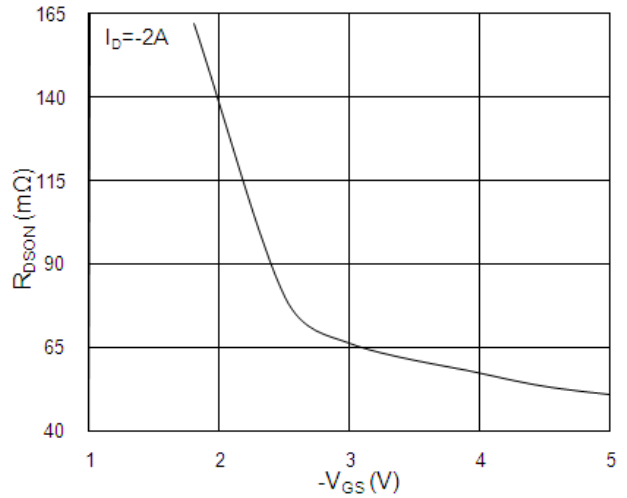
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The power dissipation is limited by 150 junction temperature
- 4.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.

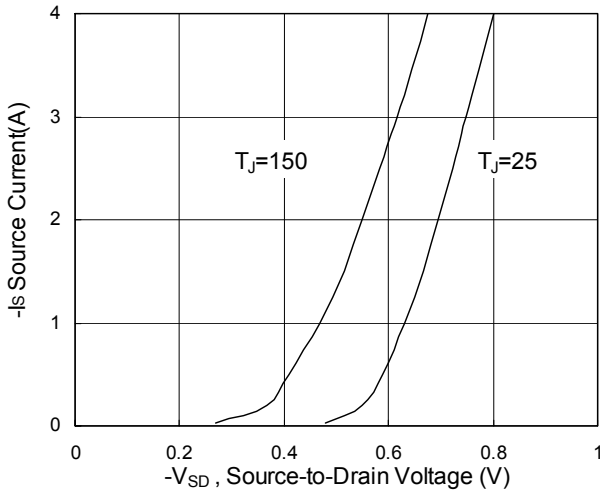
**Typical Characteristics**



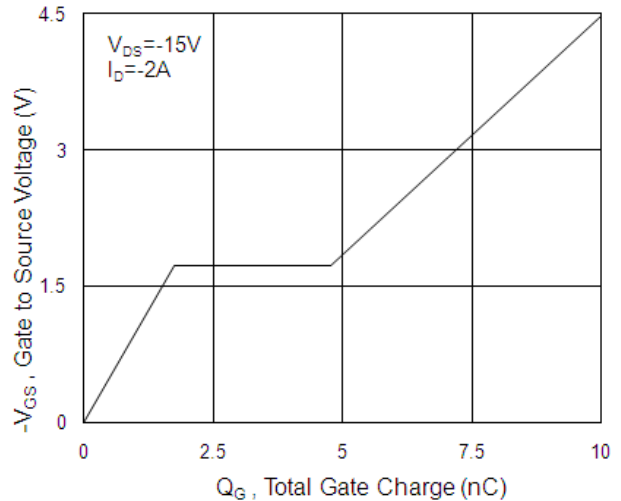
**Fig.1 Typical Output Characteristics**



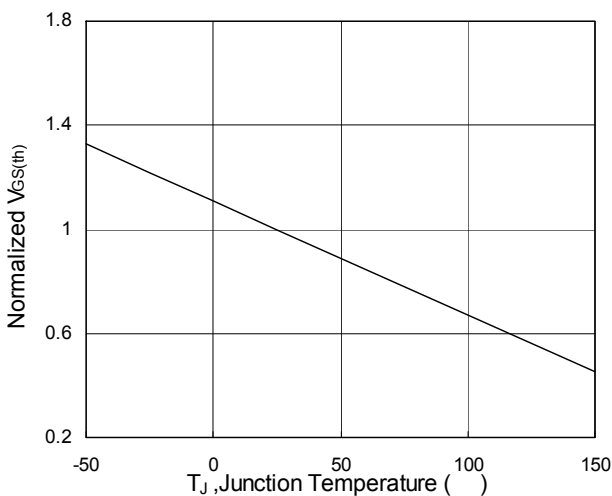
**Fig.2 On-Resistance vs. G-S Voltage**



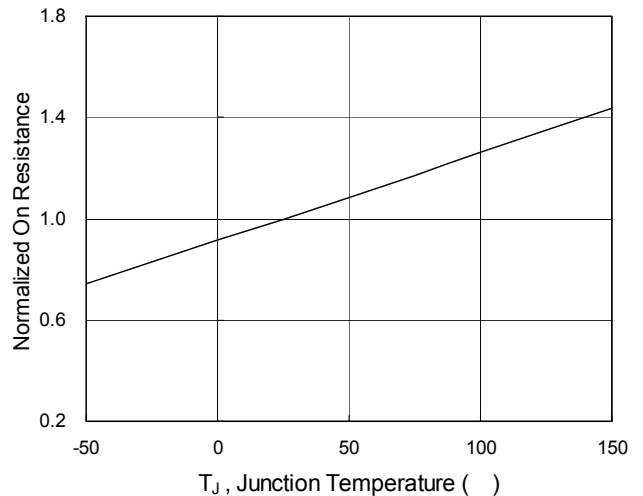
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**

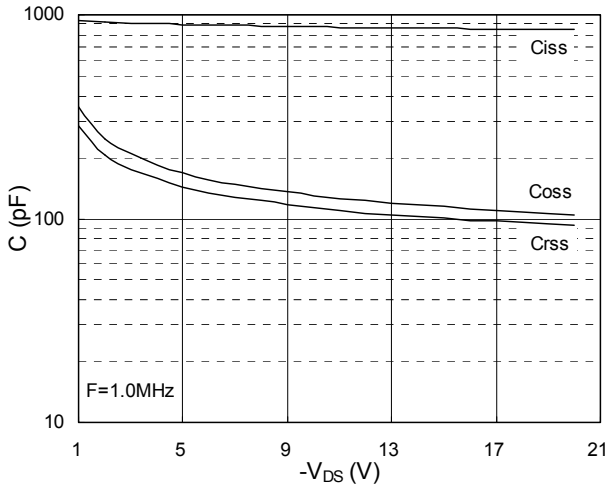


**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**

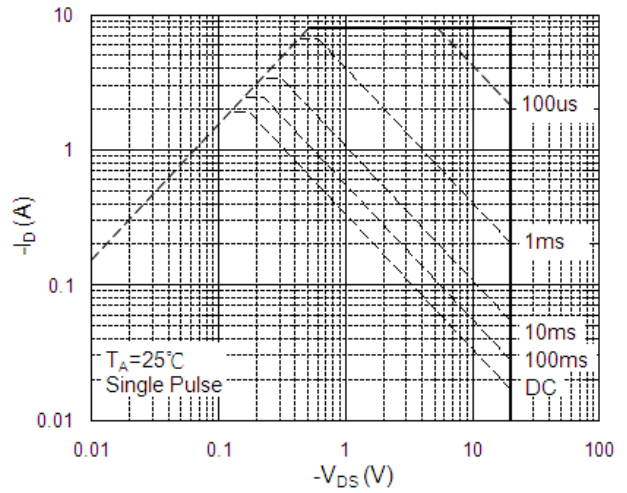


**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**

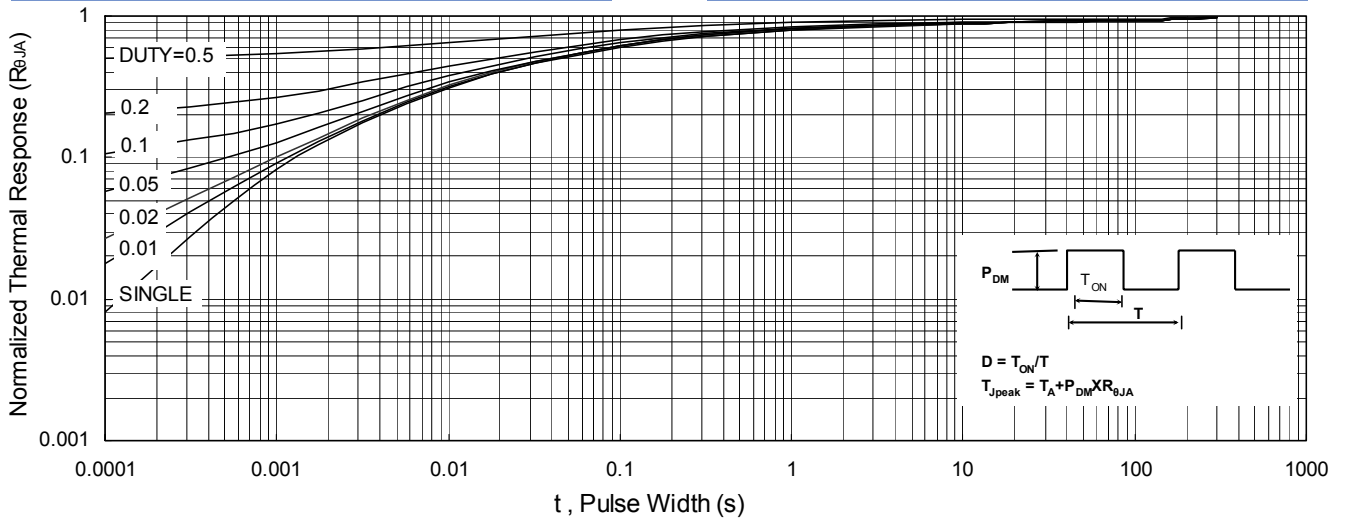
**P-Ch 20V Fast Switching MOSFETs**



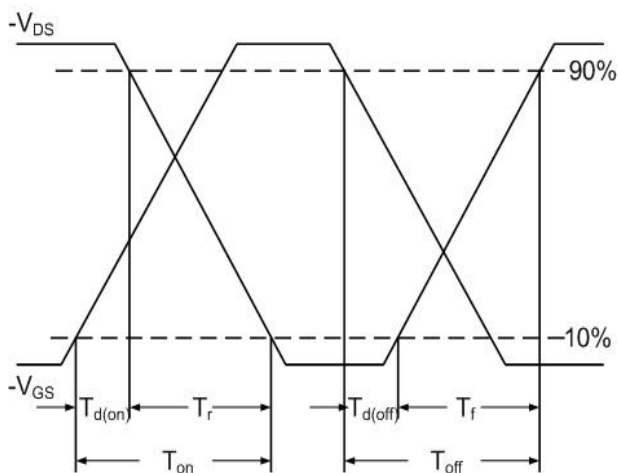
**Fig.7 Capacitance**



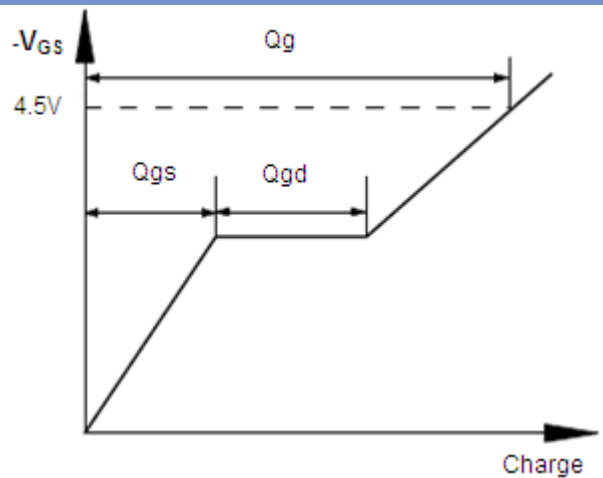
**Fig.8 Safe Operating Area**



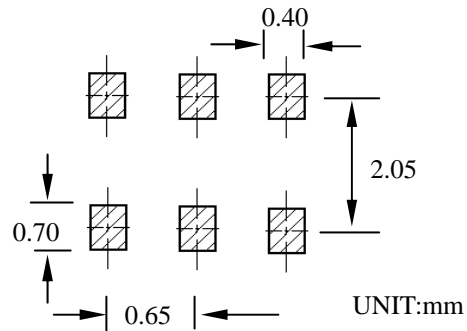
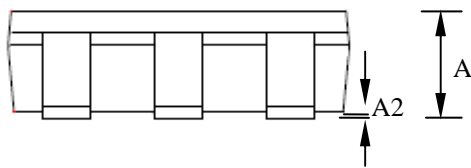
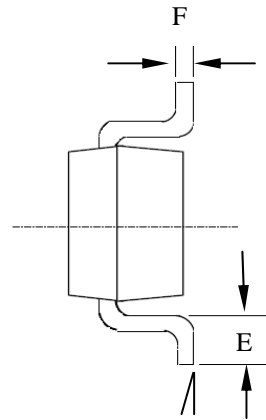
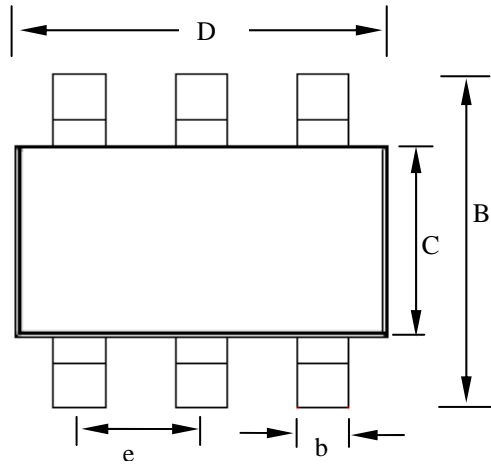
**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**

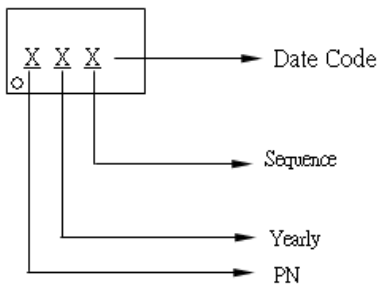


**Fig.11 Gate Charge Waveform**



LAND PATTERN RECOMMENDATION

### MARKING

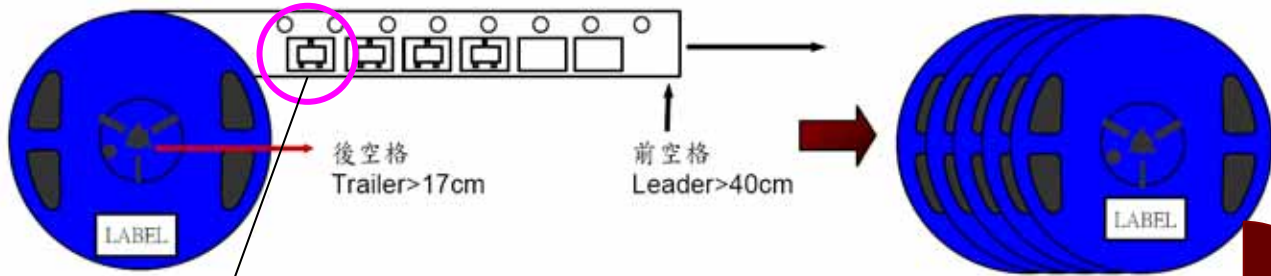


SYMBOLS	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	--	1.10	0.031	--	0.043
A2	0.00	--	0.10	0.000	--	0.004
B	1.80	2.20	2.60	0.071	0.087	0.102
C	1.15	1.25	1.40	0.045	0.049	0.055
D	1.80	2.00	2.30	0.071	0.079	0.091
E	0.15	0.36	0.46	0.006	0.014	0.018
F	0.08	--	0.25	0.003	--	0.010
b	0.15	--	0.35	0.006	--	0.014
e	--	0.65	--	--	0.026	--
$\theta$	0°	--	8°	0°	--	8°

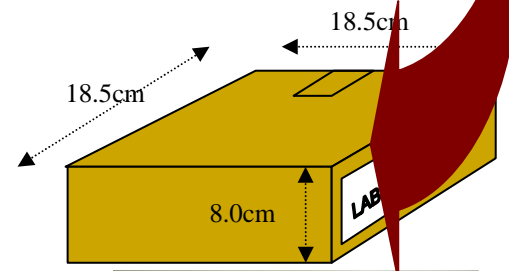
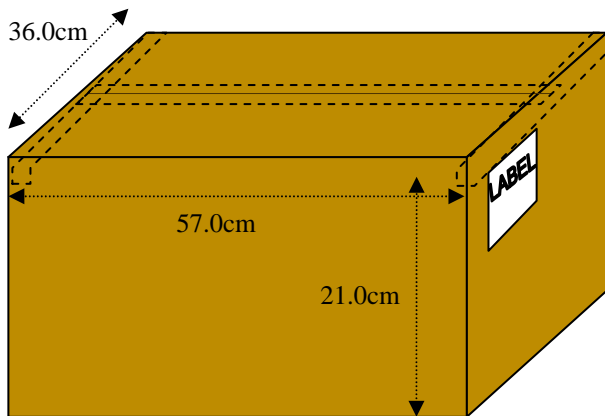
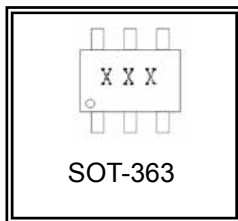
Note:

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
2. CONTROLLING DIMENSION IS MILLIMETER CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACTLY.

Tape & Reel 繞捲及裝箱方式 - SOT-363



產品正印及方向 - (正印為正時, Tape 圓孔在上方)



封裝形態 PKG TYPE	一般包裝		
	一卷數量 Immediate Quantity	中箱數量 Intermediate Quantity	外箱裝置/數量 Carton Quantity
SOT-363	3000pcs	15000pcs	180 K
	Reel ( 7" )	Box(5 reels)	Carton(12 Box)