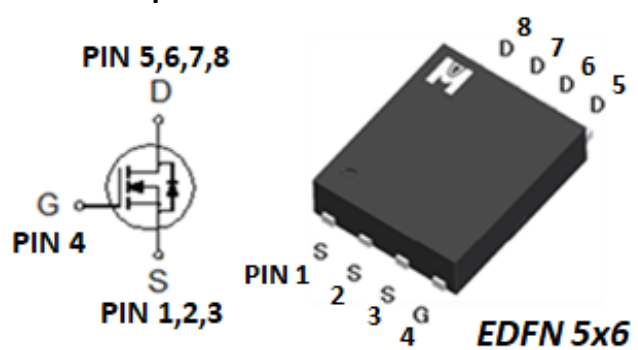


Single N-Channel Logic Level Enhancement Mode Field Effect Transistor

•Product Summary:

	N-CH
BVDSS	30 V
$R_{DSON (MAX.)}@V_{GS}=10V$	3.1 mΩ
$R_{DSON (MAX.)}@V_{GS}=4.5V$	4.2 mΩ
$I_D @T_C=25^{\circ}C$	97 A
$I_D @T_A=25^{\circ}C$	21 A

• Pin Description:



Single N Channel MOSFET  
UIS, Rg 100% Tested  
Pb-Free Lead Plating & Halogen Free



•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	$T_C = 25^{\circ}C$	$I_D$	97	A
	$T_C = 100^{\circ}C$		61	
Continuous Drain Current	$T_A = 25^{\circ}C$	$I_D$	21	
	$T_A = 70^{\circ}C$		17	
Pulsed Drain Current <sup>1</sup>		$I_{DM}$	316	
Avalanche Current		$I_{AS}$	57	
Avalanche Energy	L = 0.1mH	EAS	162	mJ
Repetitive Avalanche Energy <sup>2</sup>	L = 0.05mH	EAR	81	
Power Dissipation	$T_C = 25^{\circ}C$	$P_D$	50	W
	$T_C = 100^{\circ}C$		20	
Power Dissipation	$T_A = 25^{\circ}C$	$P_D$	2.5	W
	$T_A = 70^{\circ}C$		1.6	
Operating Junction & Storage Temperature Range		$T_{j}, T_{stg}$	-55 to 150	°C

• 100% UIS testing in condition of  $V_D=15V, L=0.1mH, V_G=10V, I_L=35A, \text{Rated } V_{DS}=30V \text{ N-CH}$

•THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE		SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Case		$R_{\theta JC}$		2.5	°C/W
Junction-to-Ambient <sup>3</sup>	$t \leq 10s$	$R_{\theta JA}$		20	
	Steady-State	$R_{\theta JA}$		50	

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

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

<sup>3</sup>50°C / W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.

<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> = 250uA	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> = 250uA	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	uA
		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	97			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		2.5	3.1	mΩ
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 24A		3.3	4.2	
Forward Transconductance <sup>1</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 5V, I <sub>D</sub> = 30A		25		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		2543		pF
Output Capacitance <sup>5</sup>	C <sub>oss</sub>			356		
Reverse Transfer Capacitance <sup>5</sup>	C <sub>rss</sub>			248		
Gate Resistance <sup>4,5</sup>	R <sub>g</sub>	V <sub>GS</sub> = 15mV, V <sub>DS</sub> = 0V, f = 1MHz		1.1		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		50.8		nC
	Q <sub>g</sub> (V <sub>GS</sub> =4.5V)			26.0		
Gate-Source Charge <sup>1,2,5</sup>	Q <sub>gs</sub>			5.9		
Gate-Drain Charge <sup>1,2,5</sup>	Q <sub>gd</sub>			10.7		
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> = 6Ω		10.2		nS
Rise Time <sup>1,2,5</sup>	t <sub>r</sub>			15.9		
Turn-Off Delay Time <sup>1,2,5</sup>	t <sub>d(off)</sub>			66.6		
Fall Time <sup>1,2,5</sup>	t <sub>f</sub>			35.2		
<b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Continuous Current	I <sub>S</sub>				97	A
Pulsed Current <sup>3</sup>	I <sub>SM</sub>				316	
Forward Voltage <sup>1,4</sup>	V <sub>SD</sub>	I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0V			1.3	V
Reverse Recovery Time <sup>5</sup>	t <sub>rr</sub>	I <sub>F</sub> = I <sub>S</sub> , dI <sub>F</sub> /dt = 400A / uS		14.0		nS
Peak Reverse Recovery Current <sup>5</sup>	I <sub>RM(REC)</sub>			2.35		A
Reverse Recovery Charge <sup>5</sup>	Q <sub>rr</sub>			16.8		nC

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

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

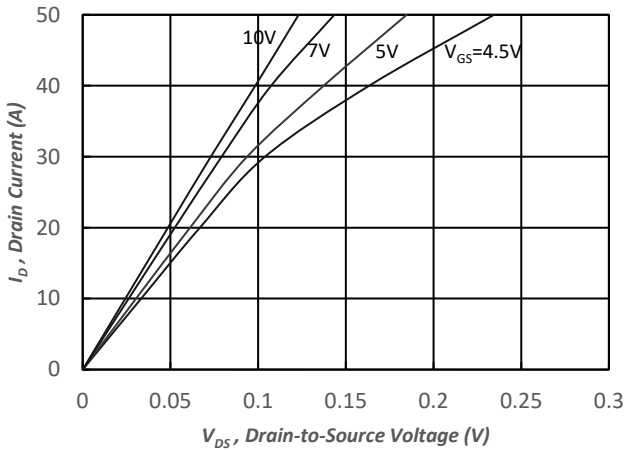
<sup>3</sup>Pulse width limited by maximum junction temperature.

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

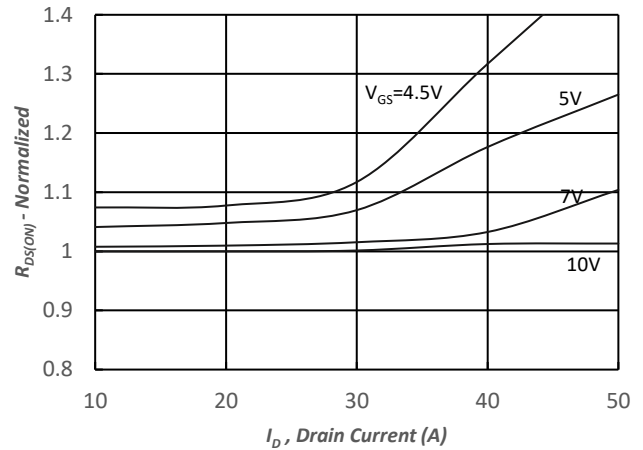
<sup>5</sup>Guarantee by Engineering test

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

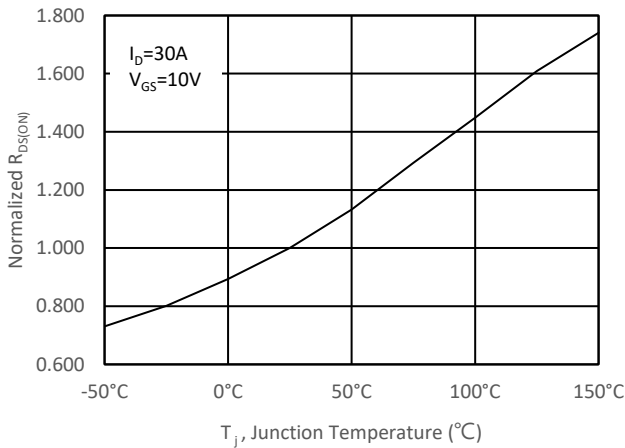
▪ TYPICAL CHARACTERISTICS



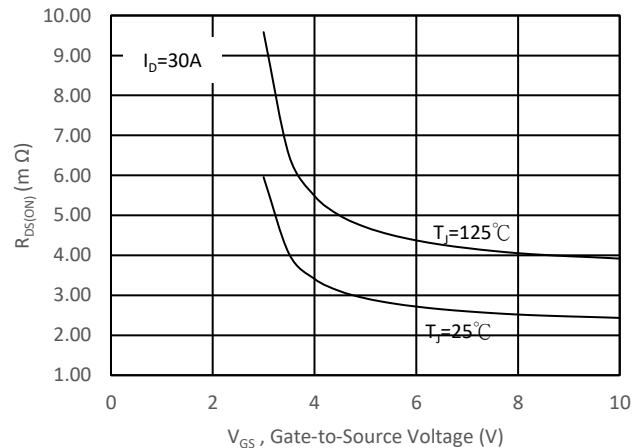
**Fig.1 Typical Output Characteristics**



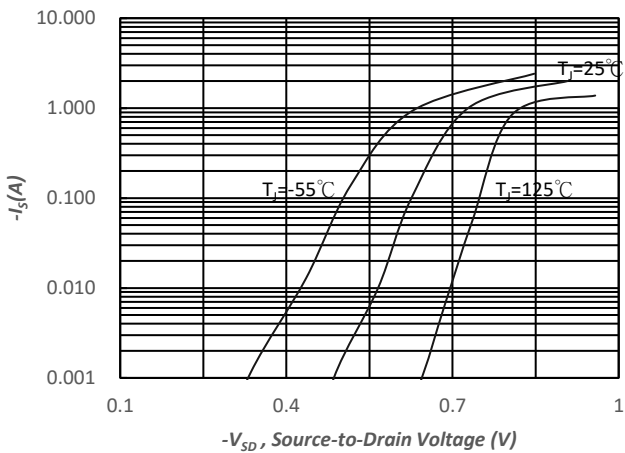
**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**



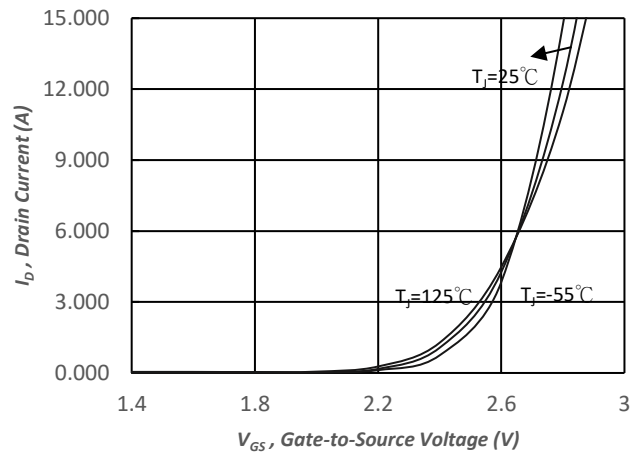
**Fig.3 Normalized On-Resistance v.s. Junction Temperature**



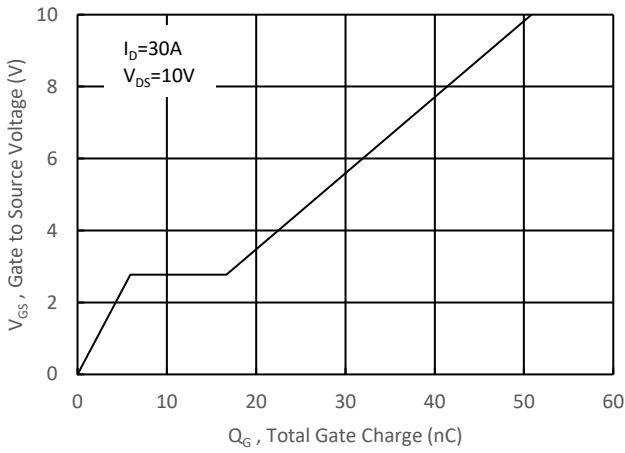
**Fig.4 On-Resistance v.s. Gate Voltage**



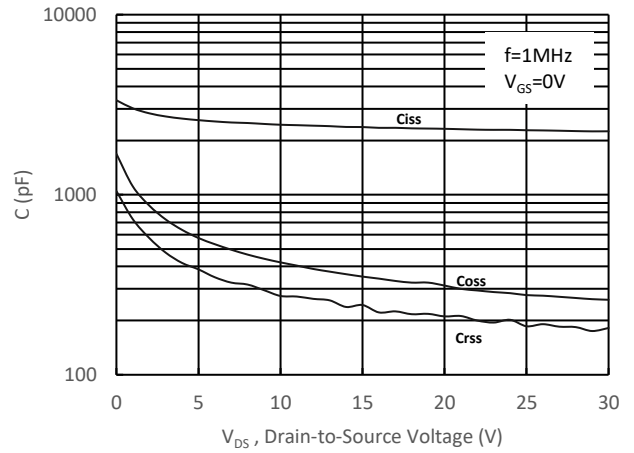
**Fig.5 Forward Characteristic of Reverse Diode**



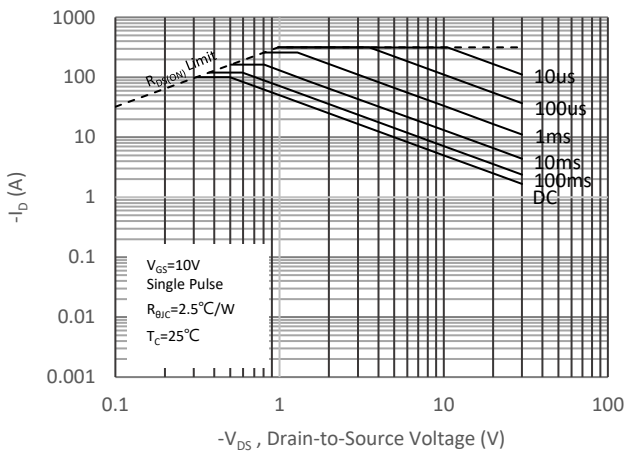
**Fig.6 Transfer Characteristics**



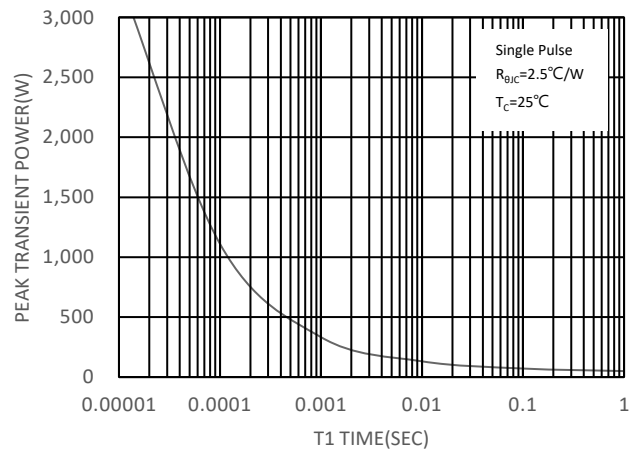
**Fig.7 Gate Charge Characteristics**



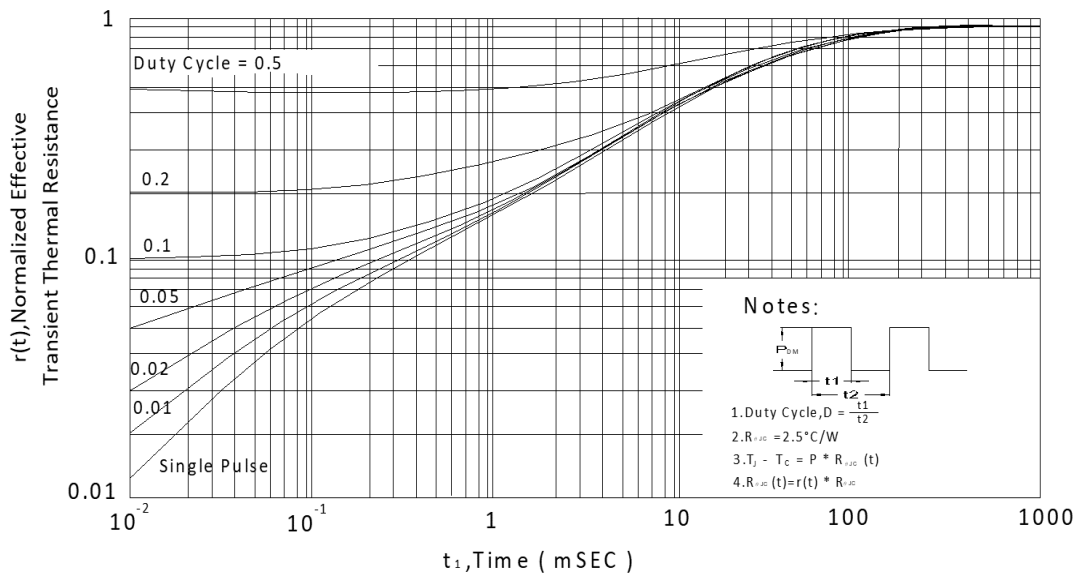
**Fig.8 Typical Capacitance Characteristics**



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



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



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

**Ordering & Marking Information:**

Device Name: EMP31N03HQ for EDFN 5x6



P31N03: Device Name

ABCDEFG: Date Code

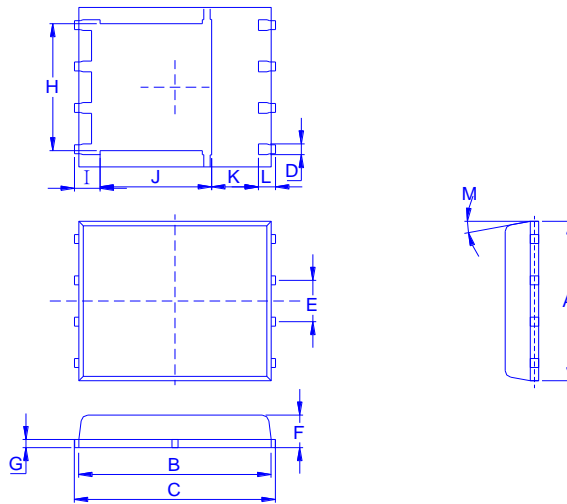
A: Assembly House

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)

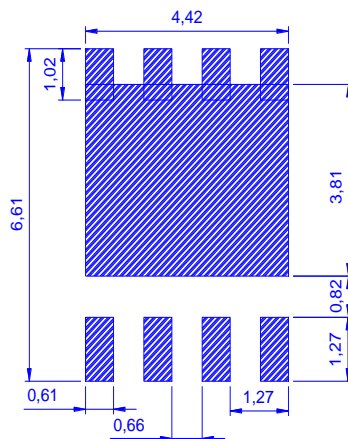
DEFG: Serial No.

**Outline Drawing**

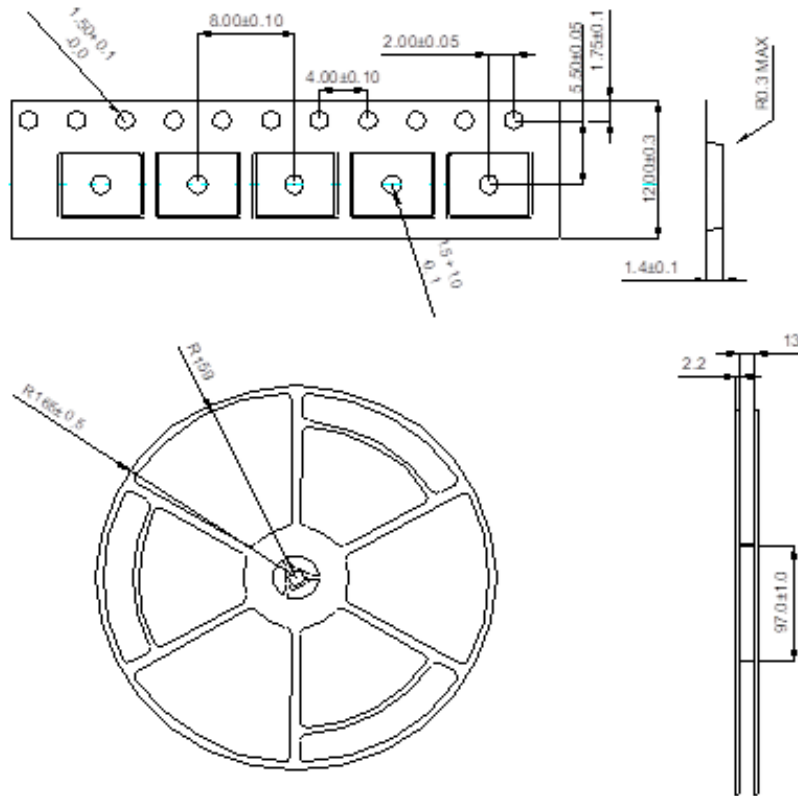


Dimension	A	B	C	D	E	F	G	H	I	J	K	L	M
Min.	4.8	5.55	5.9	0.3	1.17	0.85	0.15	3.61	0.38	3.18	1	0.38	0°
Typ.	4.9	5.7	6	0.4	1.27	0.95	0.2	3.87	0.4	3.44	1.2	0.4	
Max.	5.4	5.85	6.15	0.51	1.37	1.17	0.34	4.31	0.71	3.78	1.39	0.71	12°

**Footprint**



◆ Tape&Reel Information:2500pcs/Reel(Dimension in millimeter)



產品別	EDFN 5x6
Reel尺寸	13"
編帶方式	<p>FEED DIRECTION</p>
前空格	25
後空格	50
裝箱數	
滿捲數量	2.5K
捲/內盒比	01:01
內盒滿箱數	2.5K
內/外箱比	10:01
外箱滿箱數	25K

★Datasheet Latest version specification :

	Revision History	Prepared	Approved	Date
A.0	Initial Datasheet	Johnson	Sam	2020/3/25