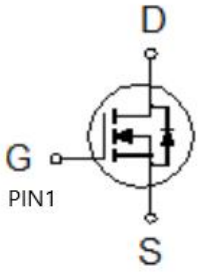
杰力科技股份有限公司
Excelliance MOS Corporation

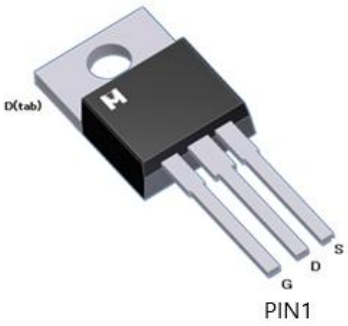
**EMP29N04E**

**N-Channel Logic Level Enhancement Mode Field Effect Transistor**

Product Summary:

| | |
|---|---|
| $BV_{DSS}$ | 40V |
| $R_{DSON\ (MAX.)}$ | 2.9mΩ |
| $I_D$ | 172A |




N Channel MOSFET

UIS, Rg 100% Tested

Pb-Free Lead Plating & Halogen Free

**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 | $I_D$ | 172 | A |
| | $T_C$ = 100 °C | | 139 | |
| Pulsed Drain Current[1] | | $I_{DM}$ | 674 | |
| Avalanche Current | | $I_{AS}$ | 69 | |
| Avalanche Energy | L = 0.1mH | $E_{AS}$ | 236 | mJ |
| Repetitive Avalanche Energy[2] | L = 0.05mH | $E_{AR}$ | 118 | |
| Power Dissipation | $T_C$ = 25 °C | $P_D$ | 227 | W |
| | $T_C$ = 100 °C | | 90 | |
| Operating Junction & Storage Temperature Range | | $T_j$, $T_{stg}$ | -55 to 150 | °C |

100% UIS testing in condition of $V_D$=20V, L=0.1mH, $V_G$=10V, $I_L$=40A, Rated $V_{DS}$=40V N-CH

**THERMAL RESISTANCE RATINGS**

| THERMAL RESISTANCE | SYMBOL | TYPICAL | MAXIMUM | UNIT |
|---|---|---|---|---|
| Junction-to-Case | $R_{\theta JC}$ | | 0.55 | °C / W |
| Junction-to-Ambient | $R_{\theta JA}$ | | 62.5 | |

[1]Pulse width limited by maximum junction temperature.

[2]Duty cycle ≤ 1%

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

| PARAMETER | SYMBOL | TEST CONDITIONS | LIMITS | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| **STATIC** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 40 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 1 | 1.4 | 2 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 32V, $V_{GS}$ = 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 | 172 | | | A |
| Drain-Source On-State Resistance[1] | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 20A | | 2.5 | 2.9 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 20A | | 3.2 | 4.0 | |
| Forward Transconductance[1] | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 20A | | 60 | | S |
| **DYNAMIC** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 20V, f = 1MHz | | 6923 | | pF |
| Output Capacitance | $C_{oss}$ | | | 1244 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 13 | | |
| Gate Resistance | $R_g$ | $V_{GS}$ = 15mV, $V_{DS}$ = 0V, f = 1MHz | | 2.0 | | Ω |
| Total Gate Charge[1,2] | $Q_g$($V_{GS}$=10V) | $V_{DS}$ = 20V, $V_{GS}$ = 10V, $I_D$ = 50A | | 82.9 | | nC |
| | $Q_g$($V_{GS}$=4.5V) | | | 34.3 | | |
| Gate-Source Charge[1,2] | $Q_{gs}$ | | | 27.2 | | |
| Gate-Drain Charge[1,2] | $Q_{gd}$ | | | 4.3 | | |
| Turn-On Delay Time[1,2] | $t_{d(on)}$ | Vdd=20V, ID=100A, Rg=6 ohm, Vgs=10V | | 15.5 | | nS |
| Rise Time[1,2] | $t_r$ | | | 123.5 | | |
| Turn-Off Delay Time[1,2] | $t_{d(off)}$ | | | 91.5 | | |
| Fall Time[1,2] | $t_f$ | | | 116 | | |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_C$ = 25 °C)** | | | | | | |
| Continuous Current | $I_S$ | | | | 221 | A |
| Pulsed Current[3] | $I_{SM}$ | | | | 674 | |
| Forward Voltage[1] | $V_{SD}$ | $I_F$ = 20A, $V_{GS}$ = 0V | | | 1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | Vdd=40V, IF=100A, di/dt (A/uS)=100, L=0.1mH, Rg=10 ohm | | 32.7 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 19.3 | | nC |

[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

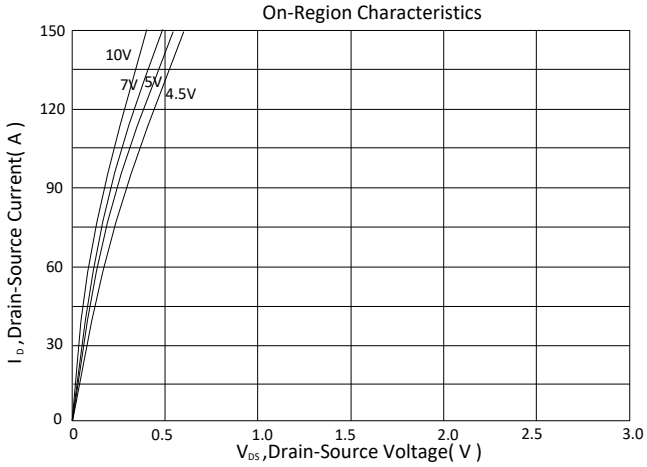
[2]Independent of operating temperature.

[3]Pulse width limited by maximum junction temperature.

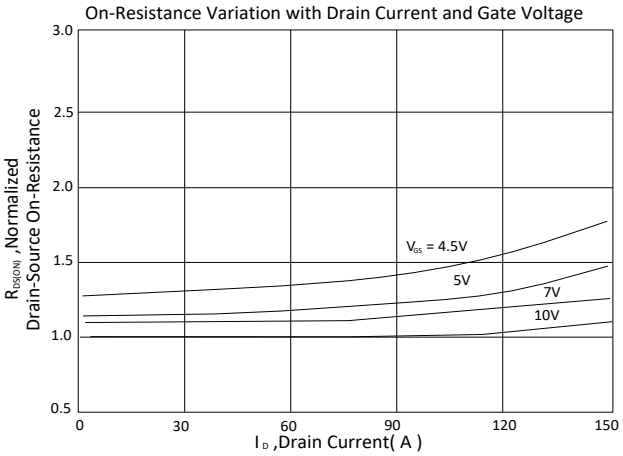
EMC will review datasheet by quarter, and update new version.

TYPICAL CHARACTERISTICS

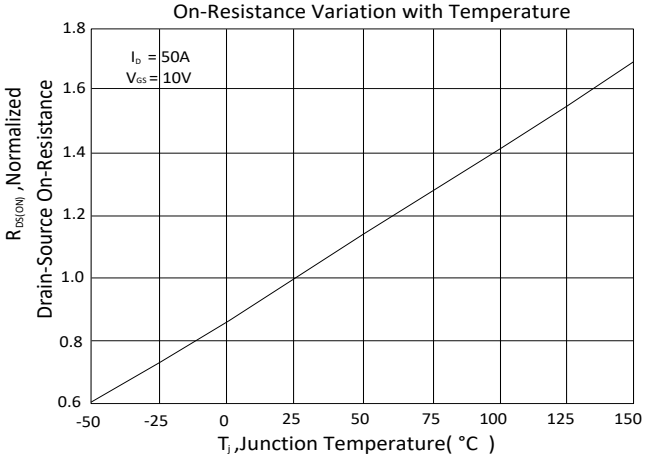
On-Region Characteristics



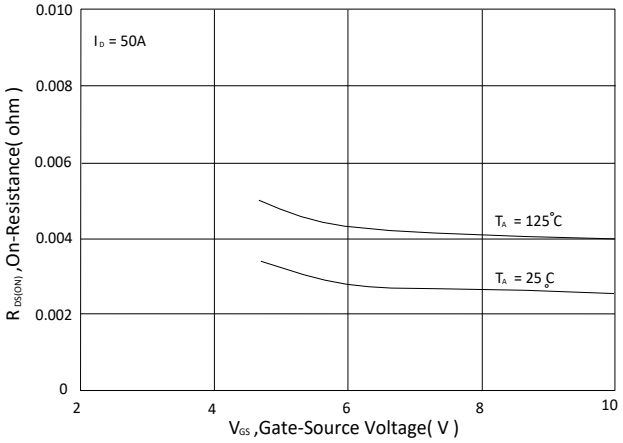

On-Resistance Variation with Drain Current and Gate Voltage



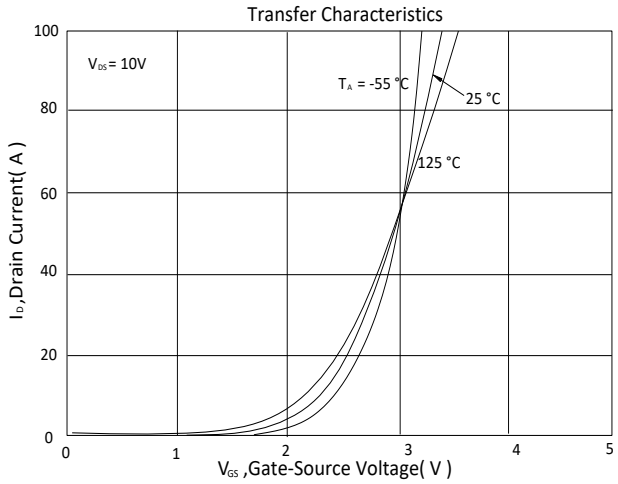

On-Resistance Variation with Temperature



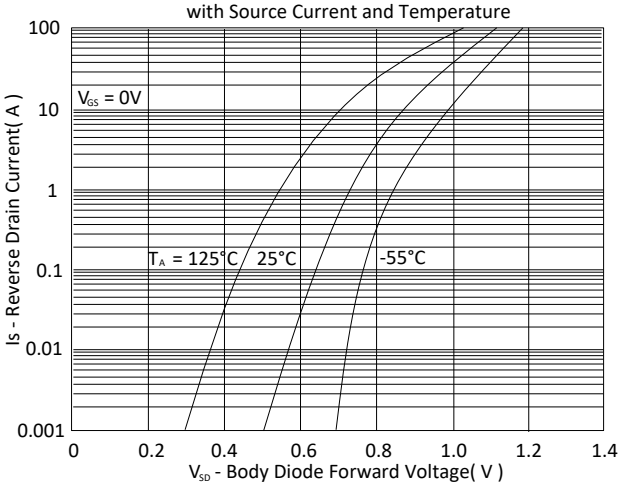

On-Resistance Variation with Gate-Source Voltage

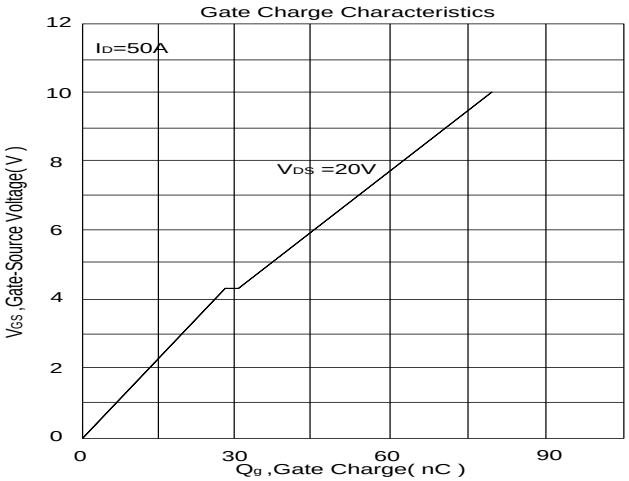


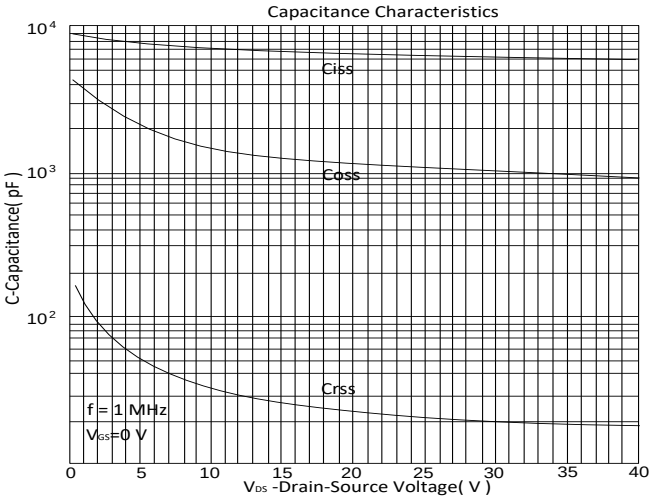

Transfer Characteristics

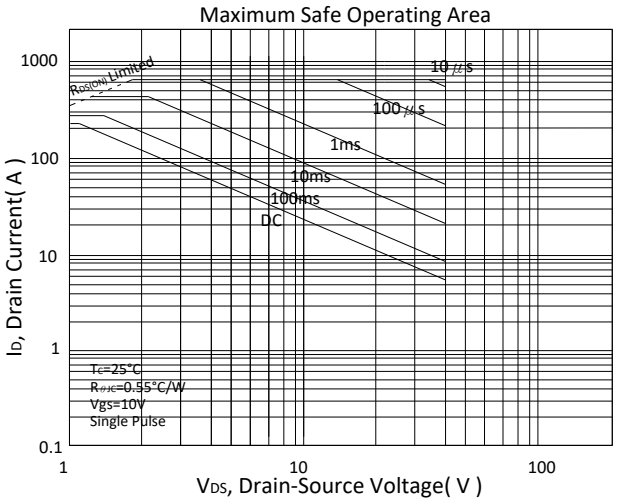


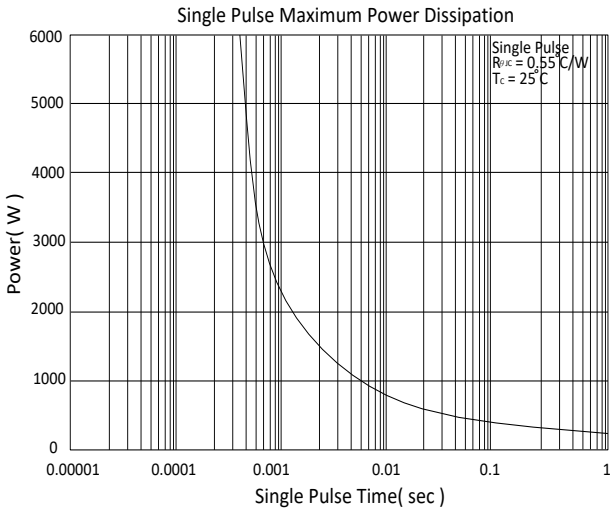

Body Diode Forward Voltage Variation with Source Current and Temperature

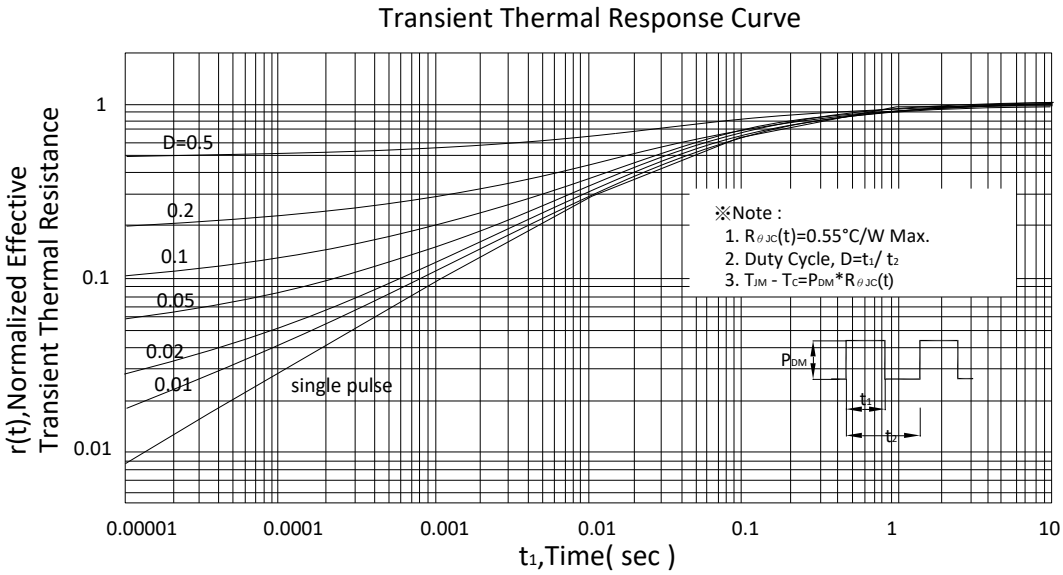



Gate Charge Characteristics
ID=50A
VDS =20V
VGS ,Gate-Source Voltage( V )
Qg ,Gate Charge( nC )


Capacitance Characteristics
Ciss
Coss
Crss
f = 1 MHz
VGS=0 V
C-Capacitance( pF )
VDS -Drain-Source Voltage( V )

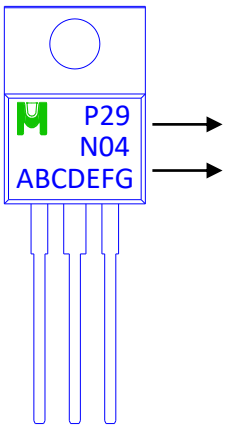

Maximum Safe Operating Area
RDS(ON) Limited
10 μs
100 μs
1ms
10ms
100ms
DC
TC=25°C
RθJC=0.55°C/W
Vgs=10V
Single Pulse
ID, Drain Current( A )
VDS, Drain-Source Voltage( V )


Single Pulse Maximum Power Dissipation
Single Pulse
RθJC = 0.55°C/W
TC = 25°C
Power( W )
Single Pulse Time( sec )


Transient Thermal Response Curve
D=0.5
0.2
0.1
0.05
0.02
0.01
single pulse
※Note :
1. RθJC(t)=0.55°C/W Max.
2. Duty Cycle, D=t1/ t2
3. TJM - TC=PDM*RθJC(t)
PDM
t1
t2
r(t),Normalized Effective Transient Thermal Resistance
t1,Time( sec )

## Ordering & Marking Information:

Device Name: EMP29N04E for TO-220




P29N04: Device Name

ABCDEFG: Date Code

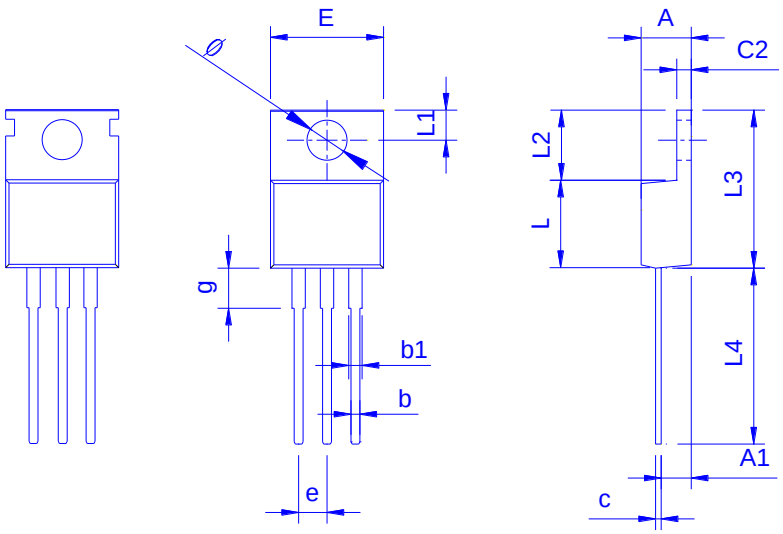
A: Assembly House

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.

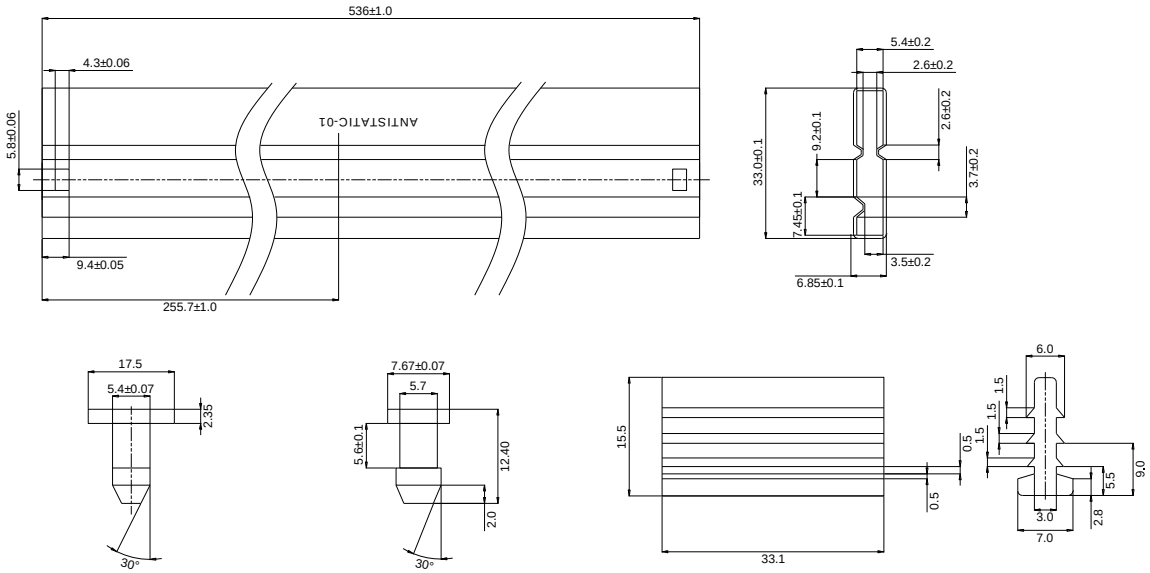
## Outline Drawing




Dimension in mm

| Dimension | A | A1 | b | b1 | c | c2 | E | L | L1 | L2 | L3 | L4 | ø | e | g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Min. | 4.07 | 2.04 | 0.60 | 1.15 | 0.31 | 1.11 | 9.90 | 8.30 | 2.50 | 6.00 | 14.30 | 12.70 | 3.40 | 2.04 | 2.85 |
| Typ. | 4.44 | 2.40 | 0.80 | 1.27 | - | 1.27 | 10.16 | - | 2.74 | 6.30 | 15.00 | 13.40 | 3.84 | 2.54 | 3.71 |
| Max. | 4.82 | 3.00 | 1.00 | 1.75 | 0.65 | 1.41 | 11.50 | 9.75 | 3.25 | 6.80 | 16.90 | 14.50 | 4.00 | 3.04 | 4.10 |

◆ Tube Information:50pcs/Tube (1000pcs/Box)




| | |
|---|---|
| 產品別 | TO-220 |
| 底塞顏色 | 白 |
| 端塞顏色 | 藍 |
| 裝管方向 | Pin 孔朝底塞 |
| 裝箱數 | |
| 滿管數量 | 50ea |
| 管/內盒比 | 20:1 |
| 內盒滿箱數 | 1K |
| 內盒/外箱比 | 4:1 |
| 外箱滿箱數 | 4K |