



### N-Channel Enhancement Mode Power MOSFET **MXB040N10**

#### DESCRIPTION

The MXB040N10 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 10V. This device is suitable for use as a wide variety of applications.

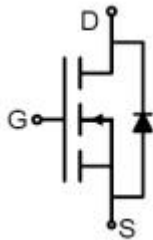
#### GENERAL FEATURES

- $V_{DS}=100V$ ,  $I_D=128A$   
 $R_{DS(ON)}$ (Typ.)=4.0m $\Omega$  @  $V_{GS}=10V$
- High Power and current handling capability
- Lead free product is acquired

#### APPLICATION

- Uninterruptible power supply
- Hard switched and high frequency circuits

#### PINOUT



Schematic diagram



Marking and pin Assignment



TO-263-3L top view

#### ORDERING INFORMATION

Part Number	StorageTemperature	Package	Devices Per Reel
MXB040N10	-55°C to 175°C	TO-263	800

#### ABSOLUTE MAXIMUM RATINGS( $T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage( $V_{GS}=0V$ )	$V_{DS}$	100	V
Gate-Source Voltage( $V_{DS}=0V$ )	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous( $T_C=25^\circ C$ )	$I_D$	128	A
Drain Current-Continuous( $T_C=100^\circ C$ )	$I_D$	81	A
Drain Current-Continuous@Current-Pulsed <sup>(Note1)</sup>	$I_{DM(pluse)}$	417	A
Maximum Power Dissipation( $T_C=25^\circ C$ )	$P_D$	167	W
Maximum Power Dissipation( $T_C=100^\circ C$ )	$P_D$	67	W
Avalanche energy <sup>(Note2)</sup>	$E_{AS}$	265	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ C$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.75	$^\circ C/W$

Note 1. Repetitive Rating: Pulse width limited by maximum junction temperature.

Note 2.  $E_{AS}$  condition:  $T_J=25^\circ C$ ,  $V_{DD}=40V$ ,  $V_G=10V$ ,  $R_g=25\Omega$ ,  $L=0.5mH$ .



#### ELECTRICAL CHARACTERISTICS ( $T_J=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	-	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$	-	4.0	5.5	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=20A$	-	51	-	S
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	2816	-	pF
Output Capacitance	$C_{oss}$		-	614	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	7.4	-	pF
Gate Resistance	$R_g$	$V_{GS}=0V, V_{DS}=0V, F=1.0\text{MHz}$	-	2.4	-	$\Omega$
<b>Switching Characteristics</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{GS}=10V, V_{DS}=50V,$ $R_L=2.5\Omega, R_{GEN}=6\Omega$	-	13	-	nS
Turn-on Rise Time	$t_r$		-	25	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	43	-	nS
Turn-Off Fall Time	$t_f$		-	37	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=50V, I_D=20A,$ $V_{GS}=10V$	-	42	-	nC
Gate-Source Charge	$Q_{gs}$		-	9.7	-	nC
Gate-Drain Charge	$Q_{gd}$		-	10.6	-	nC
<b>Drain-Source Diode Characteristics</b>						
Source-Drain Current(Body Diode)	$I_{SD}$		-	-	167	A
Forward on Voltage <sup>(Note1)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=40A$	-	-	1.0	V
Reverse Recovery Time	$t_{rr}$	$I_F=20A,$ $di/dt=100A/\mu s$	-	60	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	61	-	nC

Note 1. Repetitive Rating: Pulse width limited by maximum junction temperature.



## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 1. Saturation Characteristics

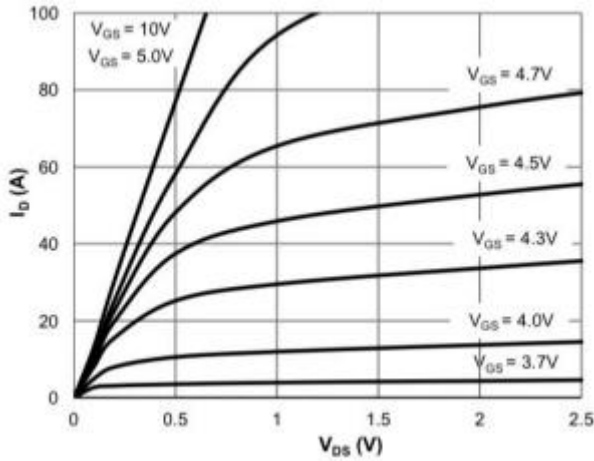


Figure 2. Transfer Characteristics

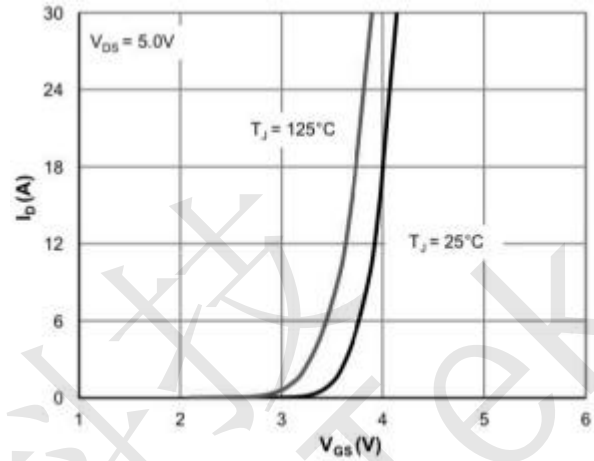


Figure 3.  $R_{DS(ON)}$  vs. Drain Current

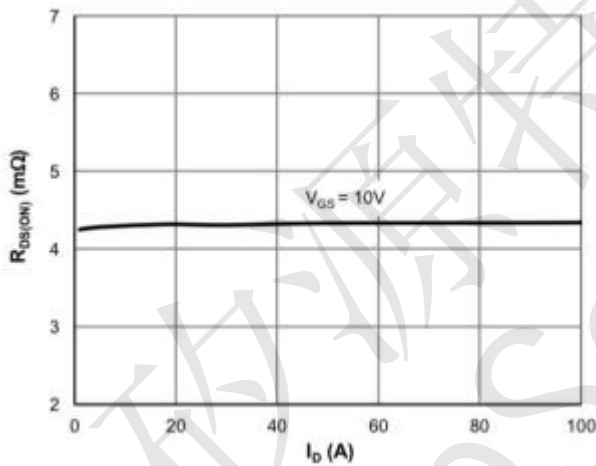


Figure 4.  $R_{DS(ON)}$  vs. Junction Temperature

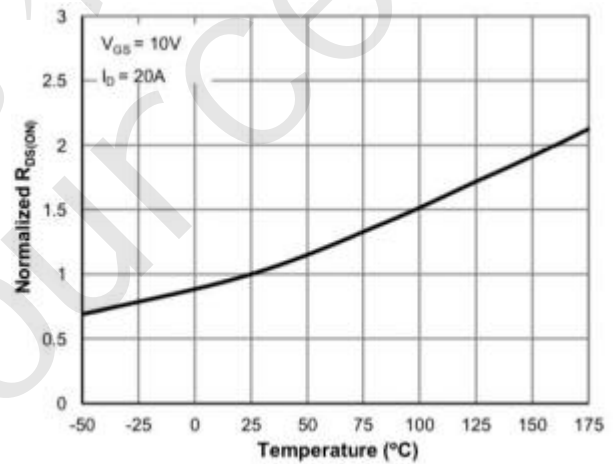


Figure 5. Body-Diode Characteristics

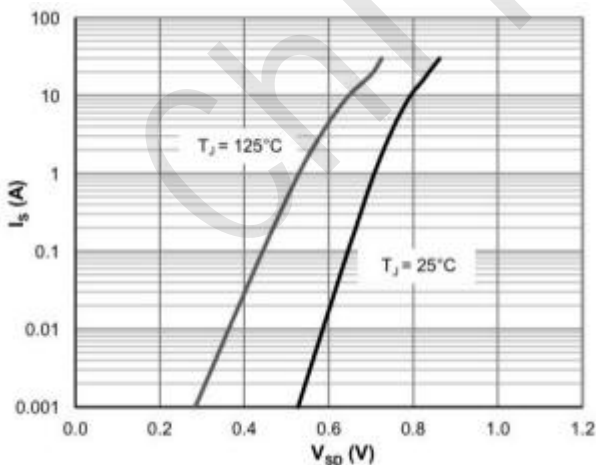
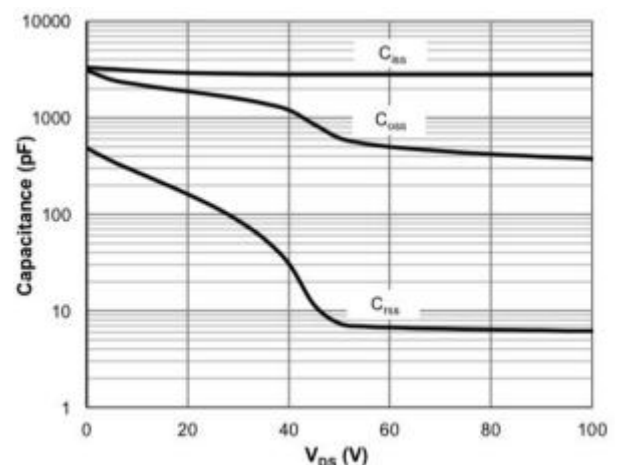


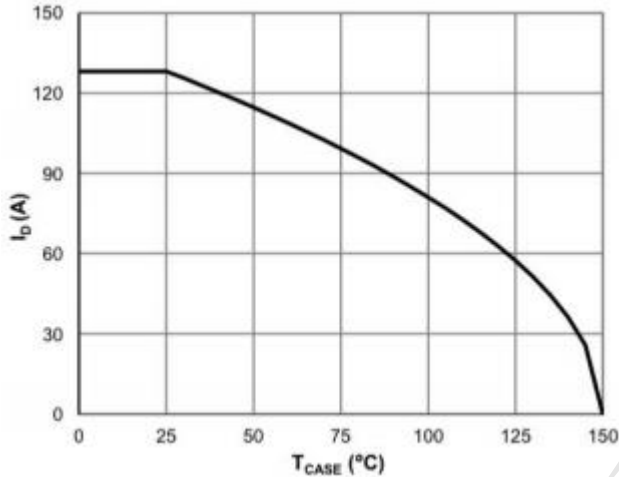
Figure 6. Capacitance Characteristics



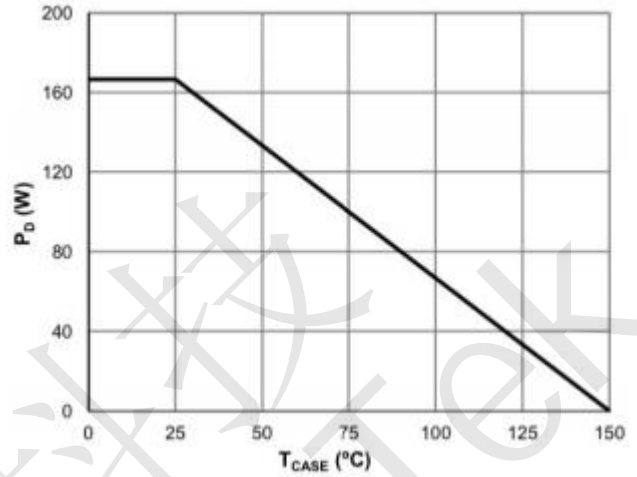


## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

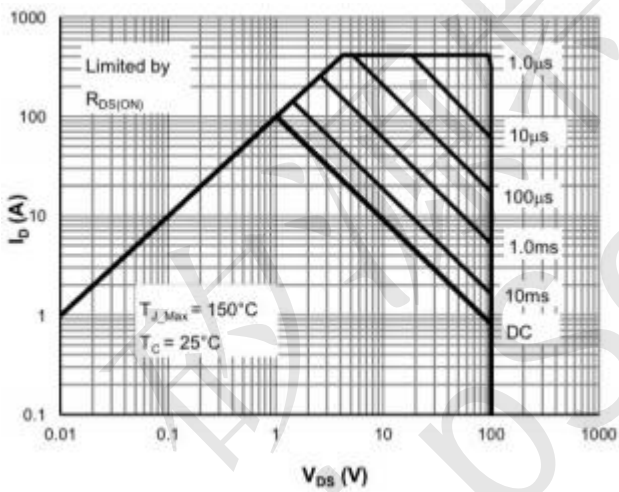
### Figure 7. Current De-rating



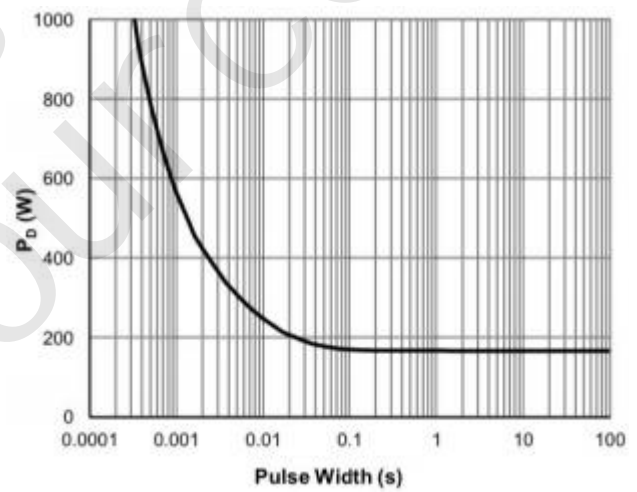
### Figure 8. Power De-rating



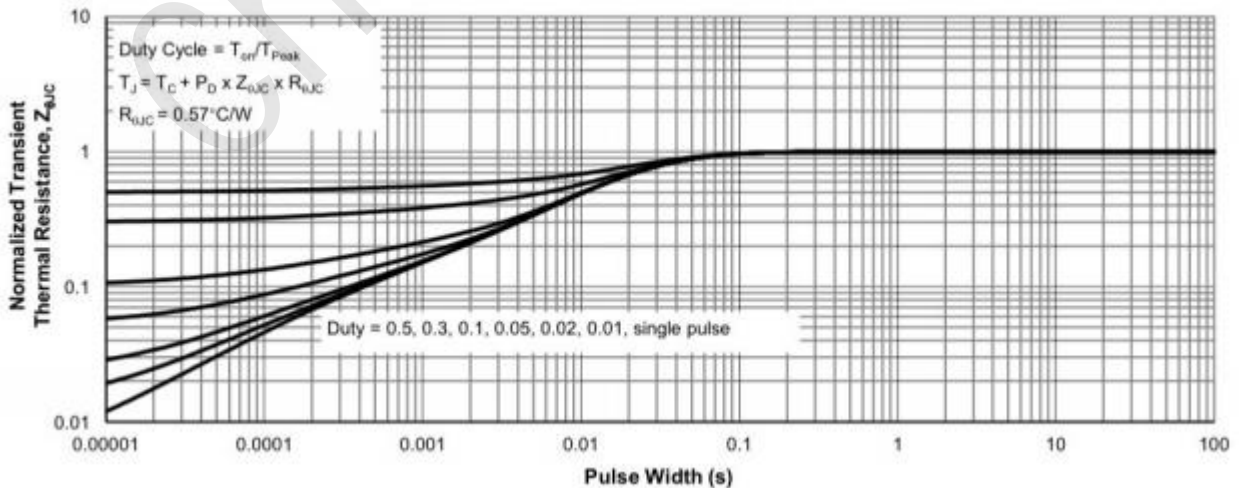
### Figure 9. Maximum Safe Operating Area



### Figure 10. Single Pulse Power Rating, Junction-to-Case



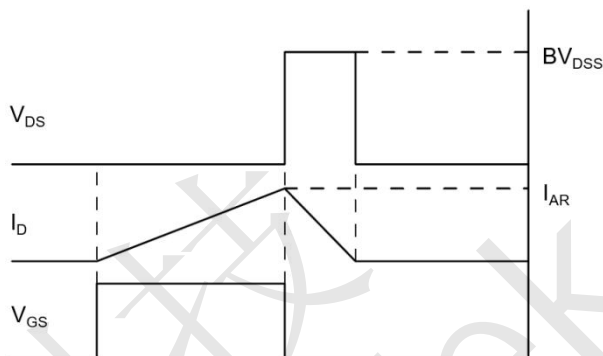
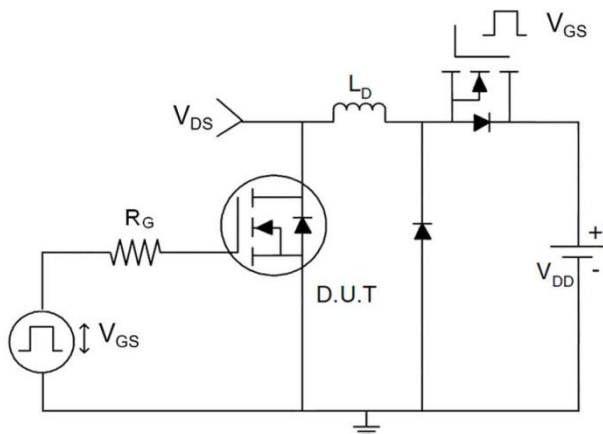
### Figure 11. Normalized Maximum Transient Thermal Impedance



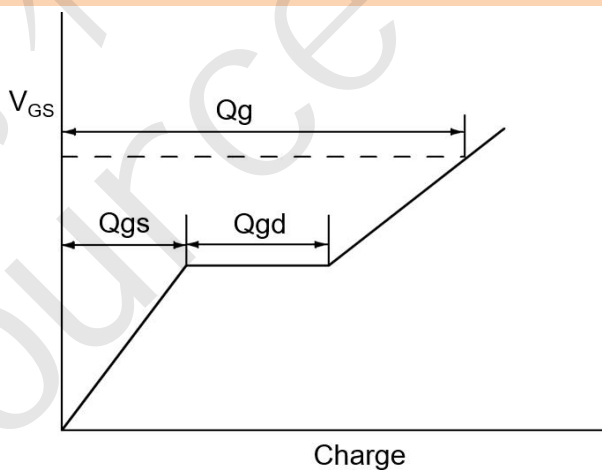
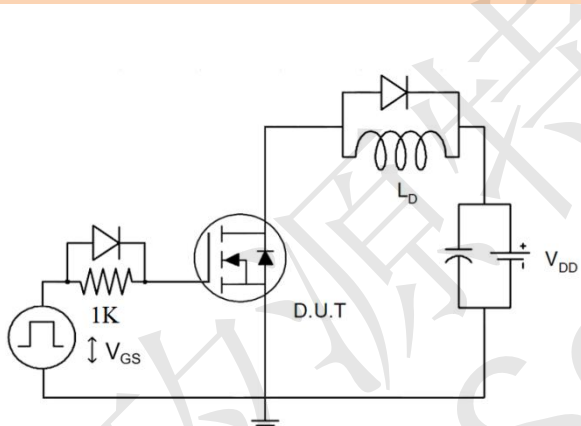


### TEST CIRCUIT

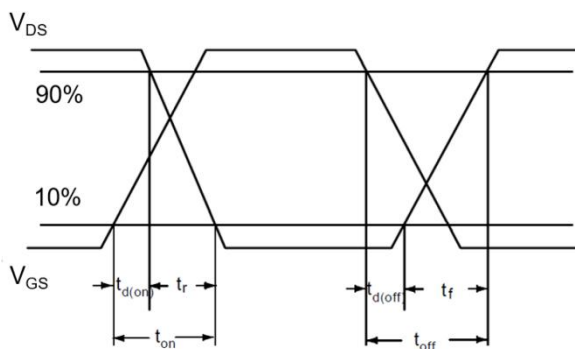
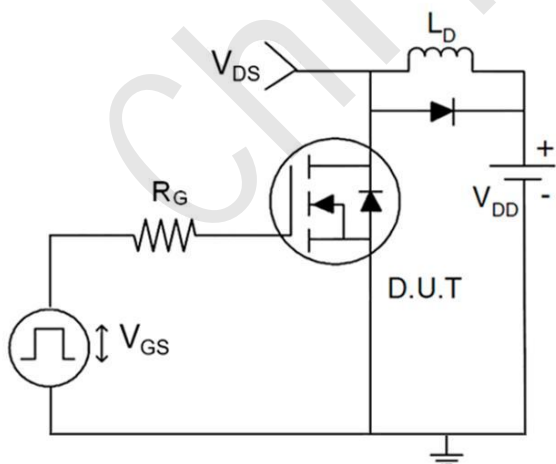
#### 1. EAS Test Circuits



#### 2. Gate Charge Test Circuits



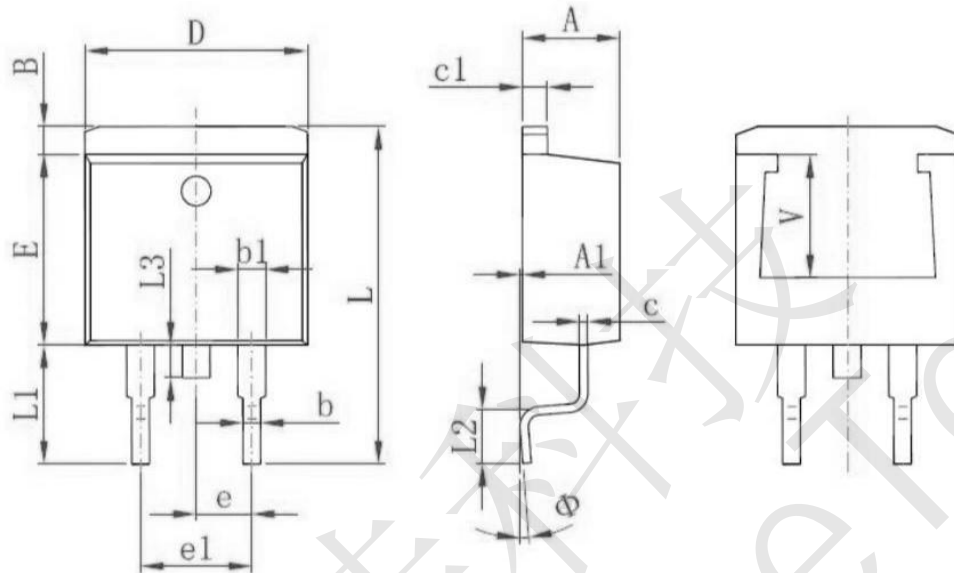
#### 3. Switch Time Test Circuits





### PACKAGE INFORMATION

TO-263



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Ma
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.120	1.420	0.044	0.056
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP.		0.100TYP.	
e1	4.980	5.180	0.196	0.204
L	14.940	15.500	0.588	0.610
L1	4.950	5.450	0.195	0.215
L2	2.340	2.740	0.092	0.108
L3	1.300	1.700	0.051	0.067
V	5.600 REF.		0.220REF.	
Φ	0°	8°	0°	8°