60V(D-S) N-Channel Enhancement Mode Power MOS FET

General Feature

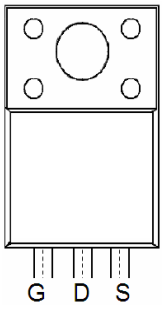
- V_{DS} =60V,I_D =100A
  $R_{DS(ON)}$ < 6.5mΩ @ V_{GS}=10V (Typ:5.7mΩ)
- Special process technology for high ESD capability
- High density cell design for ultra low Rdson
- Fully characterized Avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

RoHS Compliant

Lead Free

Application

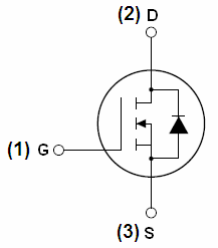
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



Marking and pin assignment

PIN Configuration

TO-220F top view



Schematic diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MSN06B0F	MSN06B0F	TO-220F	-	-	-

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	100	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	70	A
Pulsed Drain Current	I_{DM}	320	A
Maximum Power Dissipation	P_D	45	W
Derating factor		0.3	W/℃
Single pulse avalanche energy (Note 5)	E_{AS}	550	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case (Note 2)	$R_{\theta Jc}$	3.3	℃/W

Electrical Characteristics (T_C=25℃unless otherwise noted)

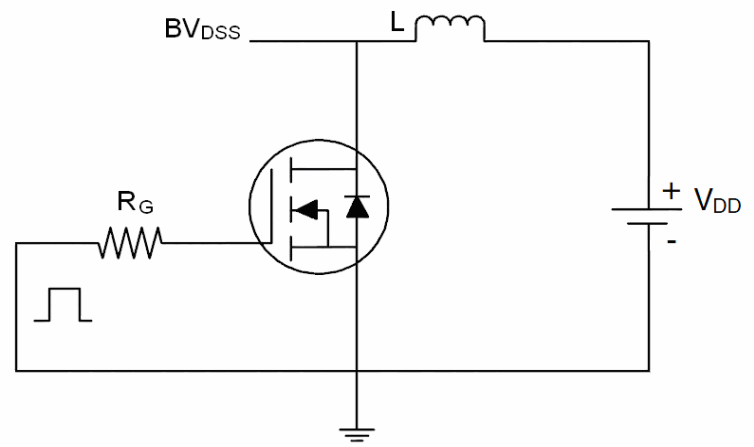
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	60	65	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	2	3	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=40A	-	5.7	6.5	mΩ
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=40A	-	50	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=30V,V_{GS}=0V, F=1.0MHz	-	4800	-	PF
Output Capacitance	C_{oss}		-	440	-	PF
Reverse Transfer Capacitance	C_{rss}		-	260	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=30V,I_D=1A V_{GS}=10V,R_{GEN}=2.5Ω	-	16.8	-	nS
Turn-on Rise Time	t_r		-	10.8	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	55	-	nS
Turn-Off Fall Time	t_f		-	13.6	-	nS
Total Gate Charge	Q_g	V_{DS}=30V,I_D=30A, V_{GS}=10V	-	85	-	nC
Gate-Source Charge	Q_{gs}		-	18	-	nC
Gate-Drain Charge	Q_{gd}		-	28	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=20A	-	-	1.2	V
Diode Forward Current (Note 2)	I_S	-	-	-	90	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF = 40A di/dt = 100A/μs (Note3)	-	38	-	nS
Reverse Recovery Charge	Qrr		-	53	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

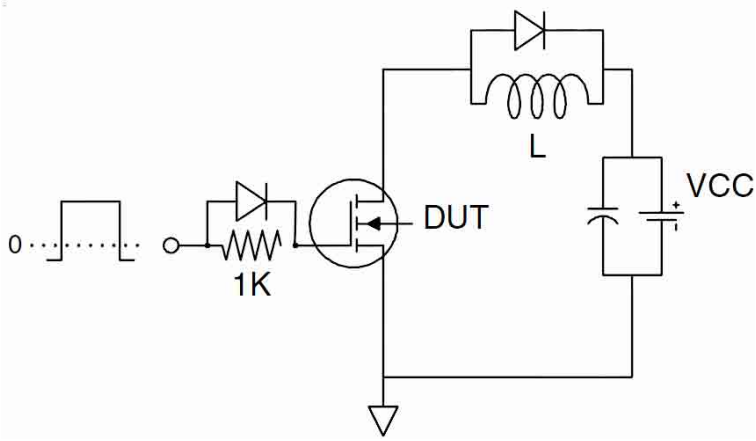
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition：Tj=25℃,V_{DD}=30V,V_G=10V,L=0.5mH,Rg=25Ω

Test circuit

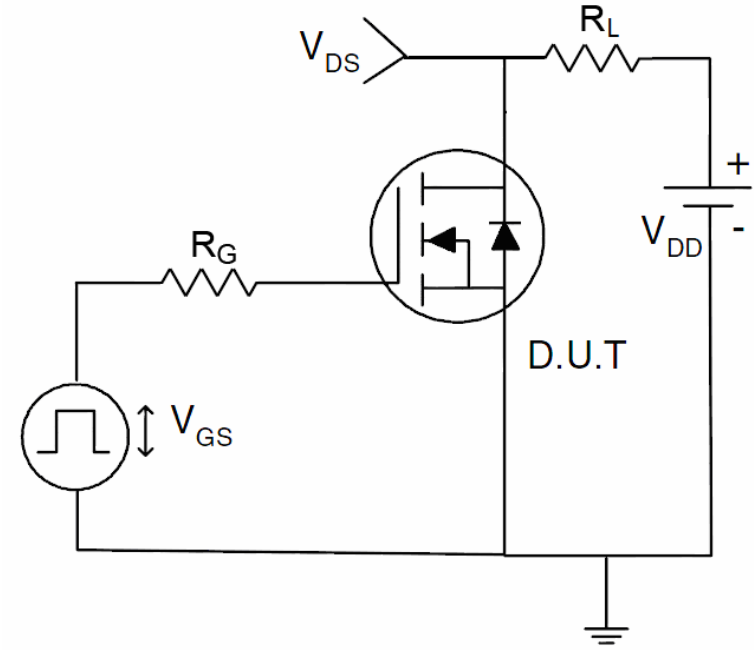
1）E_{AS} test Circuits



2）Gate charge test Circuit:



3）Switch Time Test Circuit:



Typical Electrical and Thermal Characteristics (Curves)

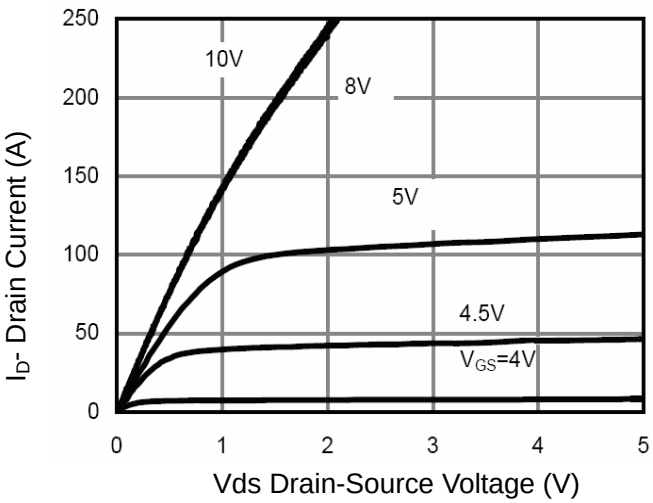


Figure 1 Output Characteristics

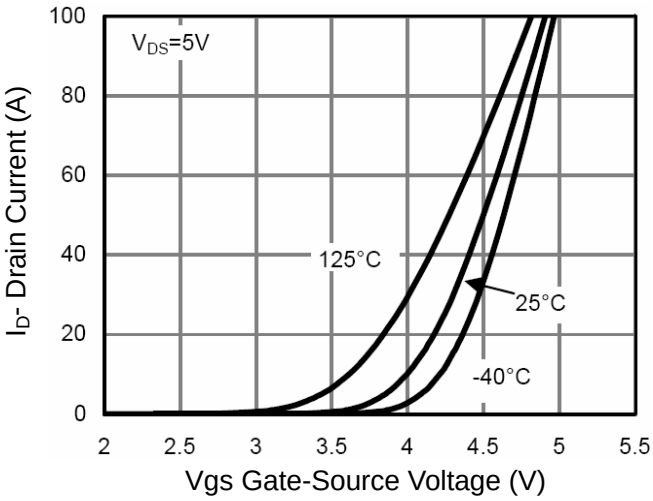


Figure 2 Transfer Characteristics

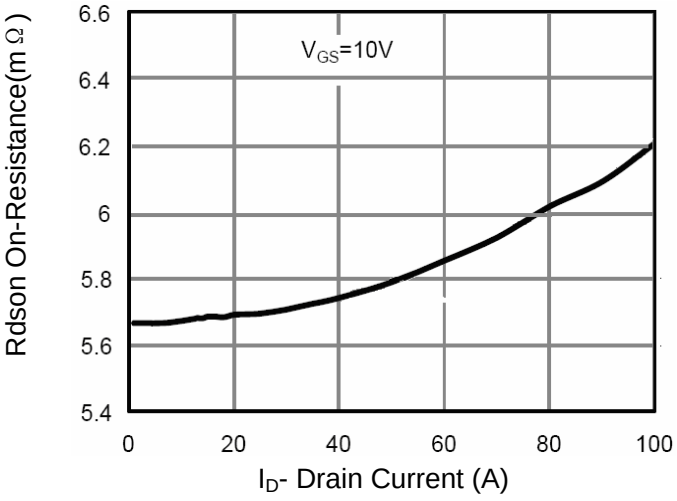


Figure 3 Rdson- Drain Current

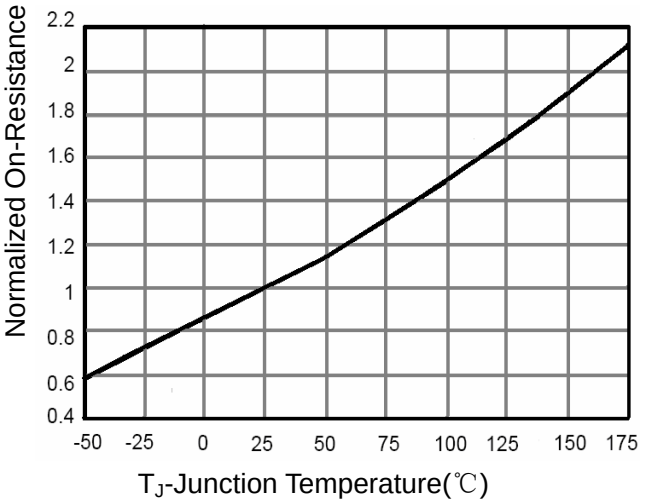


Figure 4 Rdson-JunctionTemperature

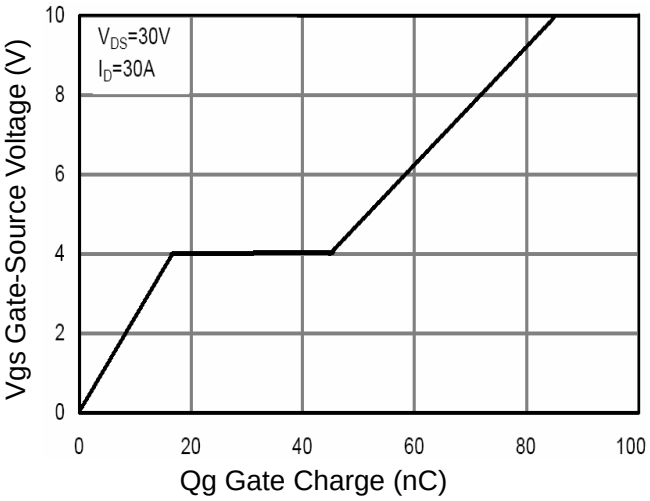


Figure 5 Gate Charge

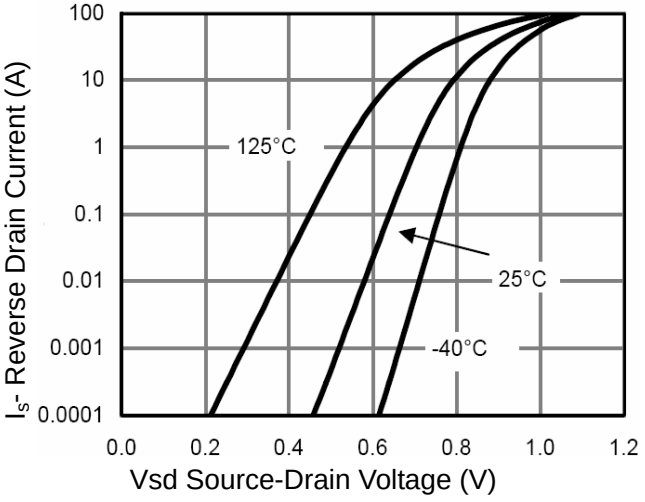


Figure 6 Source- Drain Diode Forward

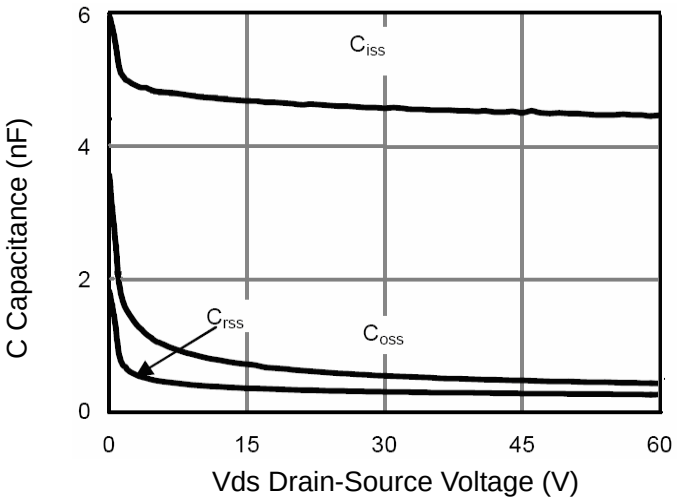


Figure 7 Capacitance vs Vds

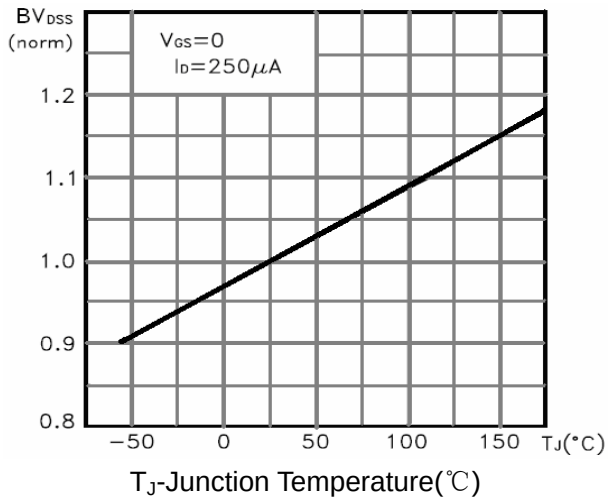


Figure 9 BV_{DSS} vs Junction Temperature

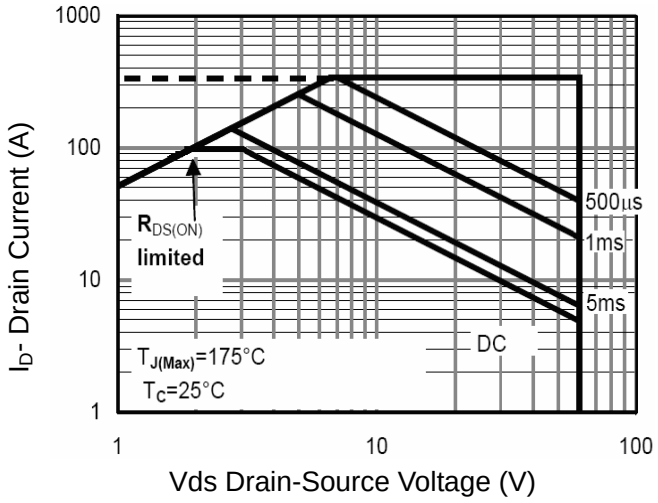


Figure 8 Safe Operation Area

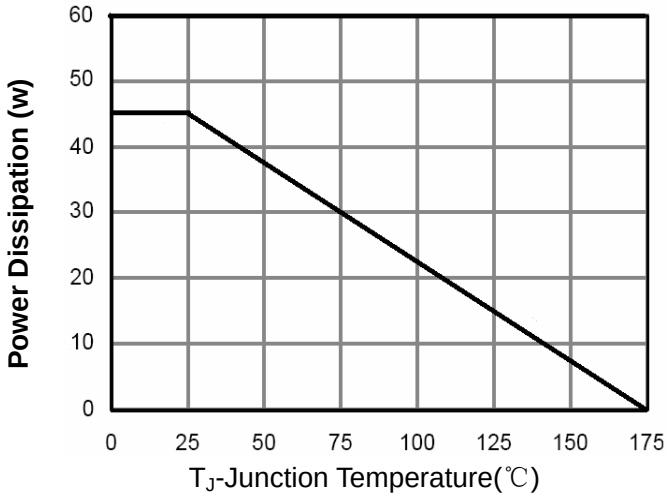


Figure 10 Power De-rating

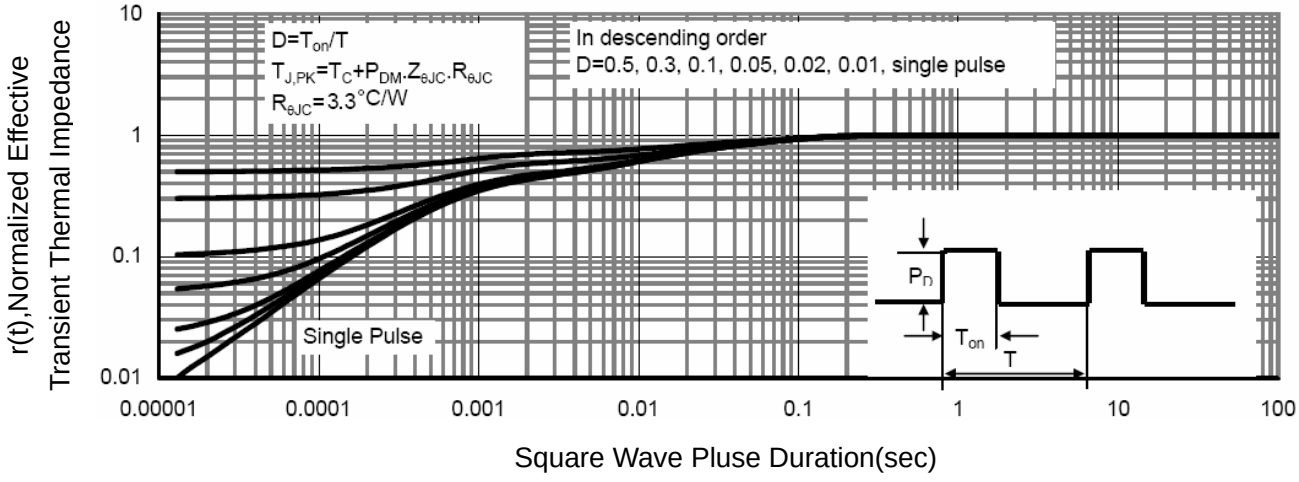
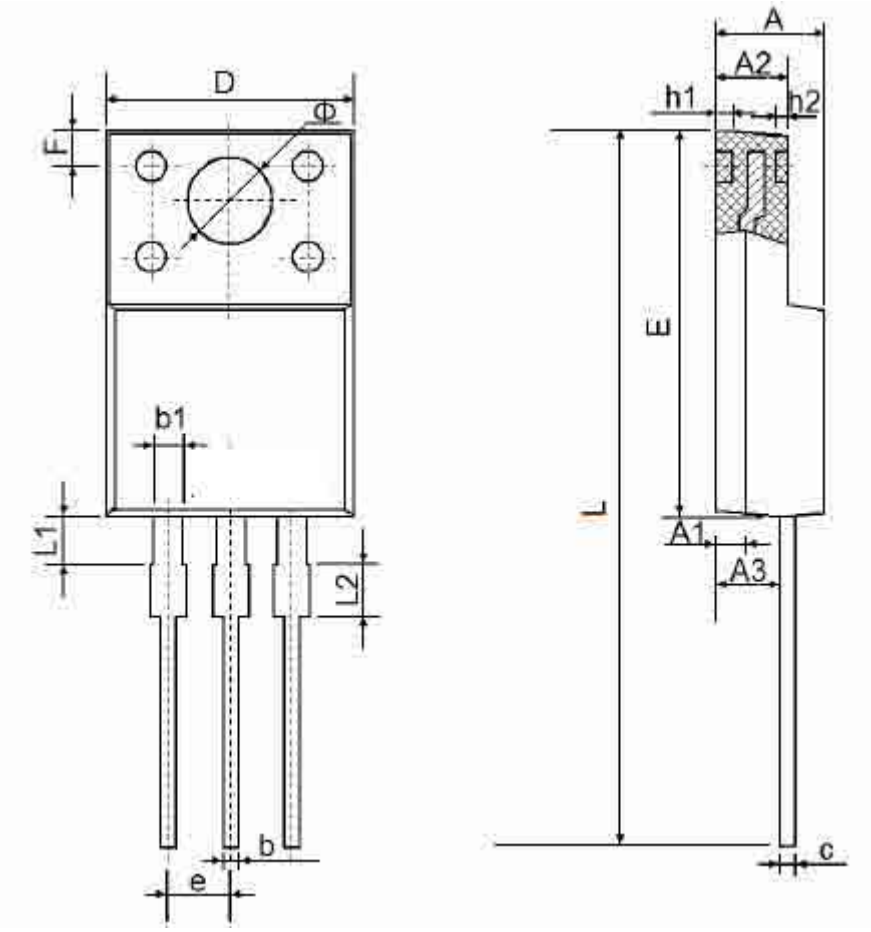


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-220F Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.300	4.700	0.169	0.185
A1	1.300REF		0.051REF	
A2	2.800	3.200	0.110	0.126
A3	2.500	2.900	0.098	0.114
b	0.500	0.750	0.020	0.030
b1	1.100	1.350	0.043	0.053
b2	1.500	1.750	0.059	0.069
c	0.500	0.750	0.020	0.030
D	9.960	10.360	0.392	0.408
E	14.800	15.200	0.583	0.598
e	2.540TYP.		0.100TYP	
F	2.700REF		0.106REF	
Φ	3.500REF		0.138REF	
h1	0.800REF		0.031REF	
h2	0.500REF		0.020REF	
L	28.000	28.400	1.102	1.118
L1	1.700	1.900	0.067	0.075
L2	1.900	2.100	0.075	0.083