

N-Channel Enhancement Mode Power MOSFET

Description

The PT HGEI uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in Automotive applications and a wide variety of other applications.

General Features

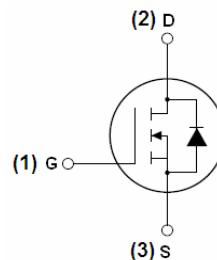
- $V_{DSS} = 75V, I_D = 210A$
 $R_{DS(ON)} < 4m\Omega @ V_{GS} = 10V$
- Good stability and uniformity with high E_{AS}
- Special process technology for high ESD capability
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

- Automotive applications
- Hard switched and high frequency circuits
- Uninterruptible power supply

100% UIS TESTED!

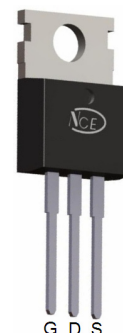
100% ΔV_{ds} TESTED!



Schematic diagram



Marking and pin assignment



TO-220-3L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
APT HGEI	APT HGEI	TO-220	-	-	-

Absolute Maximum Ratings (TC=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DSS}	75	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	210	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	150	A
Pulsed Drain Current	I_{DM}	840	A
Maximum Power Dissipation	P_D	310	W
Derating factor		2.07	W/°C

Single pulse avalanche energy (Note 4)	E_{AS}	2200	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 1)	$R_{\theta JC}$	0.48	°C/W
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Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

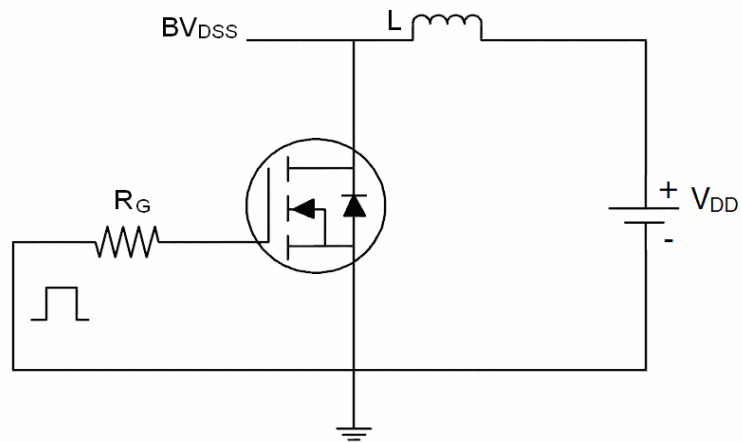
Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Off Characteristics							
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	75			V	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=75V, V_{GS}=0V$			1	μA	
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 200	nA	
On Characteristics							
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3	4	V	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=40A$		25°C	2.9	4	m Ω
				125°C	4.7	6.5	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=25V, I_D=40A$	100	165		S	
Dynamic Characteristics							
Input Capacitance	C_{iss}	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0\text{MHz}$		11000		PF	
Output Capacitance	C_{oss}			914		PF	
Reverse Transfer Capacitance	C_{rss}			695		PF	
Switching Characteristics							
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=2A, R_L=15\Omega$ $V_{GS}=10V, R_G=2.5\Omega$		23		nS	
Turn-on Rise Time	t_r			190		nS	
Turn-Off Delay Time	$t_{d(off)}$			130		nS	
Turn-Off Fall Time	t_f			120		nS	
Total Gate Charge	Q_g	$I_D=30A, V_{DD}=30V, V_{GS}=10V$	-	250		nC	
Gate-Source Charge	Q_{gs}		-	48		nC	
Gate-Drain Charge	Q_{gd}		-	98		nC	
Drain-Source Diode Characteristics							
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=40A$			1.2	V	
Reverse Recovery Time	t_{rr}	$T_J=25^\circ\text{C}, I_F=40A$ $di/dt=100A/\mu\text{s}(\text{Note}2)$		63		nS	
Reverse Recovery Charge	Q_{rr}			98		nC	
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)					

Notes:

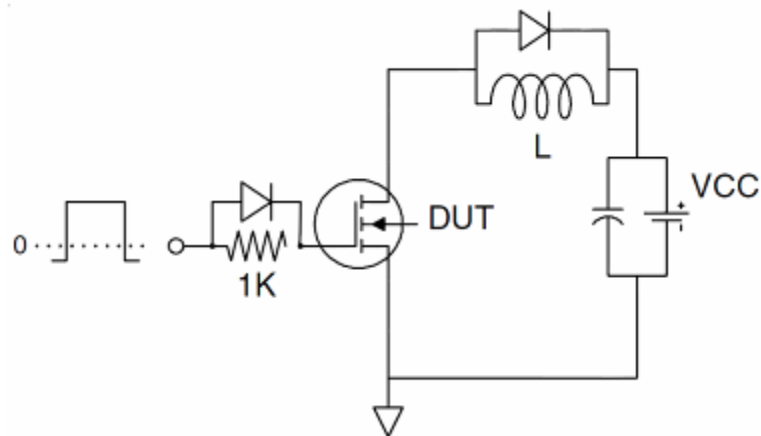
1. Surface Mounted on FR4 Board, $t \leq 10$ sec.
2. Pulse Test: Pulse Width $\leq 400\mu\text{s}$, Duty Cycle $\leq 2\%$.
3. EAS condition: $T_J=25^\circ\text{C}, V_{DD}=37.5V, V_G=10V, L=2\text{mH}, R_G=25\Omega, I_{AS}=37A$

Test circuit

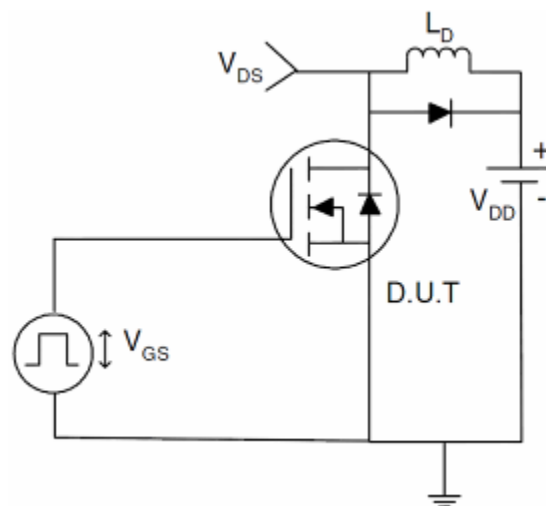
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

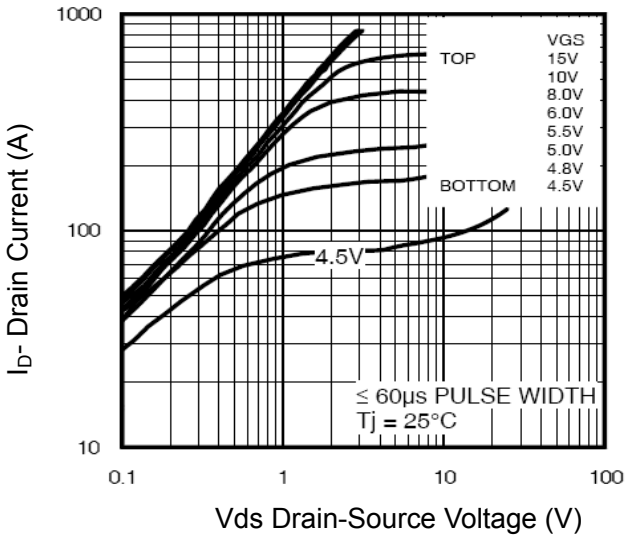


Figure 1 Output Characteristics

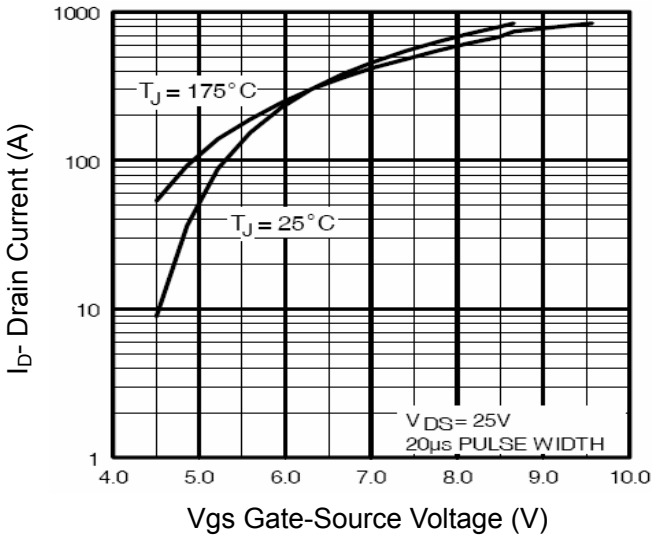


Figure 2 Transfer Characteristics

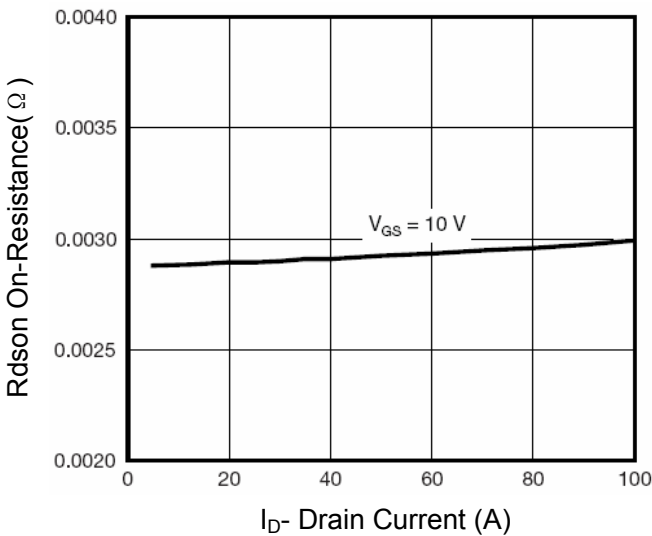


Figure 3 Rdson- Drain Current

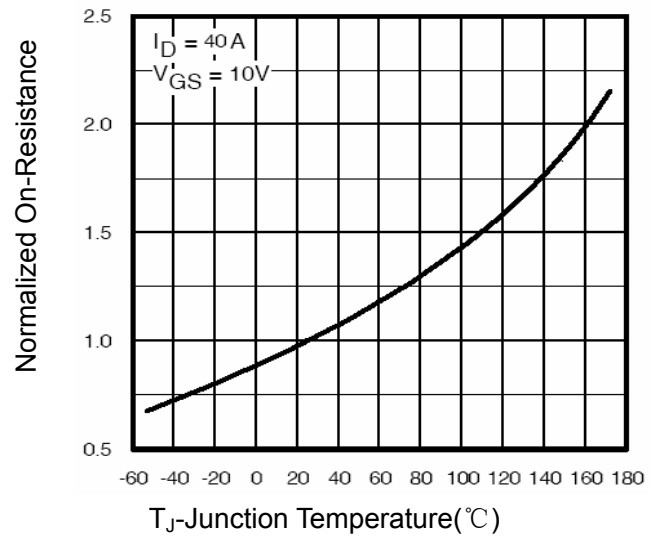


Figure 4 Rdson-Junction Temperature

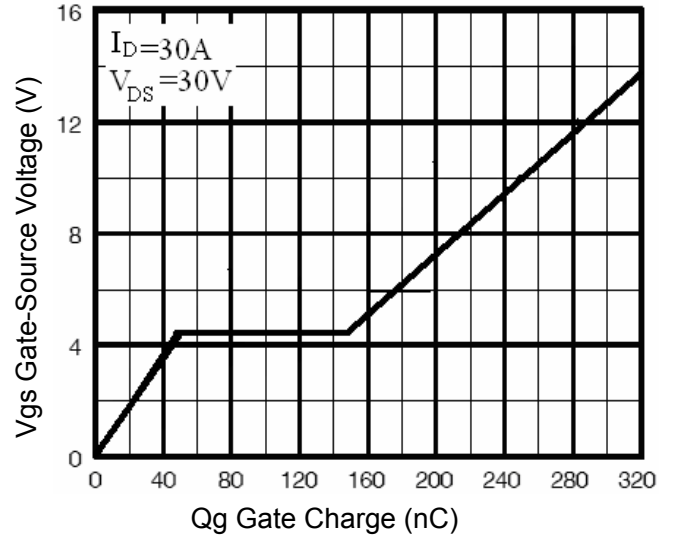


Figure 5 Gate Charge

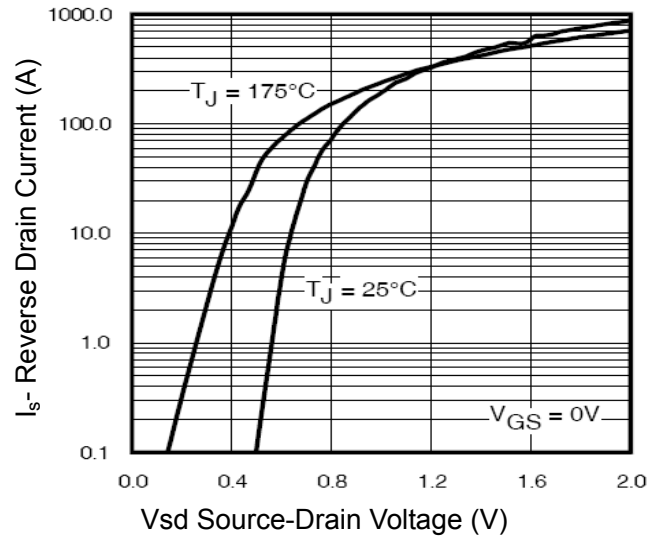


Figure 6 Source- Drain Diode Forward

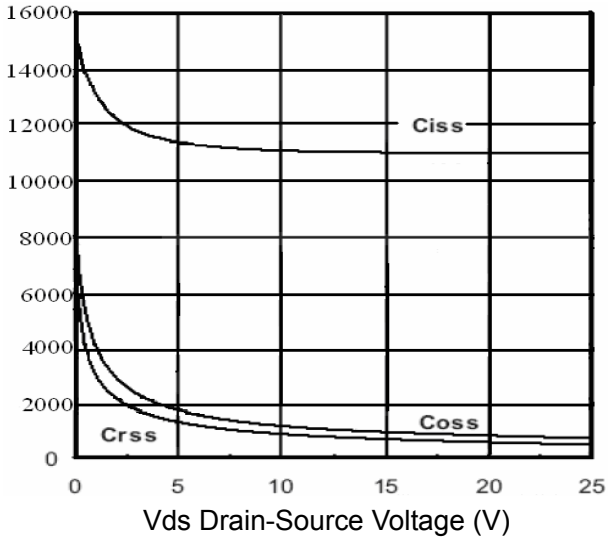


Figure 7 Capacitance vs Vds

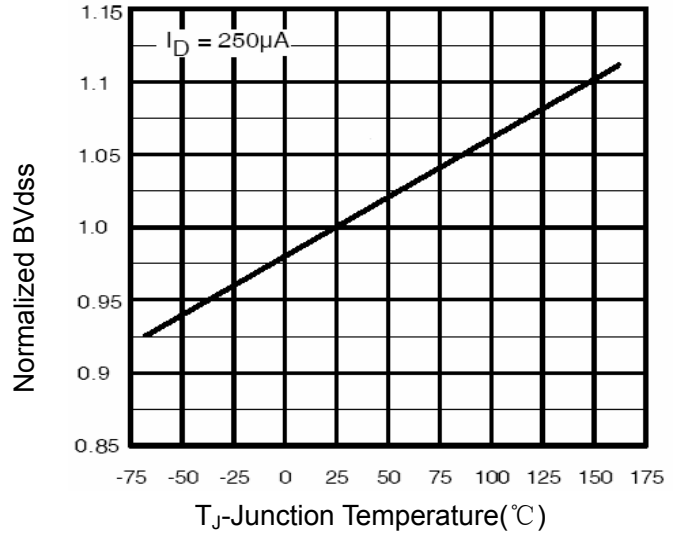


Figure 9 BV_{DSS} vs Junction Temperature

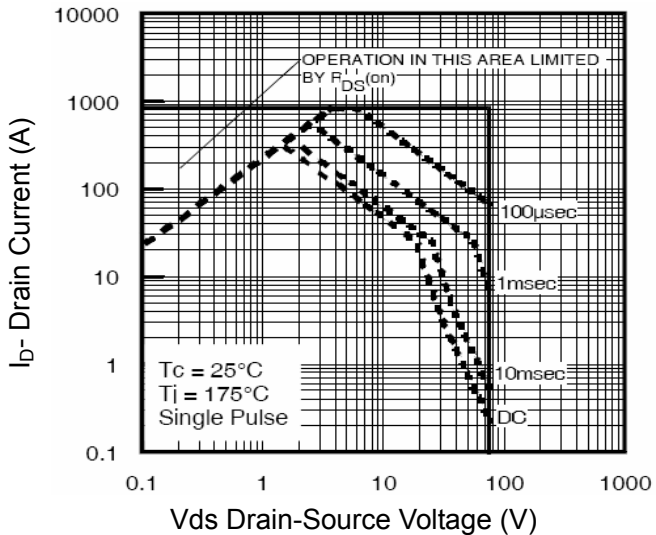


Figure 8 Safe Operation Area

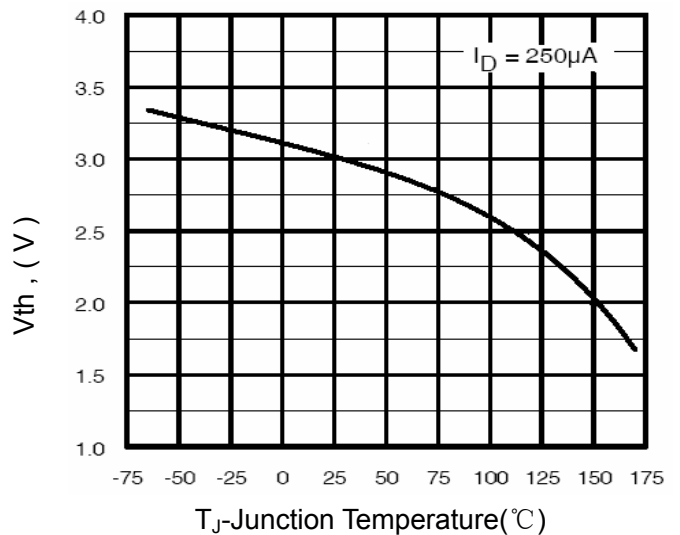


Figure 10 $V_{GS(th)}$ vs Junction Temperature

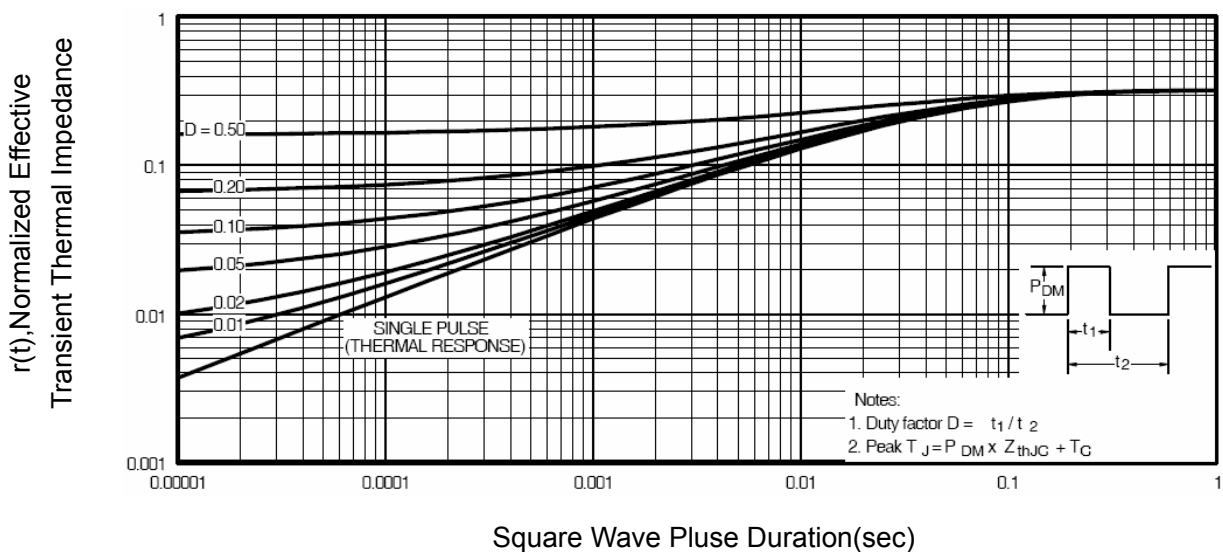
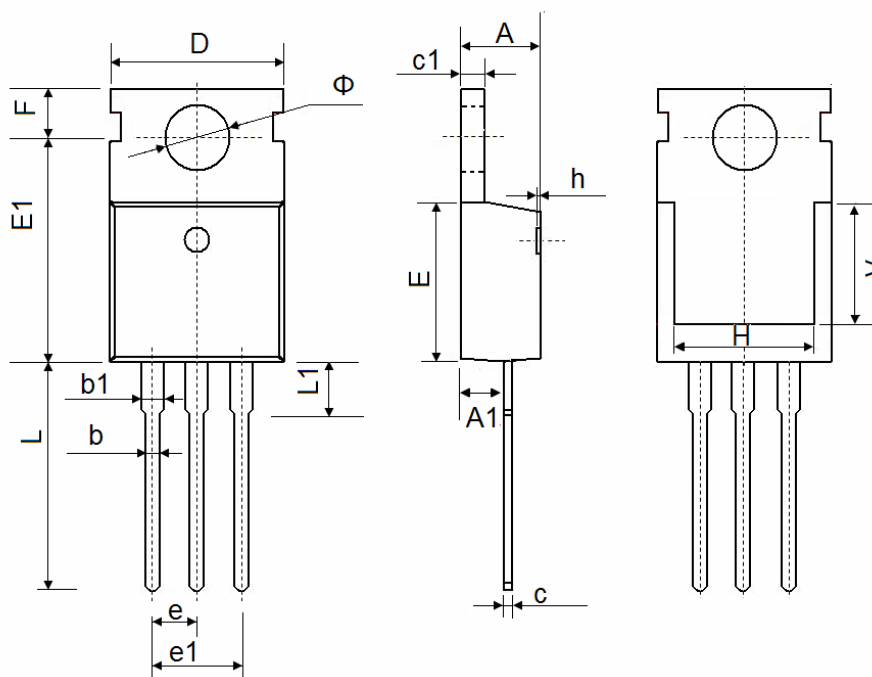


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

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