

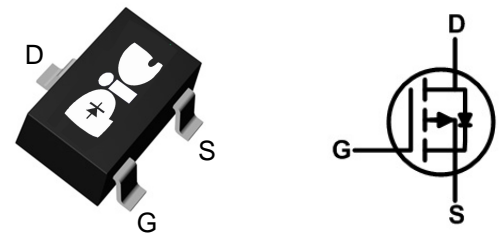
## ➤ General Description

This PAP2653N P-Channel enhancement mode power field effect transistor is the high density trench technology and this advanced technology can provide excellent  $R_{ds(On)}$  performance and efficiency for power switching and load switching application., this device also comply with the RoHS and Green Product requirement with full function reliability approved.

## ➤ Feature

- Super Low Gate Charge
- Green Device Available
- Excellent  $CdV/dt$  effect decline
- Advanced high cell density Trench technology
- SOT-23 Package design

## ➤ SOT-23



## ➤ Application

- Load Switch
- Portable instrument
- MB / NB / 3C device

## ➤ Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current, $V_{GS} @ -4.5V^1$	$I_D @ T_A=25^\circ C$	-3	A
Continuous Drain Current, $V_{GS} @ -4.5V^1$	$I_D @ T_A=70^\circ C$	-2.4	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	-12	A
Total Power Dissipation <sup>3</sup>	$P_D @ T_A=25^\circ C$	1	W
Storage Temperature Range	$T_{STG}$	-55 to 150	$^\circ C$
Operating Junction Temperature Range	$T_J$	-55 to 150	$^\circ C$
Thermal Resistance Junction-ambient <sup>1</sup>	$R_{\theta JA}$	125	$^\circ C/W$
Thermal Resistance Junction-Case <sup>1</sup>	$R_{\theta JC}$	80	$^\circ C/W$

### ➤ Electrical Characteristics ( $T_J=25^\circ C$ Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V$ , $I_D=-250\mu A$	-20	---	---	V
Static Drain-Source On-Resistance <sup>2</sup>	$R_{DS(ON)}$	$V_{GS}=-4.5V$ , $I_D=-3A$	---	---	100	m $\Omega$
		$V_{GS}=-2.5V$ , $I_D=-2A$	---	---	120	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$ , $I_D=-250\mu A$	-0.3	-0.5	-1.0	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=-16V$ , $V_{GS}=0V$ , $T_J=25^\circ C$	---	---	-1	uA
		$V_{DS}=-16V$ , $V_{GS}=0V$ , $T_J=55^\circ C$	---	---	-5	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 12V$ , $V_{DS}=0V$	---	---	$\pm 100$	nA
Forward Transconductance	$g_{fs}$	$V_{DS}=-5V$ , $I_D=-3A$	---	12.2	---	S
Total Gate Charge (-4.5V)	$Q_g$	$V_{DS}=-15V$ , $V_{GS}=-4.5V$ , $I_D=-3A$	---	10.1	---	nC
Gate-Source Charge	$Q_{gs}$		---	1.21	---	
Gate-Drain Charge	$Q_{gd}$		---	2.46	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=-10V$ , $V_{GS}=-4.5V$ , $R_G=3.3\Omega$ , $I_D=-3A$	---	5.6	---	ns
Rise Time	$T_r$		---	32.2	---	
Turn-Off Delay Time	$T_{d(off)}$		---	45.6	---	
Fall Time	$T_f$		---	29.2	---	
Input Capacitance	$C_{iss}$	$V_{DS}=-15V$ , $V_{GS}=0V$ , $f=1MHz$	---	677	---	pF
Output Capacitance	$C_{oss}$		---	82	---	
Reverse Transfer Capacitance	$C_{rss}$		---	73	---	

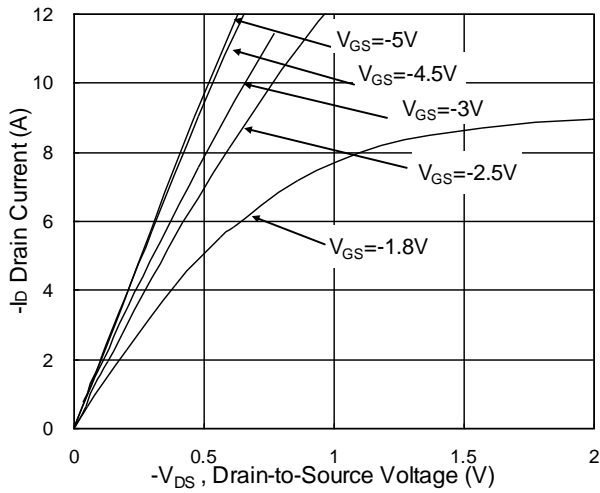
### ➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current <sup>1,4</sup>	$I_S$	$V_G=V_D=0V$ , Force Current	---	---	-3	A
Diode Forward Voltage <sup>2</sup>	$V_{SD}$	$V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^\circ C$	---	---	-1	V

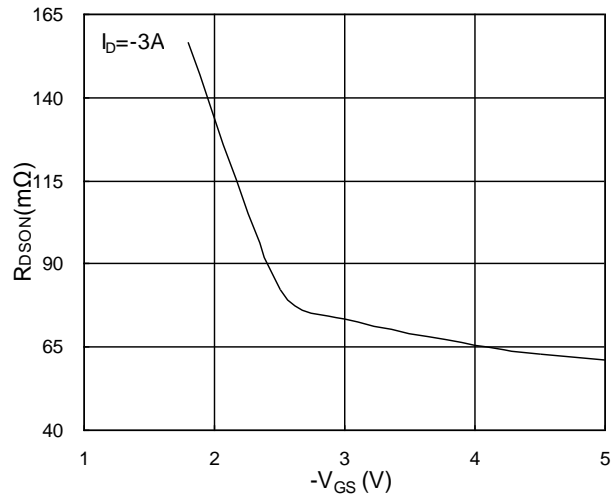
Note :

- 1.Pulse width limited by maximum junction temperature.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.Ensure that the channel temperature does not exceed  $150^\circ C$ .
- 4.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.

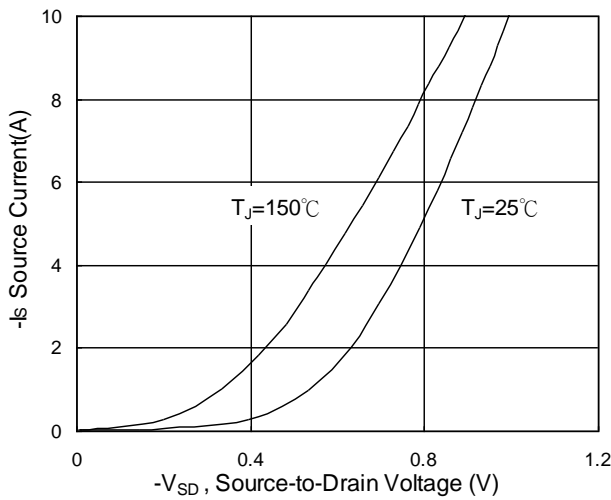
## ➤ Typical Characteristics



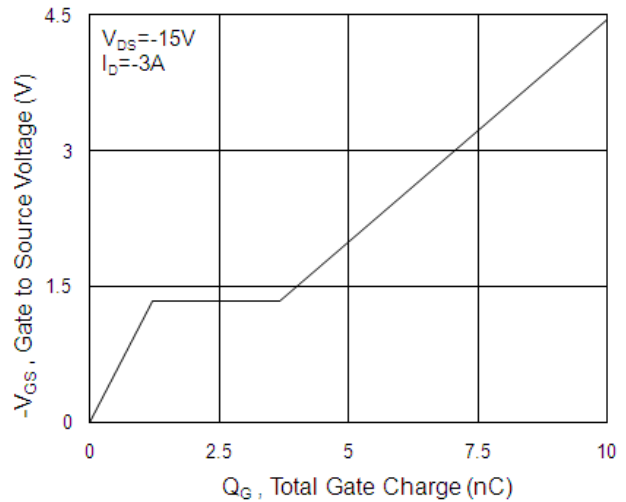
**Fig.1 Typical Output Characteristics**



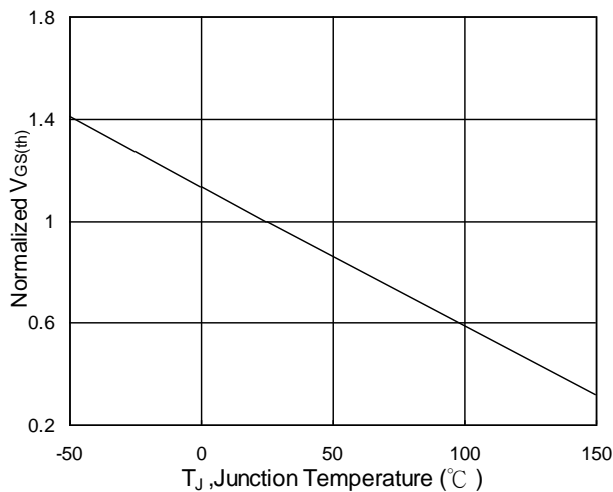
**Fig.2 On-Resistance vs. Gate-Source Voltage**



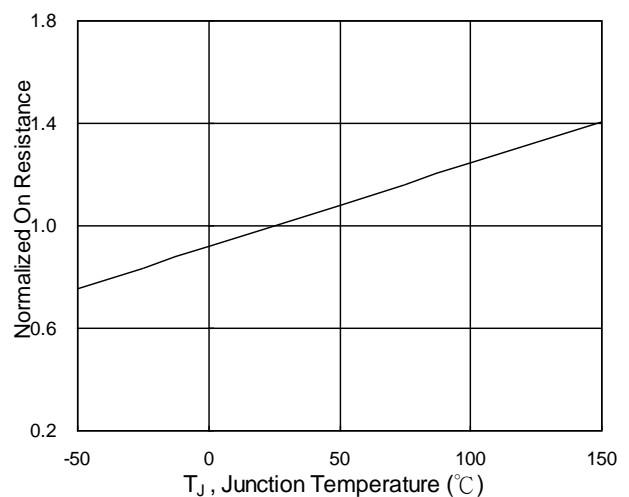
**Fig.3 Forward Characteristics of Reverse**



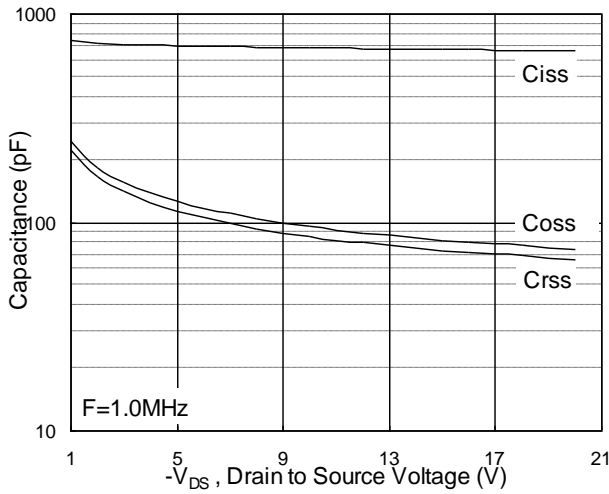
**Fig.4 Gate-Charge Characteristics**



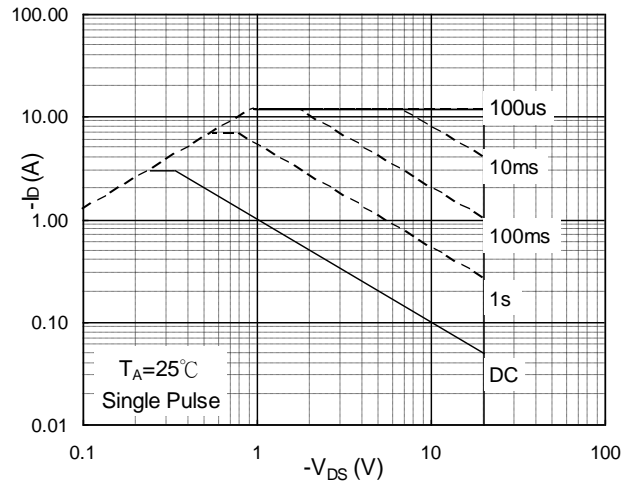
**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



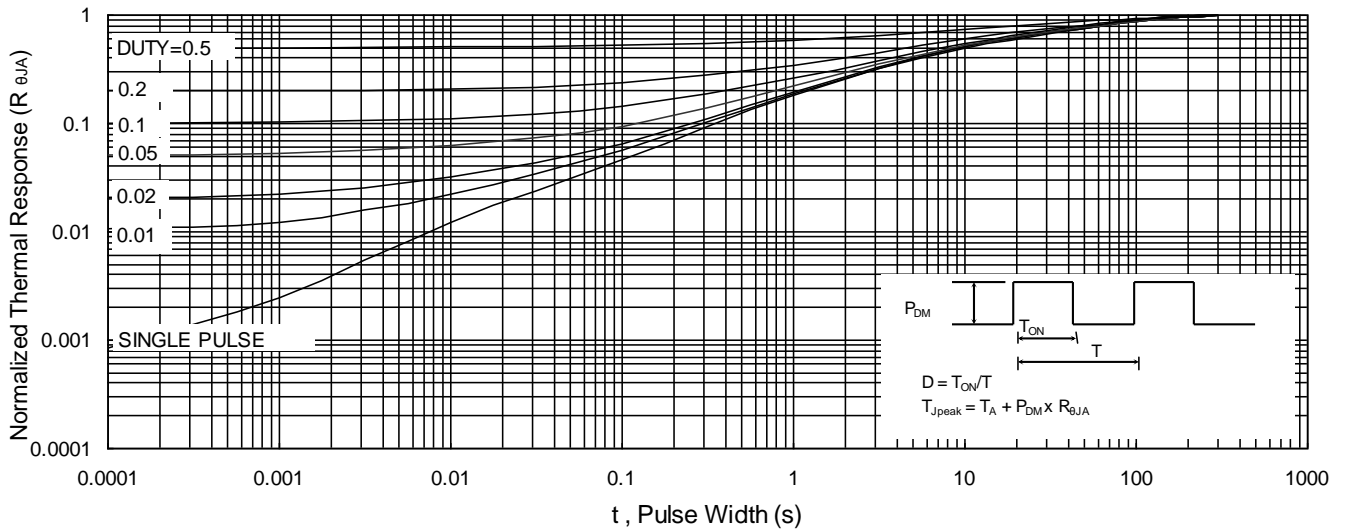
**Fig.6 Normalized  $R_{DS(ON)}$  vs.  $T_J$**



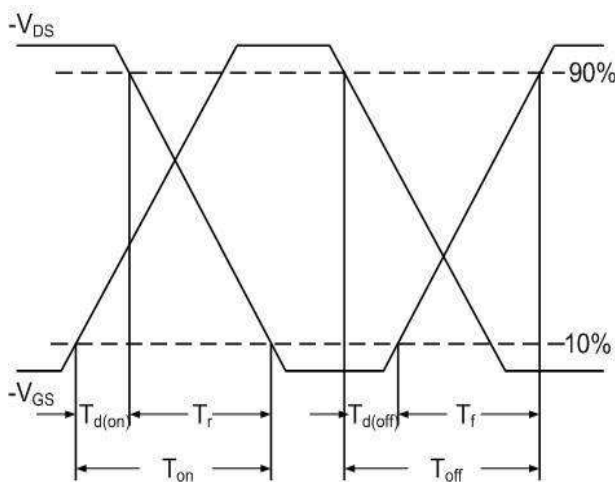
**Fig.7 Capacitance**



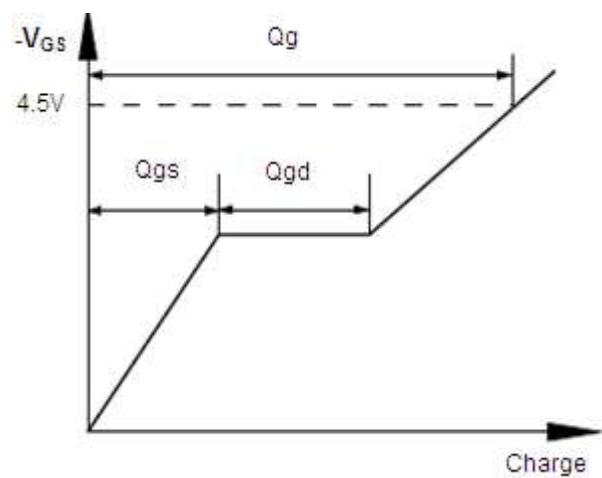
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**

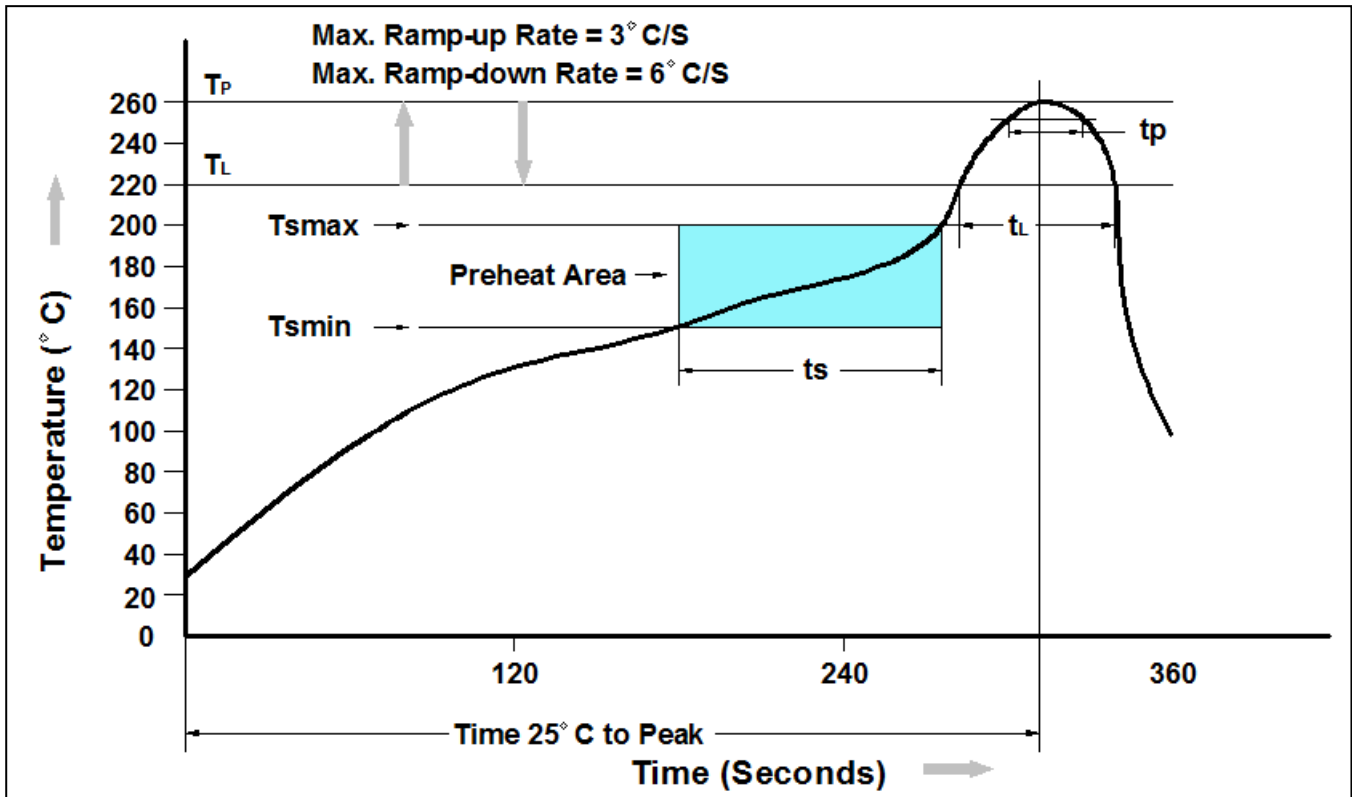


**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**

➤ Recommand IR Reflow Soldering Thermal Profile

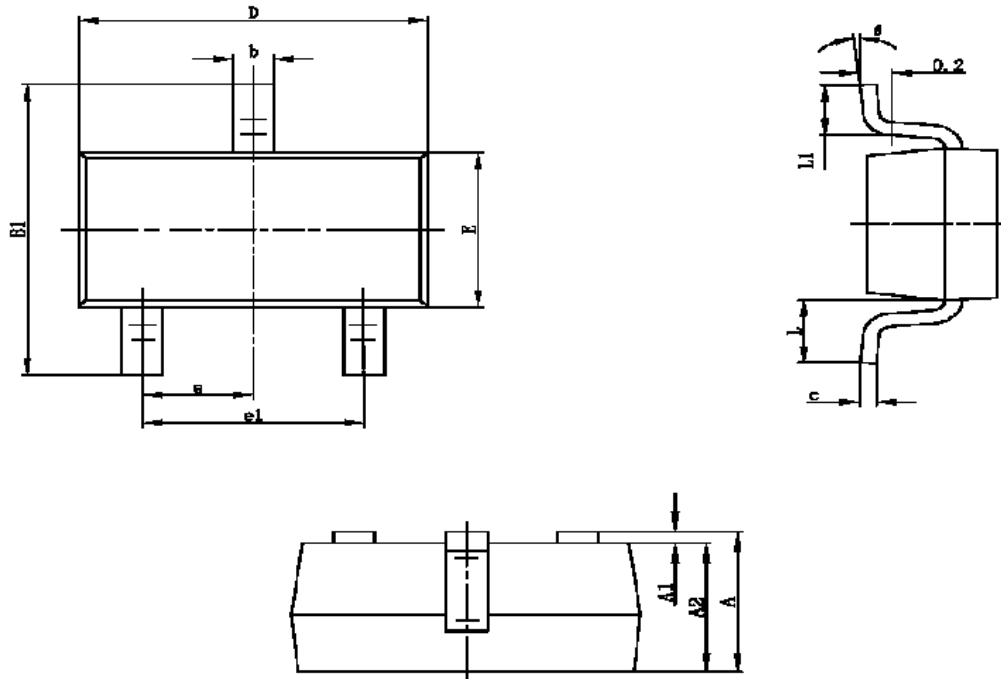


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	150°C
Temperature Max. (T <sub>smax</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds
Average Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60 – 150 seconds
Peak Temperature	260°C +0°C / -5°C
Time (t <sub>P</sub> ) within 5°C of actual Peak Temperature	30 seconds
Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.

➤ Ordering Information

Part Number	Description	Quantity
PAP2653N	SOT-23 Reel	3000 pcs

#### ➤ Package Information ( SOT-23 )



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°

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