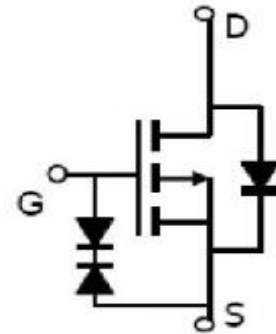




**P-Channel Enhancement Mode Power MOSFET**

**Description**

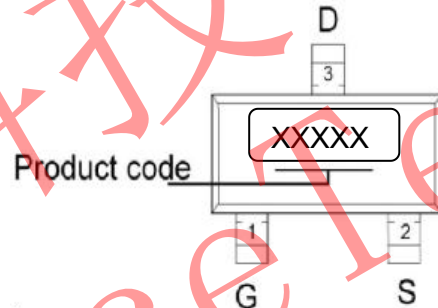
The MX3415 uses advanced trench technology to provide excellent RDS(ON), low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications .It is ESD protected.



**General Features**

- $V_{DS} = -20V$ ,  $I_D = -4.5A$
- $R_{DS(ON)}(Typ.) < 33m\Omega @ V_{GS} = -4.5V$
- $R_{DS(ON)}(Typ.) < 44m\Omega @ V_{GS} = -2.5V$
- ESD Rating: 2500V HBM
- High Power and current handing capability
- Lead free product is acquired
- Surface mount package

**Schematic diagram**



**Application**

- ◆ PWM applications
- ◆ Load switch

**Marking and pin assignment**  
SOT-23-3 (TOP VIEW)

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 10$	V
Drain Current-Continuous	$I_D$	-4.5	A
Drain Current-Pulsed (Note 1)	$I_{DM}$	-30	A
Maximum Power Dissipation	$P_D$	1.4	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

**Thermal Characteristic**

Thermal Resistance,Junction-to-Ambient (Note 2)	$R_{\theta JA}$	89.3	°C/W
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**Electrical Characteristics (TA=25°C unless otherwise noted)**

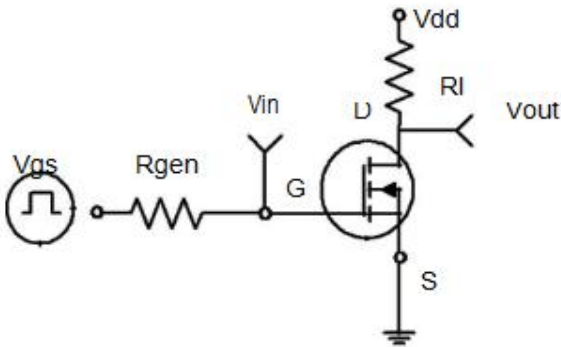
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =-250μA	-20		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V	-	-	±10	μA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-0.4	-0.65	-1.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A	-	33	47	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-4A	-	44	60	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-5V, I <sub>D</sub> =-4A	8	-	-	S
<b>Dynamic Characteristics (Note4)</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, F=1.0MHz	-	950	-	PF
Output Capacitance	C <sub>oss</sub>		-	165	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	120	-	PF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-10V, R <sub>L</sub> =2.5Ω V <sub>GS</sub> =-4.5V, R <sub>GEN</sub> =3Ω	-	12		nS
Turn-on Rise Time	t <sub>r</sub>		-	10		nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	19		nS
Turn-Off Fall Time	t <sub>f</sub>		-	25		nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-10V, I <sub>D</sub> =-4A, V <sub>GS</sub> =-4.5V	-	12		nC
Gate-Source Charge	Q <sub>gs</sub>		-	1.4	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	3.6	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A	-	-	-1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	-2.2	A

**Notes:**

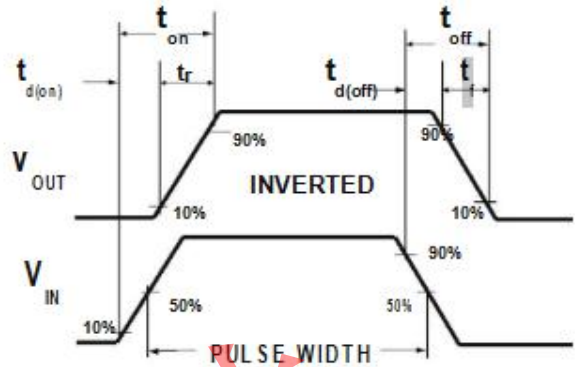
- 1.Repetitive Rating: Pulse width limited by maximum junction temperature.
- 2.Surface Mounted on FR4 Board, t ≤ 10 sec.
- 3.Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
- 4.Guaranteed by design, not subject to production



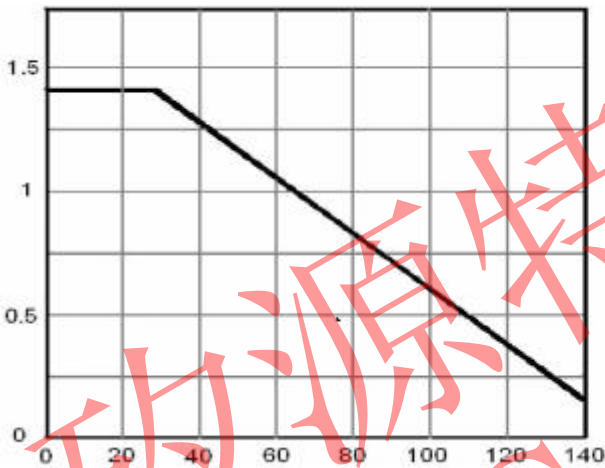
**Typical Performance Characteristics**



**Figure 1: Switching Test Circuit**

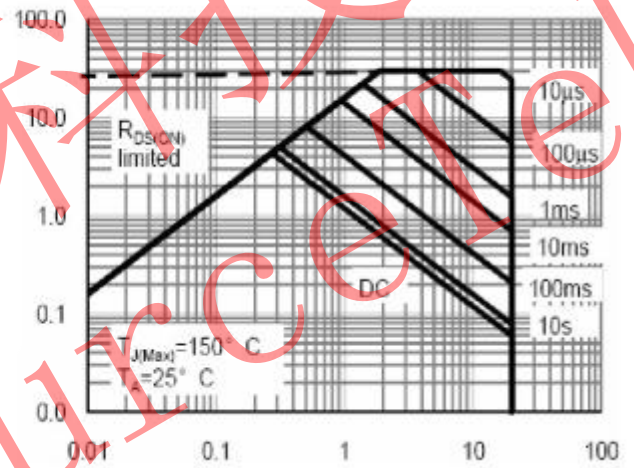


**Figure 2: Switching Waveforms**



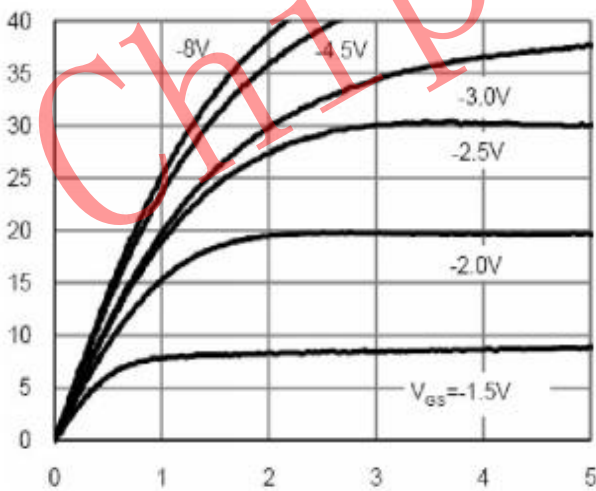
T<sub>J</sub>-Junction Temperature(°C)

**Figure 3 Power Dissipation**



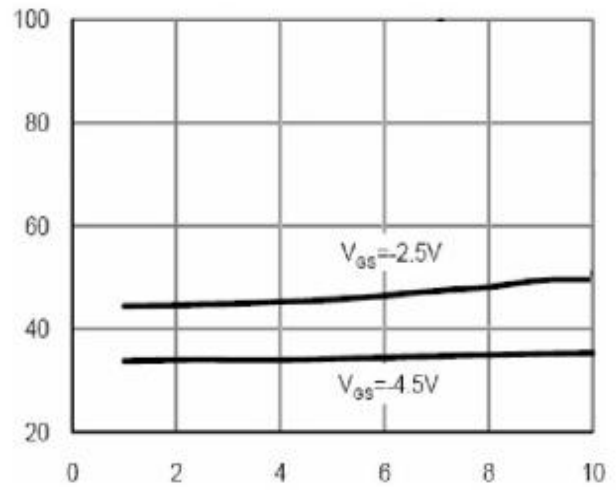
V<sub>ds</sub> Drain-Source Voltage (V)

**Figure 4 Safe Operation Area**



V<sub>ds</sub> Drain-Source Voltage (V)

**Figure 5 Output CHARACTERISTICS**



I<sub>D</sub>- Drain Current (A)

**Figure 6 Drain-Source On-Resistance**

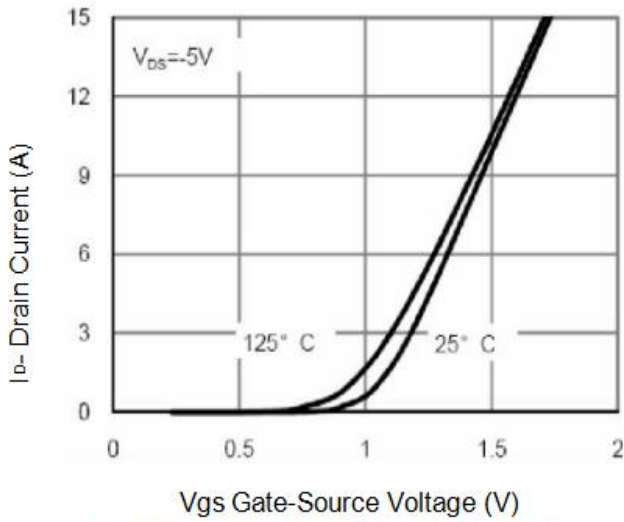


Figure 7 Transfer Characteristics

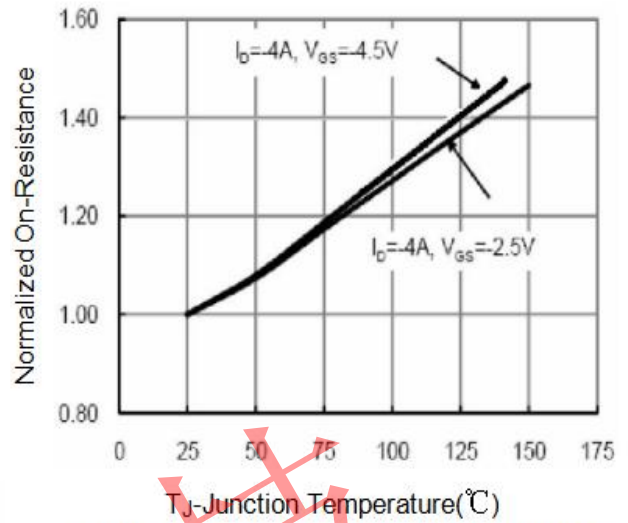


Figure 8 Drain-Source On-Resistance

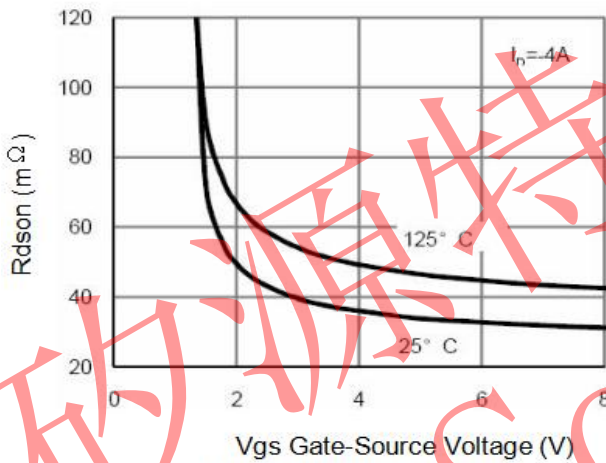


Figure 9  $R_{DS(on)}$  vs  $V_{GS}$

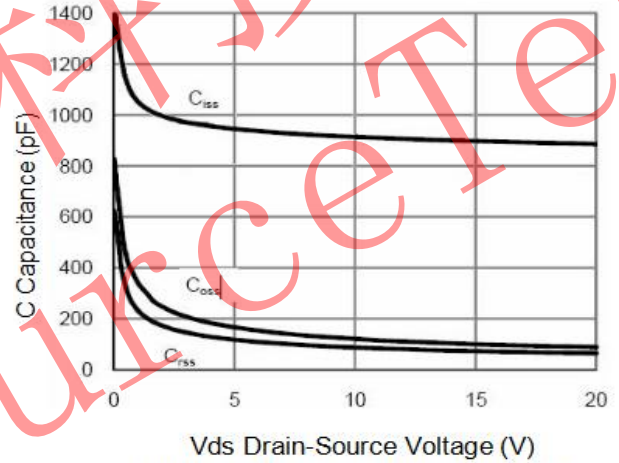


Figure 10 Capacitance vs  $V_{DS}$

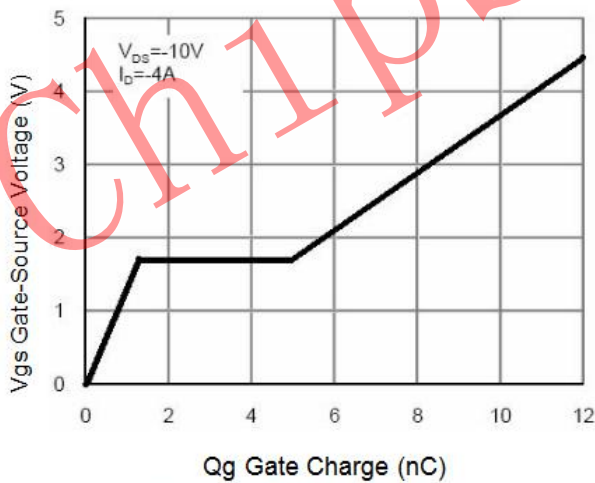


Figure 11 Gate Charge

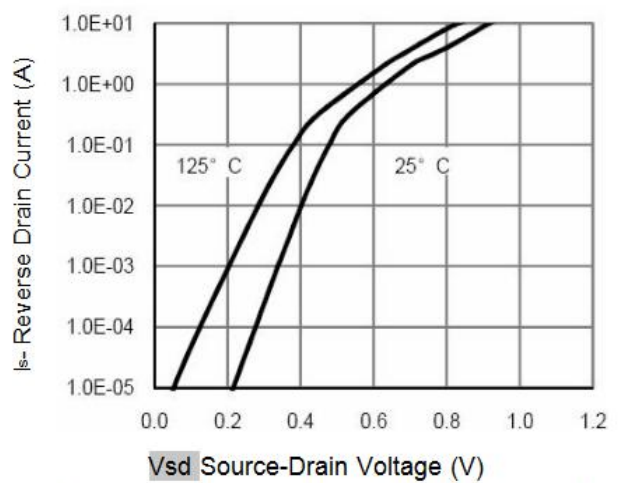


Figure 12 Source-Drain Diode Forward

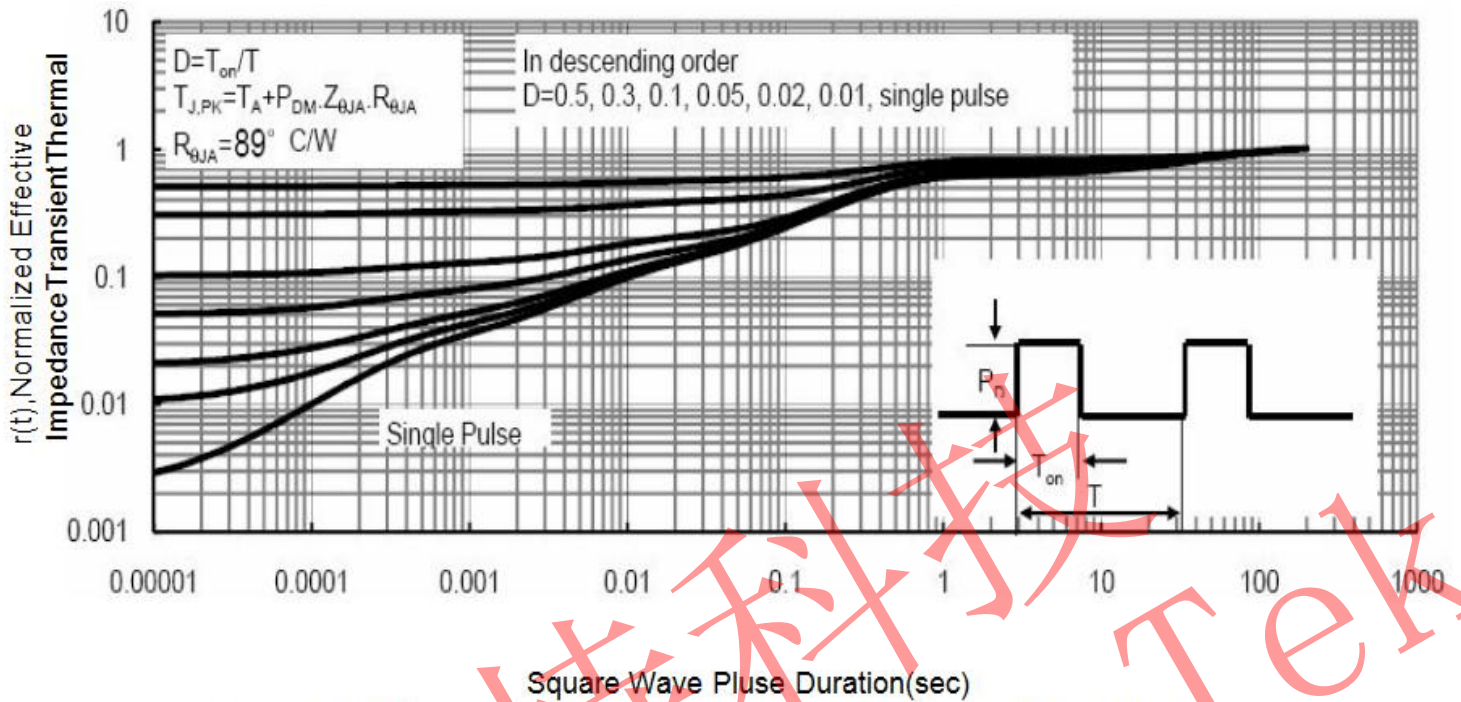
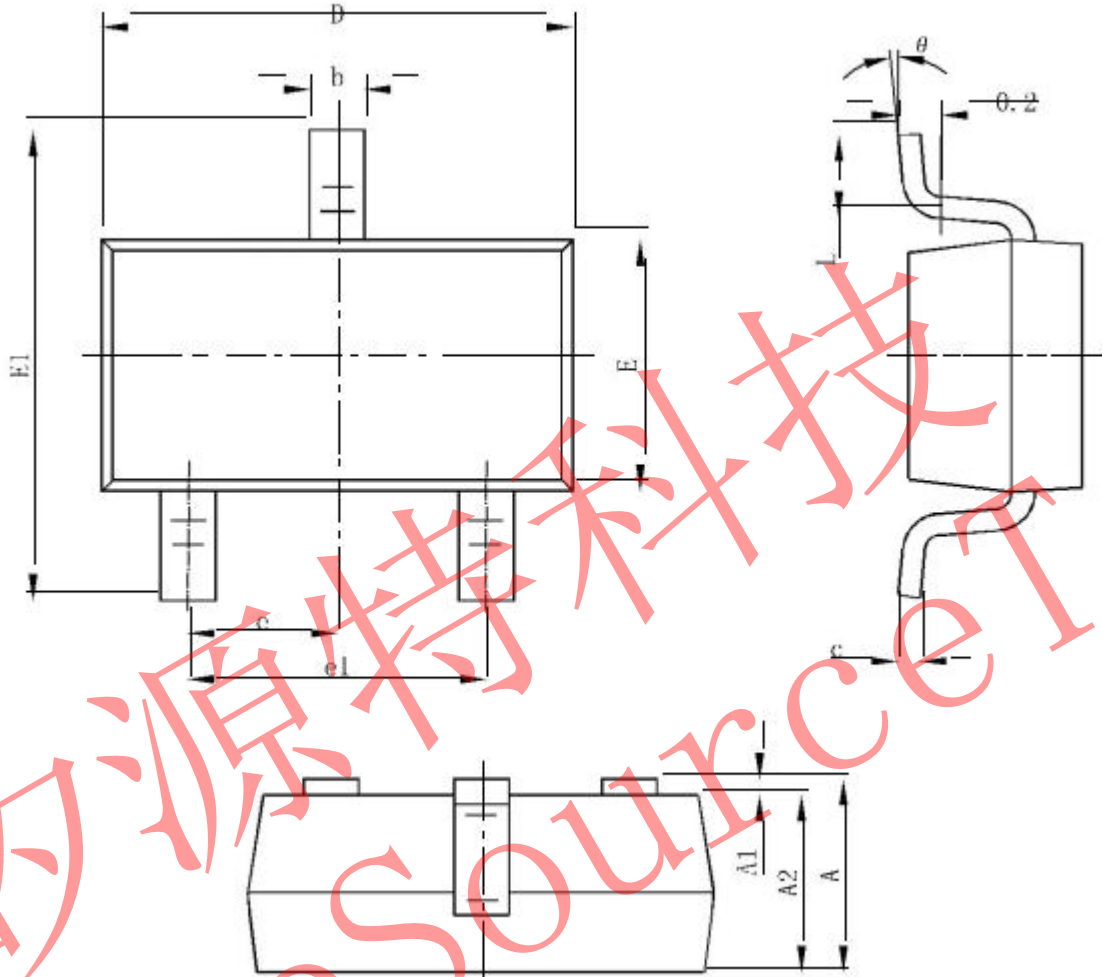


Figure 13 Normalized Maximum Transient Thermal Impedance



**SOT23-3 PACKAGE INFOR**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
<b>A</b>	<b>1.050</b>	<b>1.250</b>	<b>0.041</b>	<b>0.049</b>
<b>A1</b>	<b>0.000</b>	<b>0.100</b>	<b>0.000</b>	<b>0.004</b>
<b>A2</b>	<b>1.050</b>	<b>1.150</b>	<b>0.041</b>	<b>0.045</b>
<b>b</b>	<b>0.300</b>	<b>0.500</b>	<b>0.012</b>	<b>0.020</b>
<b>c</b>	<b>0.100</b>	<b>0.200</b>	<b>0.004</b>	<b>0.008</b>
<b>D</b>	<b>2.820</b>	<b>3.020</b>	<b>0.111</b>	<b>0.119</b>
<b>E</b>	<b>1.500</b>	<b>1.700</b>	<b>0.059</b>	<b>0.067</b>
<b>E1</b>	<b>2.650</b>	<b>2.950</b>	<b>0.104</b>	<b>0.116</b>
<b>e</b>	<b>0.950(BSC)</b>		<b>0.037(BSC)</b>	
<b>e1</b>	<b>1.800</b>	<b>2.000</b>	<b>0.071</b>	<b>0.079</b>
<b>L</b>	<b>0.300</b>	<b>0.600</b>	<b>0.012</b>	<b>0.024</b>
<b>θ</b>	<b>0°</b>	<b>8°</b>	<b>0°</b>	<b>8°</b>