

## N-Channel 20 V (D-S) MOSFET



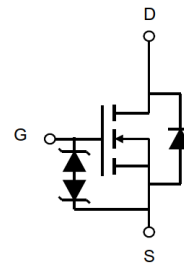
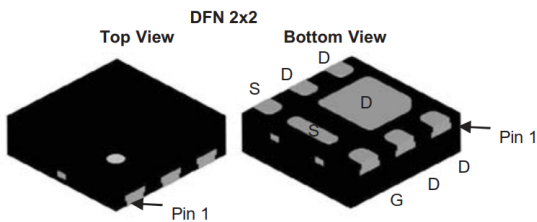
PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ (m $\Omega$ )(TYP.)	$I_D$ (A) <sup>a</sup>
20	5.8 at $V_{GS} = 4.5$ V	25
	6.9 at $V_{GS} = 2.5$ V	20

### FEATURES

- DT-Trench Power MOSFET
- ESD Protected: 4000 V
- Common Drain

### APPLICATIONS

- 1-2 Cell Battery Protection Circuitry



ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	20	V	
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V	
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	$T_C = 25$ °C	25 <sup>a</sup>	A
		$T_C = 70$ °C	20 <sup>a</sup>	
		$T_A = 25$ °C	18 <sup>a, b, c</sup>	
		$T_A = 70$ °C	15.1 <sup>b, c</sup>	
Pulsed Drain Current	$I_{DM}$	75	A	
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25$ °C	12 <sup>a</sup>	A
		$T_A = 25$ °C	2.9 <sup>b, c</sup>	
Maximum Power Dissipation	$P_D$	$T_C = 25$ °C	24.2	W
		$T_C = 70$ °C	16.3	
		$T_A = 25$ °C	3.5 <sup>b, c</sup>	
		$T_A = 70$ °C	2.2 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	°C	
Soldering Recommendations (Peak Temperature) <sup>d, e</sup>		260	°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient <sup>b, f</sup>	$R_{thJA}$	28	36	°C/W	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	5.3	6.5	°C/W	

Notes:

- Package limited
- Surface mounted on 1" x 1" FR4 board.
- $t = 5$  s.
- The DFN2X2 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under steady state conditions is 80 °C/W.

<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		24		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.6		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.5		1.5	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			$\pm 5$	$\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	25			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$		5.8	7.3	m $\Omega$
		$V_{GS} = 2.5\text{ V}, I_D = 5\text{ A}$		6.9	8.5	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 7\text{ A}$		16		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1200		pF
Output Capacitance	$C_{oss}$			286		
Reverse Transfer Capacitance	$C_{rss}$			190		
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$		16.5		nC
Gate-Source Charge	$Q_{gs}$			1.3		
Gate-Drain Charge	$Q_{gd}$			3.8		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		6		$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong 7\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		15		ns
Rise Time	$t_r$			10		
Turn-Off Delay Time	$t_{d(off)}$			13		
Fall Time	$t_f$			10		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		11		
Rise Time	$t_r$			8		
Turn-Off Delay Time	$t_{d(off)}$			13		
Fall Time	$t_f$			8		
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			12	A
Pulse Diode Forward Current	$I_{SM}$				75	
Body Diode Voltage	$V_{SD}$	$I_S = 1\text{ A}, V_{GS} = 0\text{ V}$		0.6	1	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 7\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		20		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			8		nC
Reverse Recovery Fall Time	$t_a$			9		ns
Reverse Recovery Rise Time	$t_b$			10		

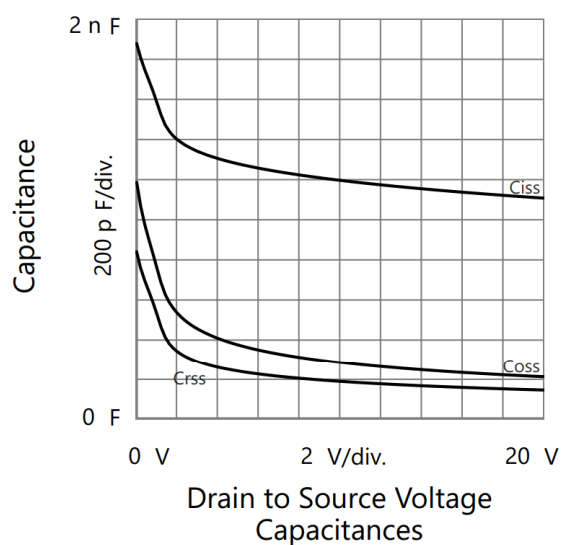
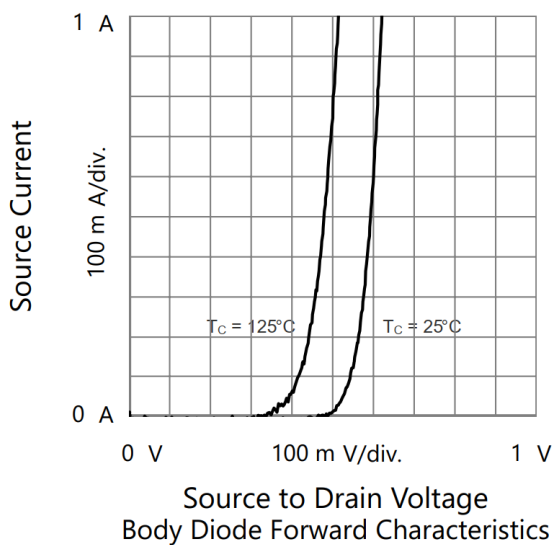
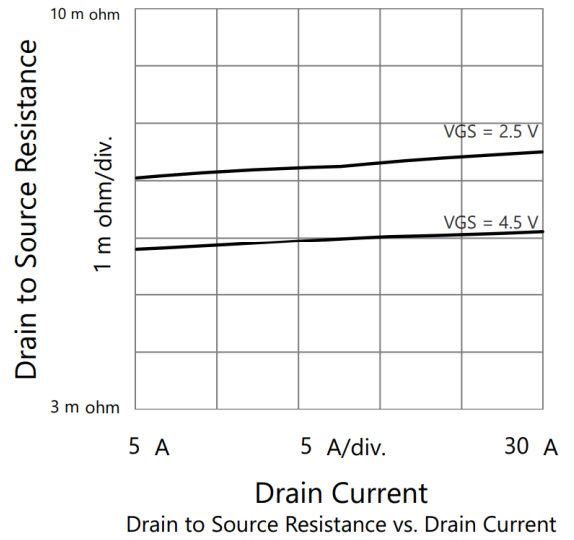
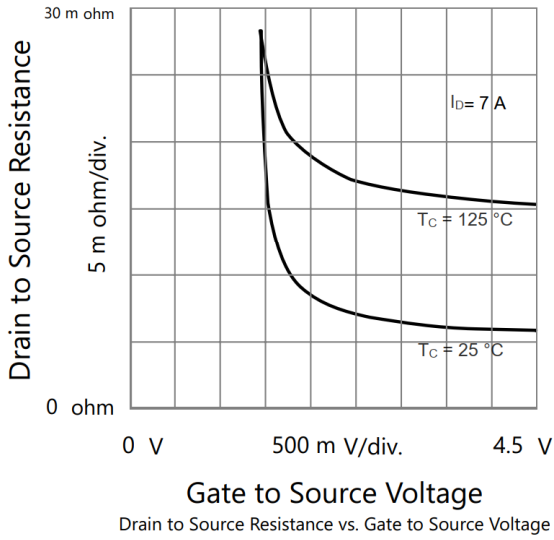
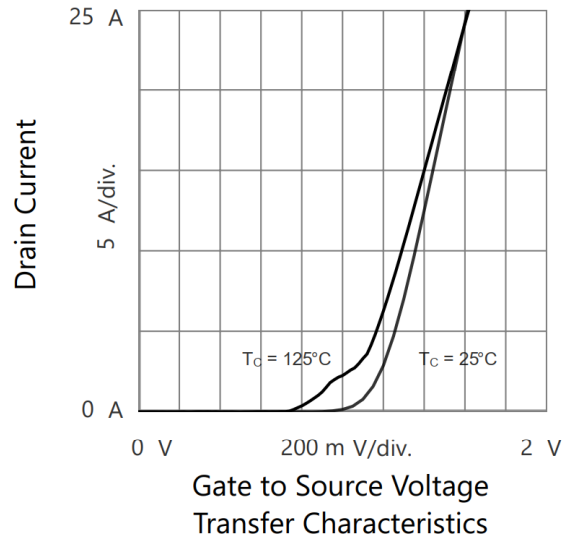
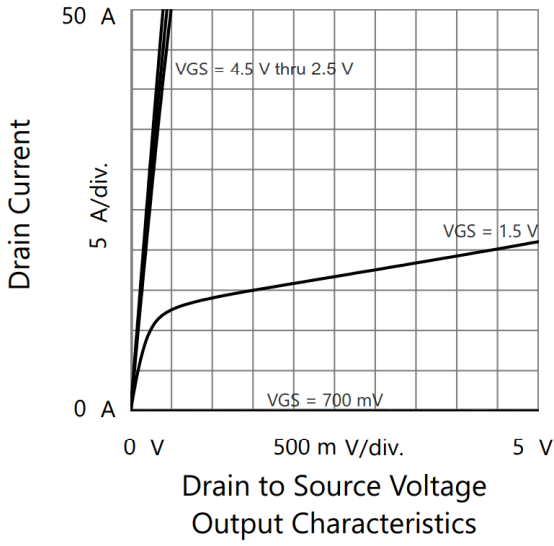
Notes:

 a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

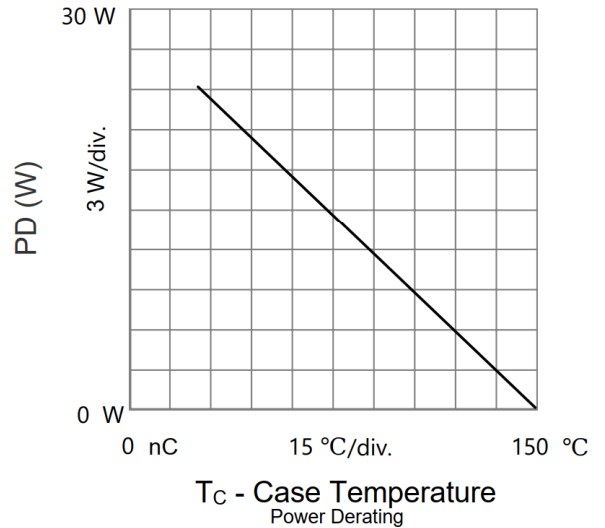
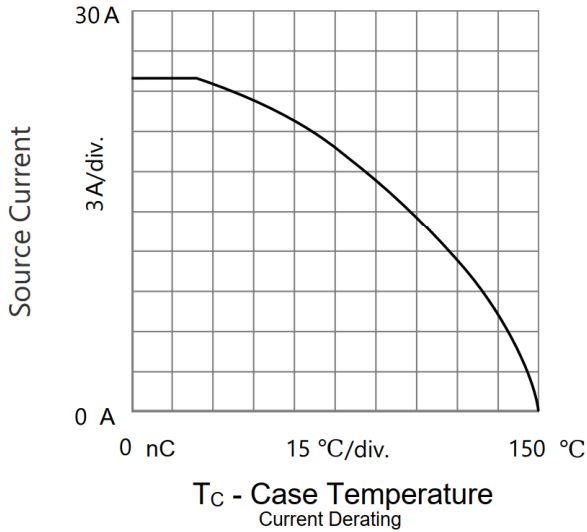
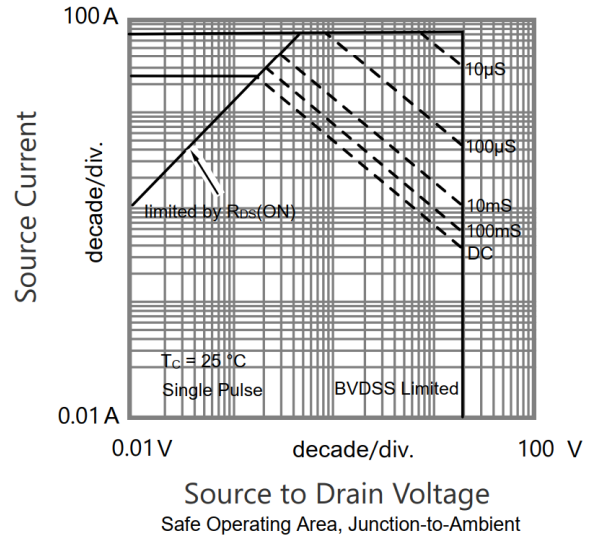
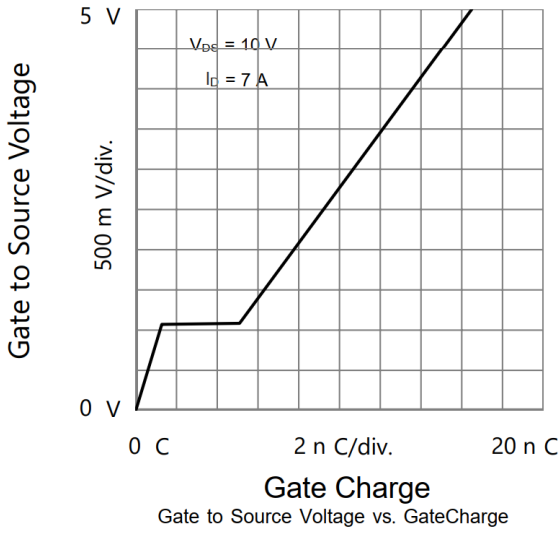
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

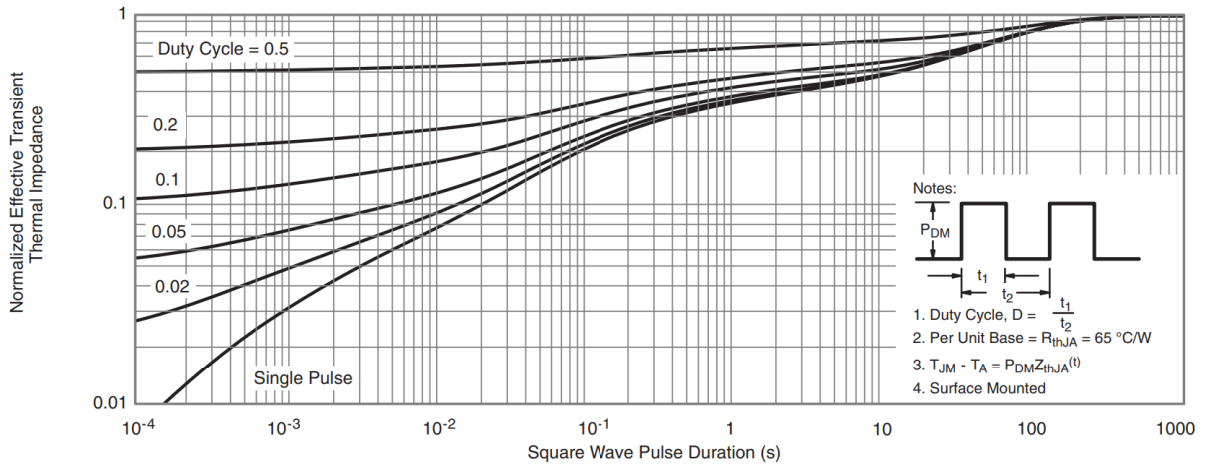
**TYPICAL CHARACTERISTIC** (25 °C, unless otherwise noted)



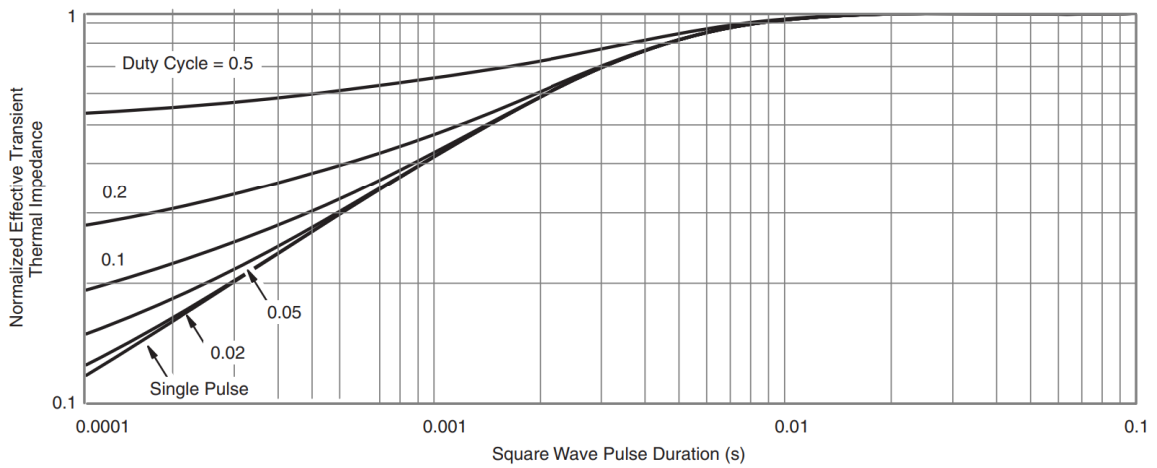
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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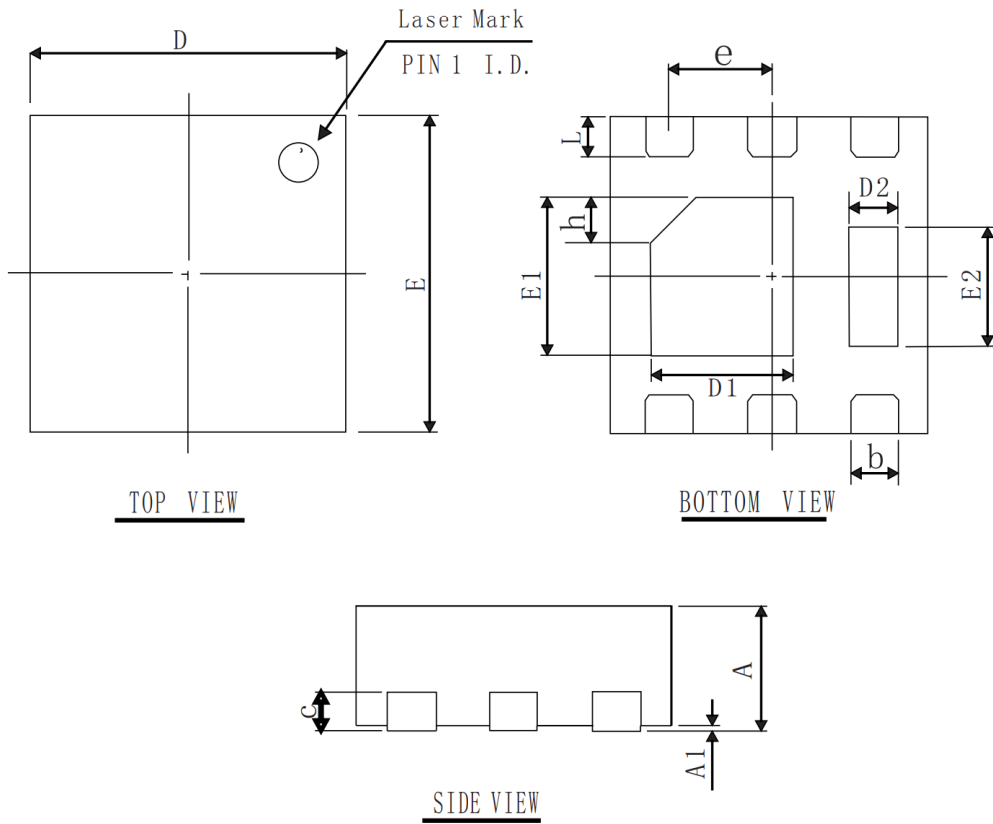


**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Case**

DFN 2X2 PACKAGE OUTLINE



COMMON DIMENSIONS  
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	0.60	0.75	0.90
A1	0.00	0.02	0.10
b	0.15	0.25	0.40
D	1.80	2.00	2.25
E	1.80	2.00	2.25
D1	0.70	0.90	1.10
E1	0.75	1.00	1.20
D2	0.15	0.30	0.45
E2	0.45	0.75	0.95
L	0.15	0.25	0.40
h	0.15	0.25	0.40
c	0.203 REF		
e	0.65 BSC		

Other thickness dimensions are as follows

A	0.50	0.55	0.60
A	0.40	0.45	0.50

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