

P-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^c
- 60	0.0030 at $V_{GS} = - 10$ V	- 120
	0.0040 at $V_{GS} = - 4.5$ V	- 105

FEATURES

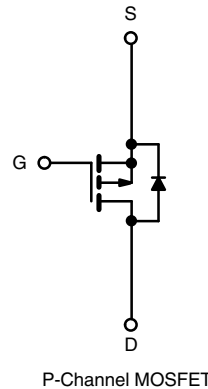
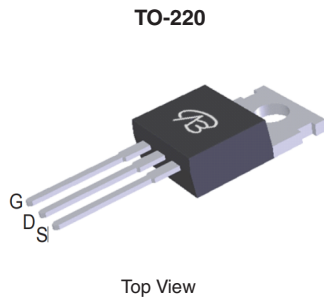
- Trench Power MOSFET
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT

APPLICATIONS

- DC/DC Primary Switch



ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V_{DS}	- 60	V	
Gate-Source Voltage	V_{GS}	± 20		
Continuous Drain Current ($T_J = 175$ °C) ^c	$T_C = 25$ °C	I_D	- 120	A
	$T_C = 125$ °C		- 75	
Pulsed Drain Current		I_{DM}	- 360	
Avalanche Current	L = 0.1 mH	I_{AS}	- 90	mJ
Single Pulse Avalanche Energy ^a		E_{AS}	211	
Power Dissipation	$T_C = 25$ °C	P_D	250 ^b	W
	$T_A = 25$ °C		2.4	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	°C	

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient Free Air	R_{thJA}	62	°C/W
Junction-to-Case	R_{thJC}	0.6	

Notes:

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- Limited by package.

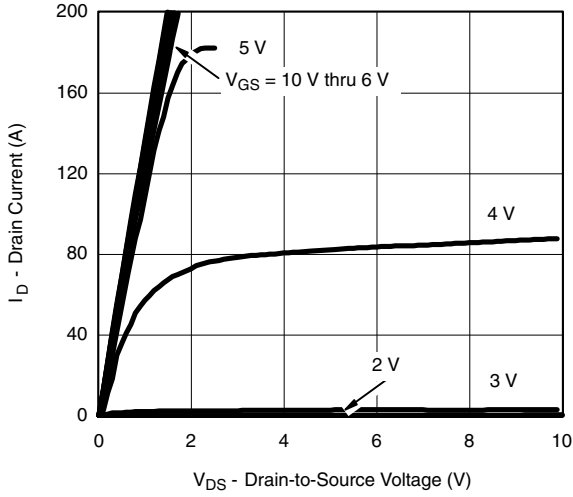
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-60			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$		-3		
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			-50	
		$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			-250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = -5\text{ V}, V_{GS} = -10\text{ V}$	-120			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -30\text{ A}$		0.0030		Ω
		$V_{GS} = -10\text{ V}, I_D = -30\text{ A}, T_J = 125\text{ }^\circ\text{C}$		0.0040		
		$V_{GS} = -10\text{ V}, I_D = -30\text{ A}, T_J = 175\text{ }^\circ\text{C}$		0.0060		
		$V_{GS} = -4.5\text{ V}, I_D = -20\text{ A}$		0.0040		
Forward Transconductance ^a	g_{fs}	$V_{DS} = -15\text{ V}, I_D = -30\text{ A}$	20			S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = -25\text{ V}, f = 1\text{ MHz}$		18500		pF
Output Capacitance	C_{oss}			975		
Reverse Transfer Capacitance	C_{rss}			760		
Total Gate Charge ^c	Q_g	$V_{DS} = -30\text{ V}, V_{GS} = -10\text{ V}, I_D = -90\text{ A}$		160	240	nC
Gate-Source Charge ^c	Q_{gs}			40		
Gate-Drain Charge ^c	Q_{gd}			36		
Gate Resistance	R_g	$f = 1.0\text{ MHz}$		3		Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = -30\text{ V}, R_L = 0.33\text{ }\Omega$ $I_D \cong -90\text{ A}, V_{GEN} = -10\text{ V}, R_g = 2.5\text{ }\Omega$		20	30	ns
Rise Time ^c	t_r			190	250	
Turn-Off Delay Time ^c	$t_{d(off)}$			140	210	
Fall Time ^c	t_f			290	350	
Source-Drain Diode Ratings and Characteristics ($T_C = 25\text{ }^\circ\text{C}$) ^b						
Continuous Current	I_S				-120	A
Pulsed Current	I_{SM}				-360	
Forward Voltage ^a	V_{SD}	$I_F = -50\text{ A}, V_{GS} = 0\text{ V}$		-1.0	-1.5	V
Reverse Recovery Time	t_{rr}	$I_F = -50\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		60	90	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			-3	-4.5	A
Reverse Recovery Charge	Q_{rr}				0.09	0.2

Notes:

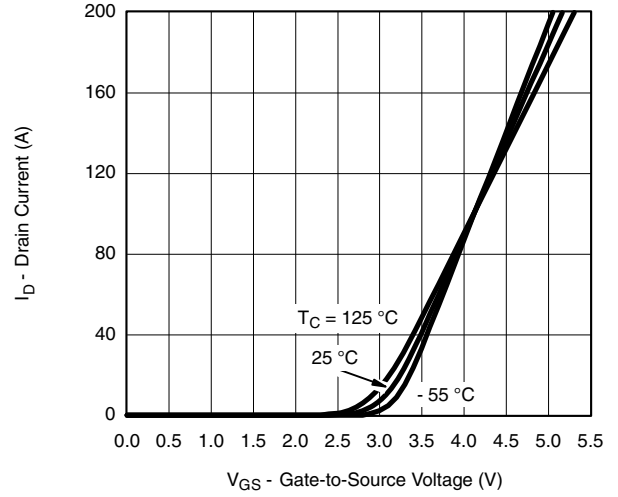
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

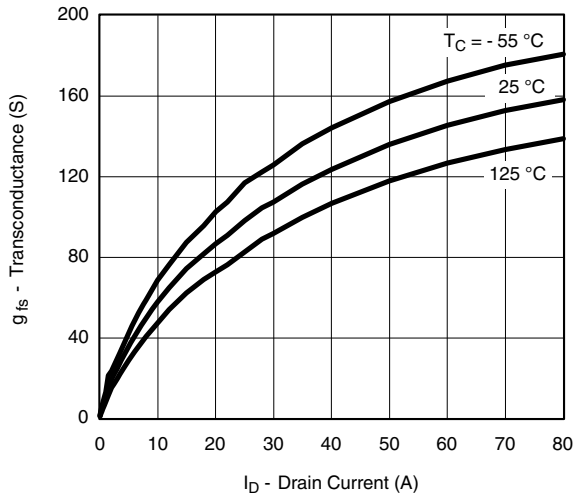
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



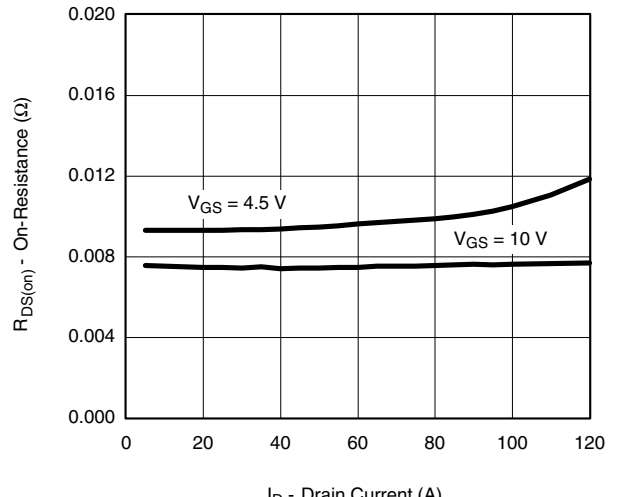
Output Characteristics



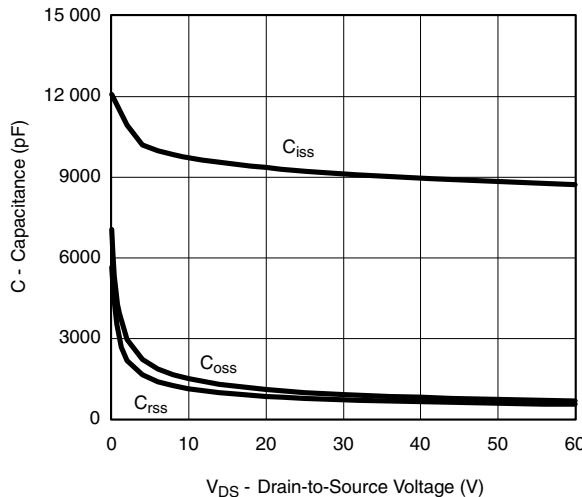
Transfer Characteristics



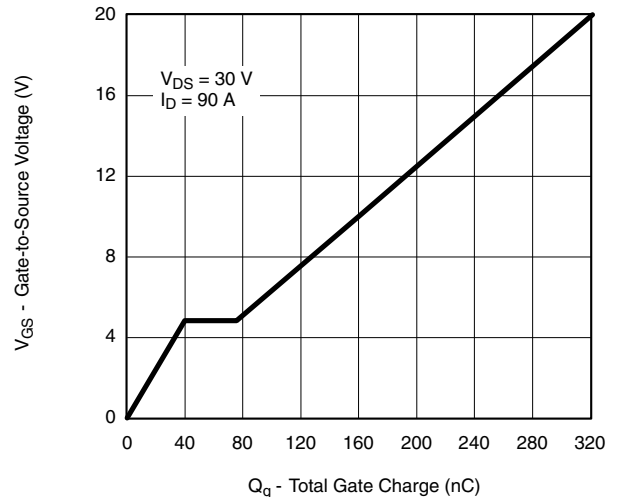
Transconductance



On-Resistance vs. Drain Current

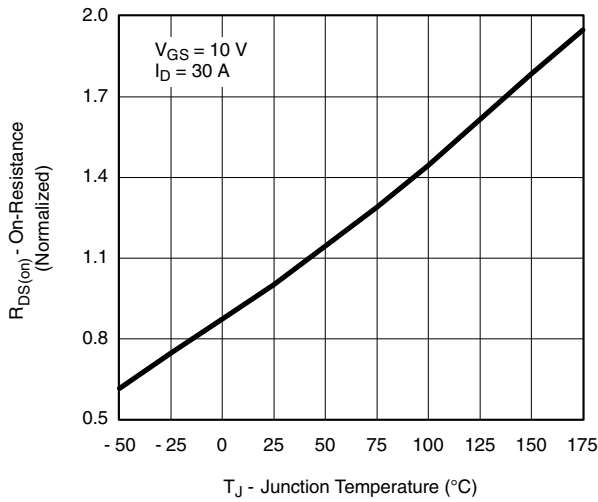


Capacitance

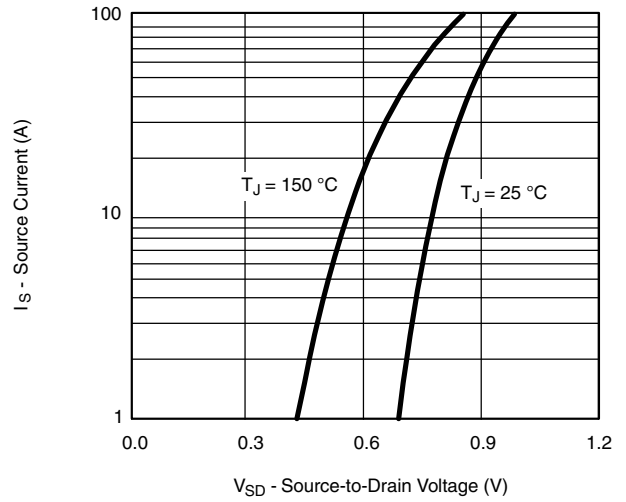


Gate Charge

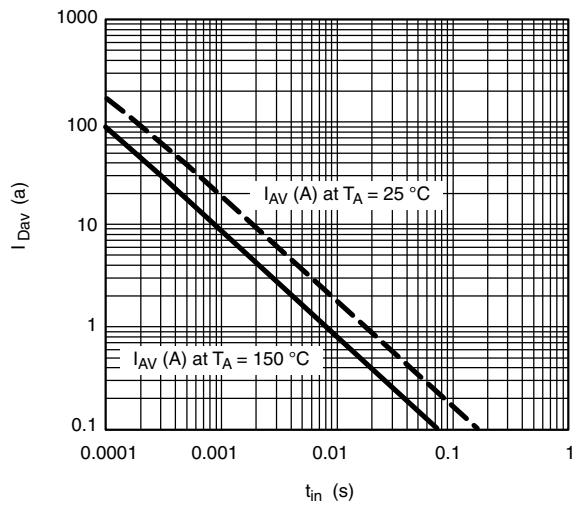
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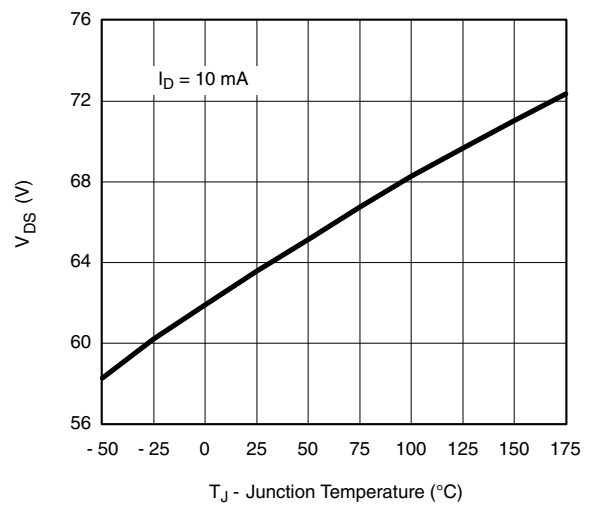
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

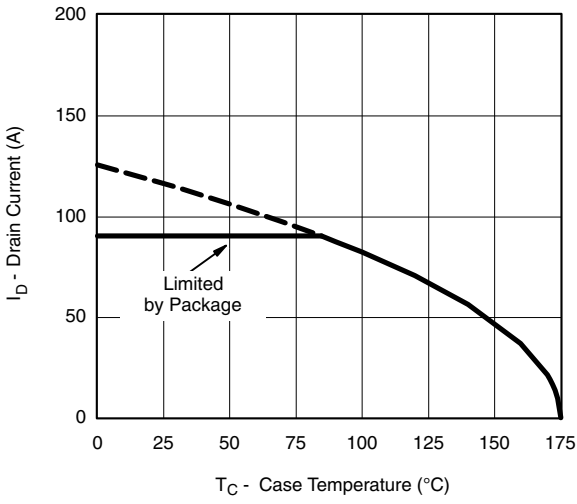


Avalanche Current vs. Time

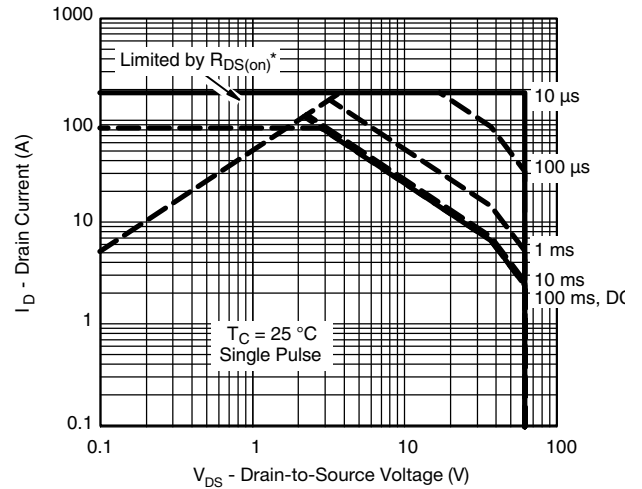


Drain Source Breakdown vs. Junction Temperature

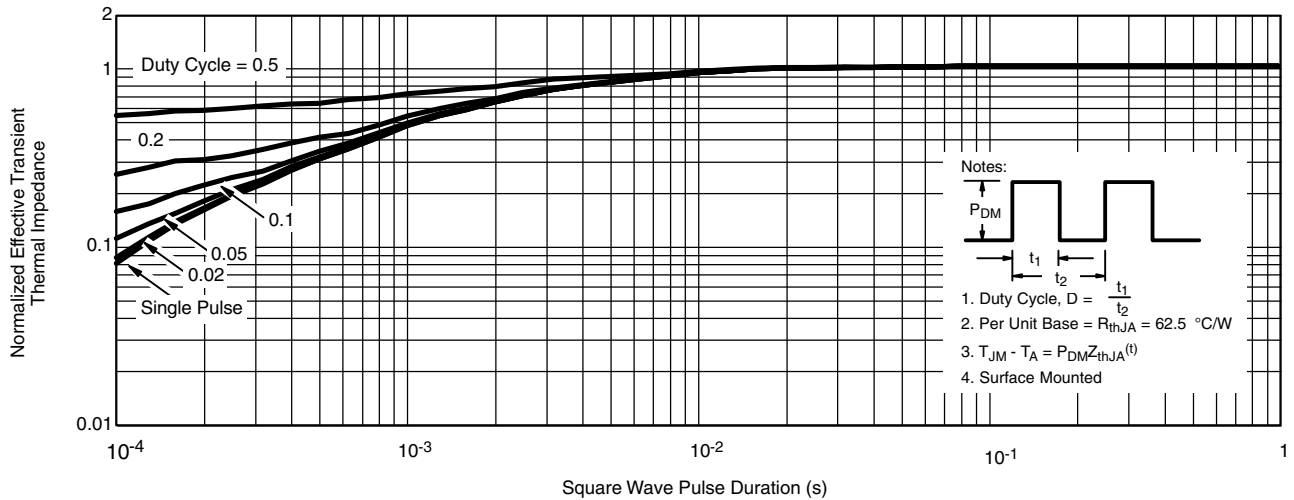
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature

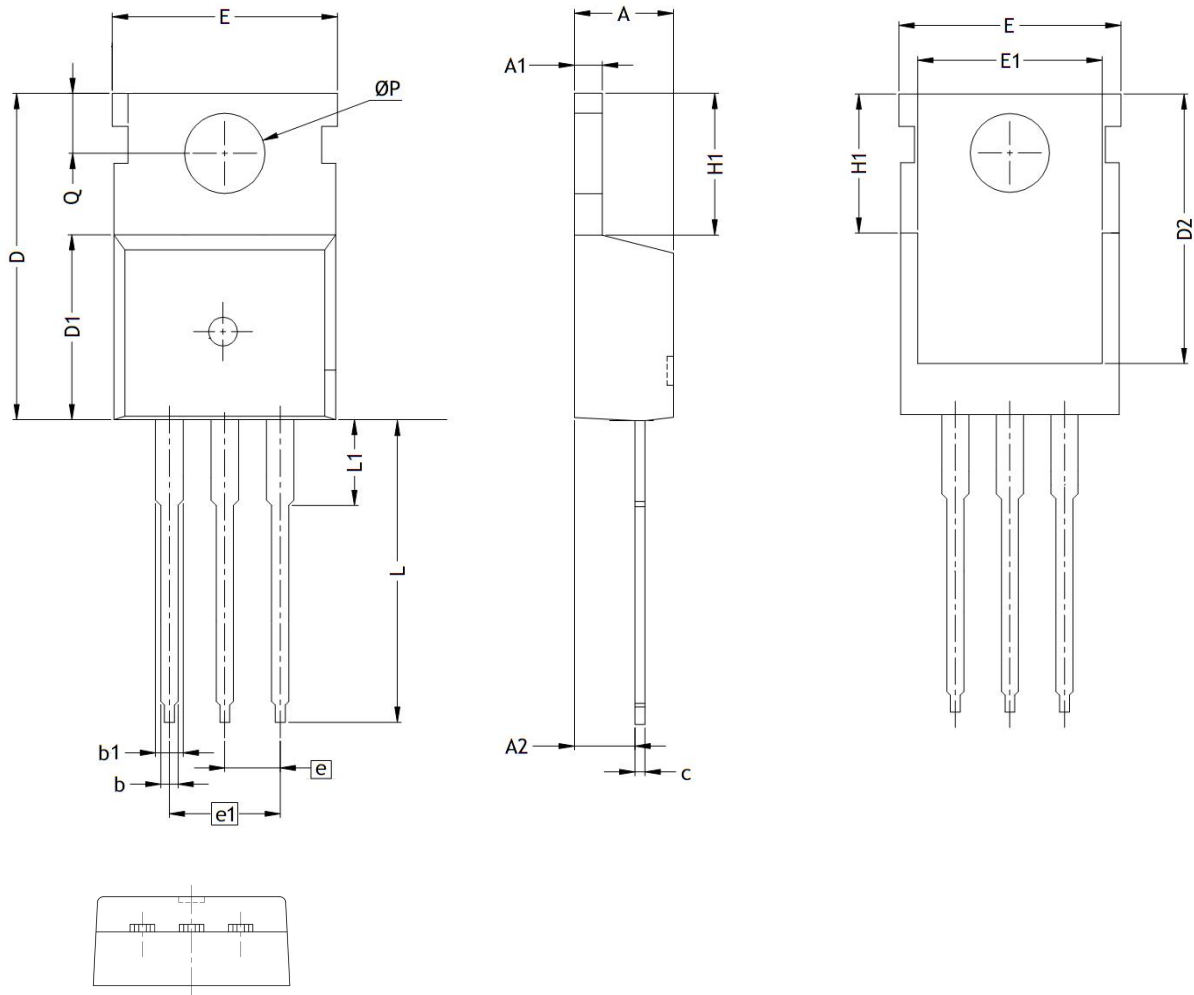


Safe Operating Area
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified



Normalized Thermal Transient Impedance, Junction-to-Case

TO-220 Package Outline Drawing



UNIT: mm

SYMBOLS	A	A1	A2	b	b1	c	D	D1	D2	E	E1	e
MIN	4.25	1.25	2.35	0.7	1.15	0.45	14.35	8.80	13.05	9.90	7.85	2.540
MAX	4.65	1.35	2.55	0.9	1.75	0.60	15.95	9.50	13.65	10.35	8.85	BSC
SYMBOLS	e1	H1	L	L1	Q	ϕP						
MIN	5.080	6.30	12.85	2.85	2.70	3.50						
MAX	BSC	6.65	13.50	3.25	2.90	3.70						

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