60V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D T_C = +25°C
60V	10mΩ @ V_{GS} = 10V	74.5A
	12.8mΩ @ V_{GS} = 4.5V	65.8A

Features and Benefits

- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low $R_{DS(ON)}$—Ensures On State Losses Are Minimized
- Excellent Q_{gd} x $R_{DS(ON)}$ Product (FOM)
- Advanced Technology for DC-DC Converters
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Description and Applications

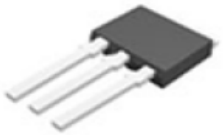
This new generation MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

- Power Management Functions
- DC-DC Converters
- Backlighting

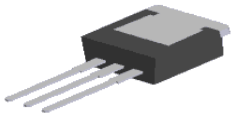
Mechanical Data

- Case: TO251 (Type TH)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.33 grams (Approximate)

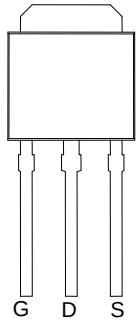
TO251 (Type TH)



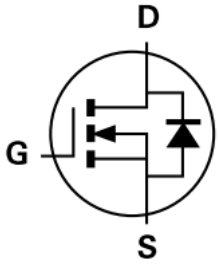
Top View



Bottom View



Top View
Pin Configuration



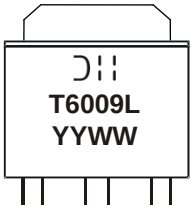
Internal Schematic

Ordering Information (Note 4)

Part Number	Case	Packaging
DMT6009LJ3	TO251 (Type TH)	75 Pieces / Tube

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3).compliant. All applicable RoHS exemptions applied.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



= Manufacturer's Marking
T6009L = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 18 = 2018)
WW or WW = Week Code (01 to 53)

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Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	60	V
Gate-Source Voltage		V_{GSS}	±16	V
Continuous Drain Current (Note 7)	T_C = +25°C T_C = +70°C	I_D	74.5 59.6	A
Maximum Body Diode Forward Current (Note 7)		I_S	50	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	280	A
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)		I_{SM}	280	A
Avalanche Current, L=0.1mH		I_{AS}	28.2	A
Avalanche Energy, L=0.1mH		E_{AS}	39.8	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	2.9	W
Thermal Resistance, Junction to Ambient (Note 6)		$R_{\Theta JA}$	43	°C/W
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\Theta JA}$	80	°C/W
Total Power Dissipation (Note 7)	T_C = +25°C	P_D	83.3	W
Thermal Resistance, Junction to Case (Note 7)		$R_{\Theta JC}$	1.5	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 48V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±16V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.7	—	2	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	8	10	mΩ	V_{GS} = 10V, I_D = 13.5A
		—	9.8	12.8		V_{GS} = 4.5V, I_D = 11.5A
Diode Forward Voltage	V_{SD}	—	0.8	1.2	V	V_{GS} = 0V, I_S = 5A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	1925	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	438	—		
Reverse Transfer Capacitance	C_{rss}	—	41	—		
Gate Resistance	R_g	—	1.7	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	15.6	—	nC	V_{DS} = 30V, I_D = 13.5A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	33.5	—		
Gate-Source Charge	Q_{gs}	—	4.7	—		
Gate-Drain Charge	Q_{gd}	—	5.3	—		
Turn-On Delay Time	$t_{D(ON)}$	—	4.5	—	ns	V_{DD} = 30V, V_{GS} = 10V, R_g = 6Ω, I_D = 13.5A
Turn-On Rise Time	t_R	—	8.6	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	35.9	—		
Turn-Off Fall Time	t_F	—	15.7	—		
Body Diode Reverse Recovery Time	t_{RR}	—	18.2	—	ns	I_F = 13.5A, di/dt = 400A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	33.1	—	nC	

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to production testing.

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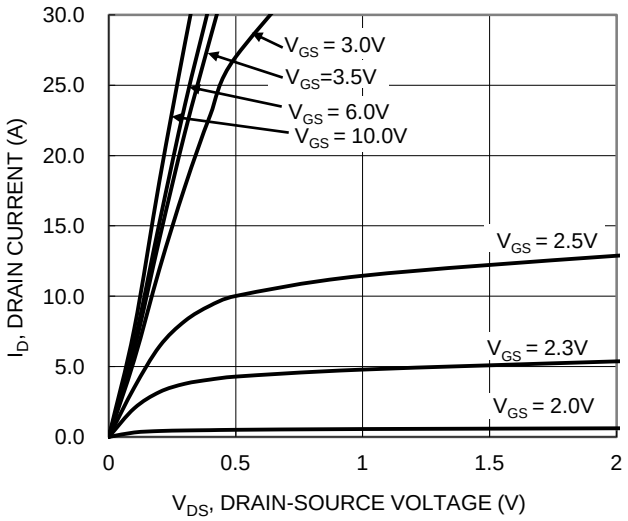

Figure 1. Typical Output Characteristic

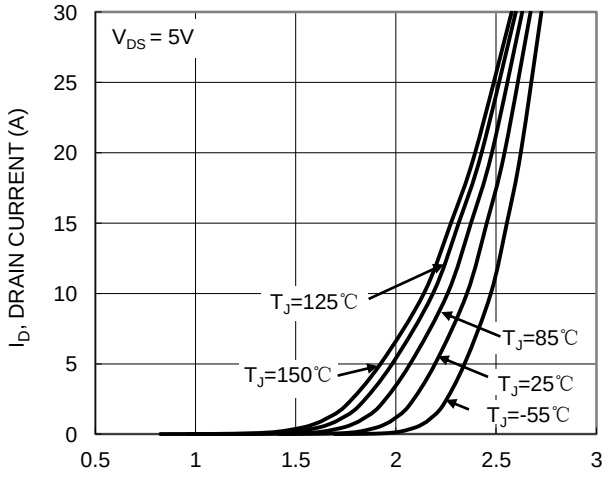

Figure 2. Typical Transfer Characteristic

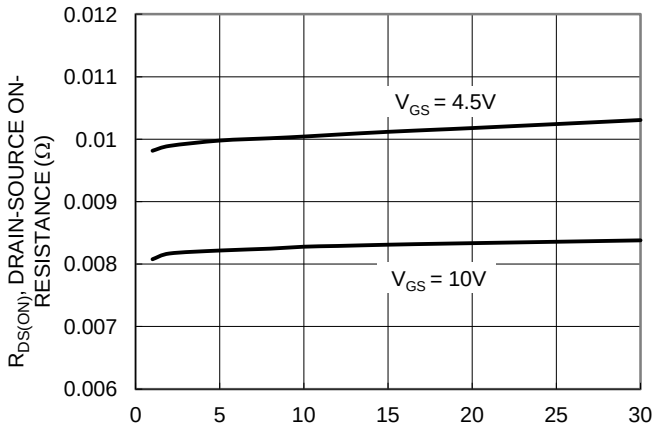

Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

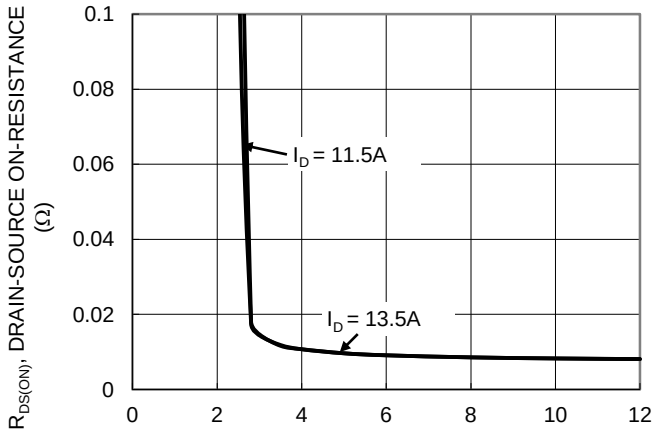

Figure 4. Typical Transfer Characteristic

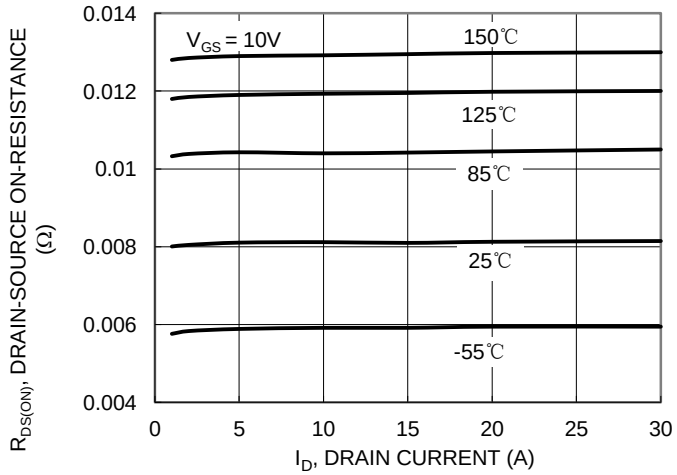

Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

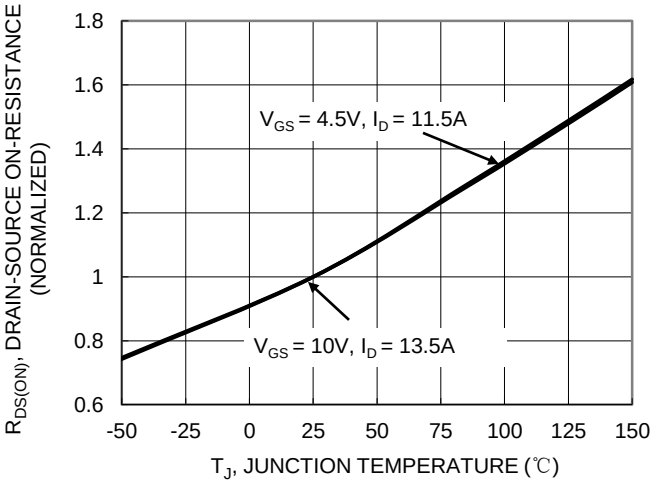

Figure 6. On-Resistance Variation with Junction Temperature

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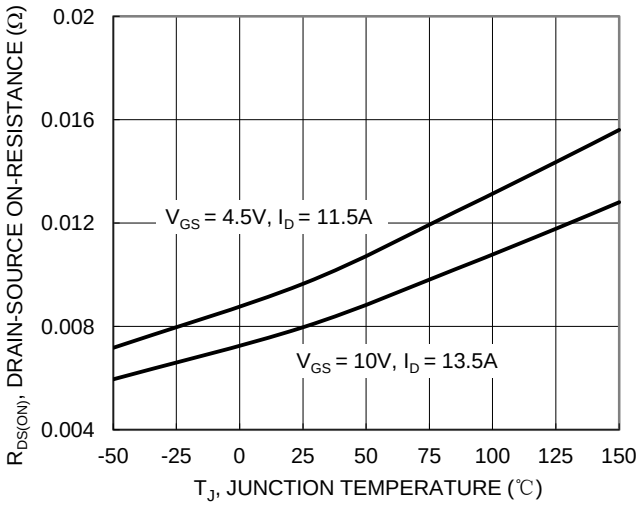

Figure 7. On-Resistance Variation with Junction Temperature

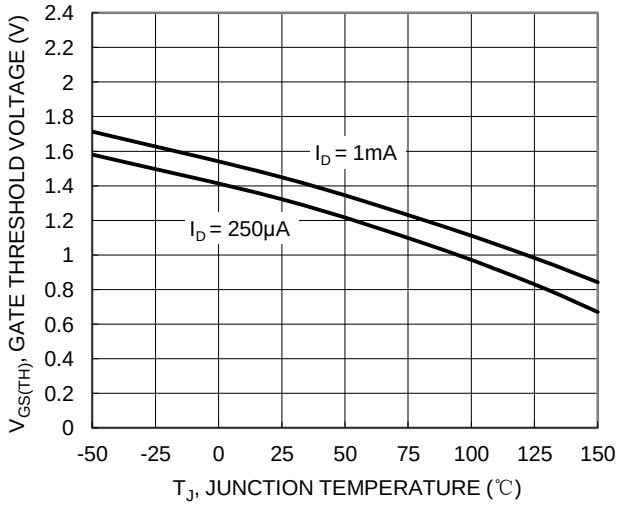

Figure 8. Gate Threshold Variation vs. Junction Temperature

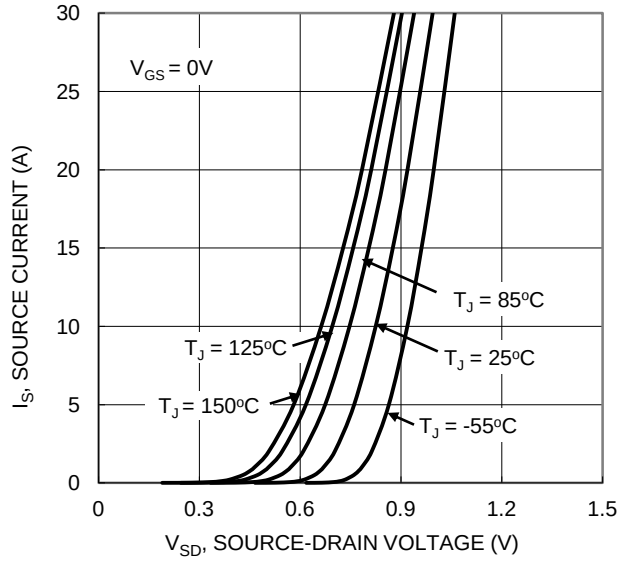

Figure 9. Diode Forward Voltage vs. Current

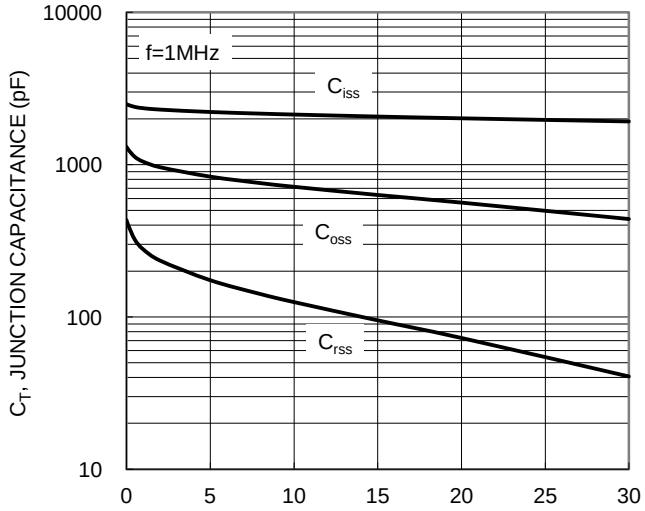

Figure 10. Typical Junction Capacitance

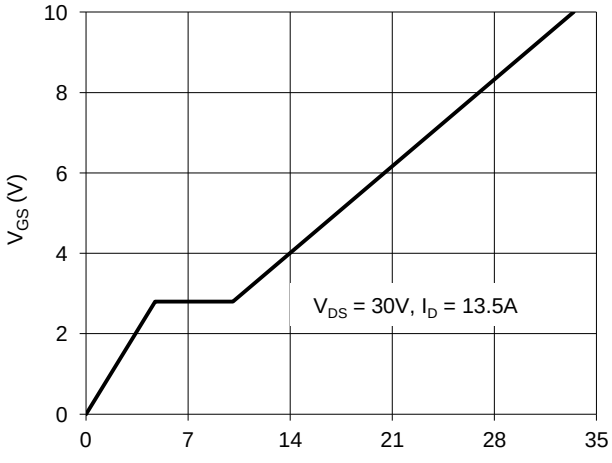

Figure 11. Gate Charge

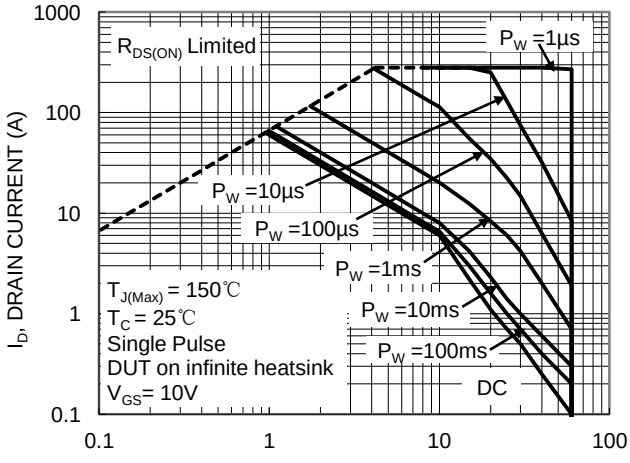

Figure 12. SOA, Safe Operation Area

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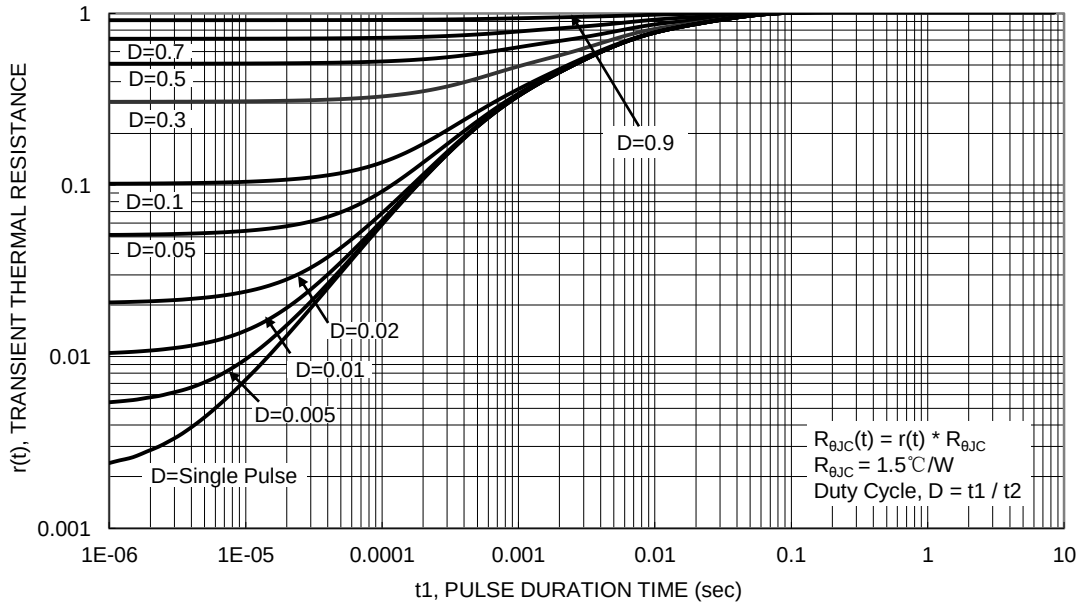
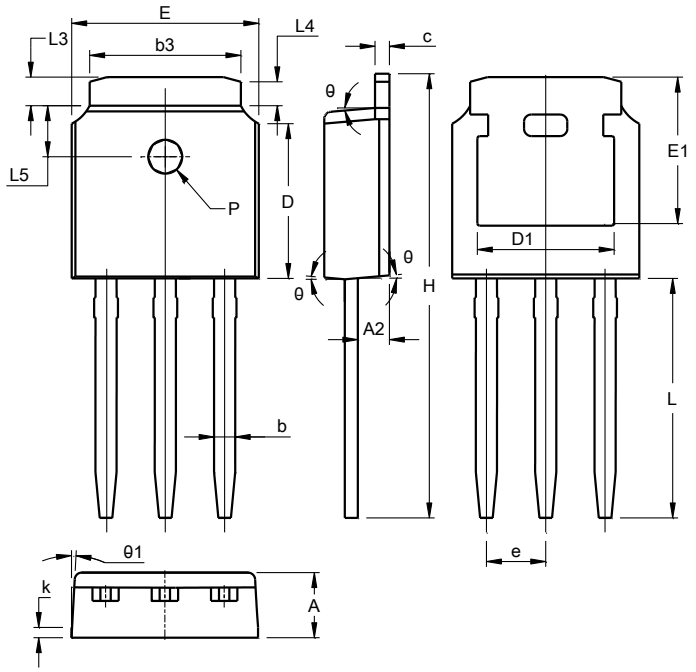


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

TO251 (Type TH)



TO251 (Type TH)			
Dim	**Min**	**Max**	**Typ**
A	2.20	2.40	2.30
A2	0.97	1.17	1.07
b	0.68	0.90	0.78
b3	5.20	5.50	5.33
c	0.43	0.63	0.53
D	5.98	6.22	6.10
D1	5.30 REF		
e	2.286 BSC		
E	6.40	6.80	6.60
E1	4.63	5.03	4.83
H	16.22	16.82	16.52
k	0.40REF		
L	9.15	9.65	9.40
L3	0.88	1.28	1.02
L4	0.75 REF		
L5	1.65	1.95	1.80
PØ	1.20		
θ	5°	9°	7°
θ1	5°	9°	7°
All Dimensions in mm			

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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331