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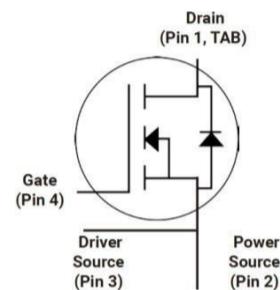
650V, 60mΩ, N-Channel SiC Power MOSFET

$V_{DS}$	=	650	V
$R_{DS(on)}$	=	60	mΩ
$I_D @ 25^\circ C$	=	29	A

## Features

- 2<sup>nd</sup> Generation SiC MOSFET Technology
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Fast Intrinsic Diode with Low Reverse Recovery (Qrr)

## Package



## Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency
- Easy to Parallel and Simple to Drive
- Enable Totem-Pole PFC Topologies

## Applications

- EV Charging
- Server Power Supplies
- Solar PV Inverters
- UPS
- DC/DC Converters

Part Number	Package	Marking
65R060	TO-247-4	65R060

## Maximum Ratings ( $T_c=25^\circ C$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{DSmax}$	Drain-Source Voltage, $T_c=25^\circ C$	650	V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GSmax}$	Gate-Source Voltage	-8/+22	V	<b>Absolute maximum values</b>	
$V_{GSop}$	Gate-Source Voltage	-4/+18	V	<b>Recommended operational values</b>	
$I_D$	Continuous Drain Current	29	A	$V_{GS}=18V, T_c=25^\circ C$	
		20		$V_{GS}=18V, T_c=100^\circ C$	
$I_{D(pulse)}$	Pulsed Drain Current	99	A	Pulse width $t_p$ limited by $T_{Jmax}$	
$P_D$	Power Dissipation	150	W	$T_c=25^\circ C, T_J=175^\circ C$	
$T_J, T_{STG}$	Operating Junction and Storage Temperature	-40 to +175	°C		
$T_L$	Solder Temperature	260	°C		
$M_d$	Mounting Torque	1	Nm		



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### Electrical Characteristics ( $T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note	
$V_{(\text{BR})\text{DSS}}$	Drain-Source Breakdown Voltage	650	/	/	V	$V_{GS}=0\text{V}, I_D=100\mu\text{A}$		
$V_{GS(\text{th})}$	Gate Threshold Voltage	1.8	2.6	4.0	V	$V_{DS}=V_{GS}, I_D=5\text{mA}$		
		/	1.8	/		$V_{DS}=V_{GS}, I_D=5\text{mA}, T_J=175^\circ\text{C}$		
$I_{DSS}$	Zero Gate Voltage Drain Current	/	1	50	$\mu\text{A}$	$V_{DS}=650\text{V}, V_{GS}=0\text{V}$		
$I_{GSS}$	Gate-Source Leakage Current	/	10	250	nA	$V_{DS}=0\text{V}, V_{GS}=18\text{V}$		
$R_{DS(\text{on})}$	Drain-Source On-State Resistance	42	60	79	$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=13.2\text{A}$		
		/	75	/		$V_{GS}=18\text{V}, I_D=13.2\text{A}, T_J=175^\circ\text{C}$		
$C_{iss}$	Input Capacitance	/	830	/	pF	$V_{GS}=0\text{V}, V_{DS}=600\text{V}$ $f=1\text{MHz}, V_{AC}=25\text{mV}$		
$C_{oss}$	Output Capacitance	/	82	/				
$C_{rss}$	Reverse Transfer Capacitance	/	14	/				
$E_{ON}$	Turn-On Switching Energy	/	140	/	$\mu\text{J}$	$V_{DS}=400\text{V}, V_{GS}=-4\text{V}/18\text{V}$		
$E_{OFF}$	Turn-Off Switching Energy	/	52	/		$I_D=13.2\text{A}, R_{G(\text{ext})}=2.5\Omega, L=200\mu\text{H}$		
$t_{d(on)}$	Turn-On Delay Time	/	8	/		$V_{DS}=400\text{V}, V_{GS}=-4\text{V}/18\text{V}, I_D=13.2\text{A}$ $R_{G(\text{ext})}=2.5\Omega, R_L=30\Omega$		
$t_r$	Rise Time	/	9	/	ns			
$t_{d(off)}$	Turn-Off Delay Time	/	21	/				
$t_f$	Fall Time	/	8	/				
$R_{G(\text{int})}$	Internal Gate Resistance	/	6	/	$\Omega$	$f=1\text{MHz}, V_{AC}=25\text{mV}$		
$Q_{GS}$	Gate to Source Charge	/	13	/	nC	$V_{DS}=400\text{V}$		
$Q_{GD}$	Gate to Drain Charge	/	12	/		$V_{GS}=-4\text{V}/18\text{V}$		
$Q_G$	Total Gate Charge	/	50	/		$I_D=13.2\text{A}$		

### Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$V_{SD}$	Diode Forward Voltage	4.2	/	V	$V_{GS}=-4\text{V}, I_{SD}=6.6\text{A}$	
		3.8	/		$V_{GS}=-4\text{V}, I_{SD}=6.6\text{A}, T_J=175^\circ\text{C}$	
$I_S$	Continuous Diode Forward Current	/	23	A	$V_{GS}=-4\text{V}, T_c=25^\circ\text{C}$	
$t_{rr}$	Reverse Recover Time	28	/	ns	$V_R=400\text{V}, I_{SD}=13.2\text{A}$	
$Q_{rr}$	Reverse Recovery Charge	47	/	nC		
$I_{rrm}$	Peak Reverse Recovery Current	3	/	A		

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.99	/	°C/W		
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	40	/			



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## Typical Performance

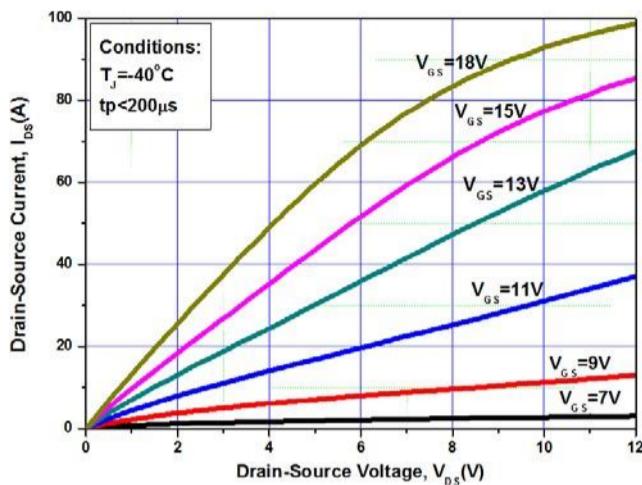


Figure 1. Output Characteristics  $T_J = -40^\circ\text{C}$

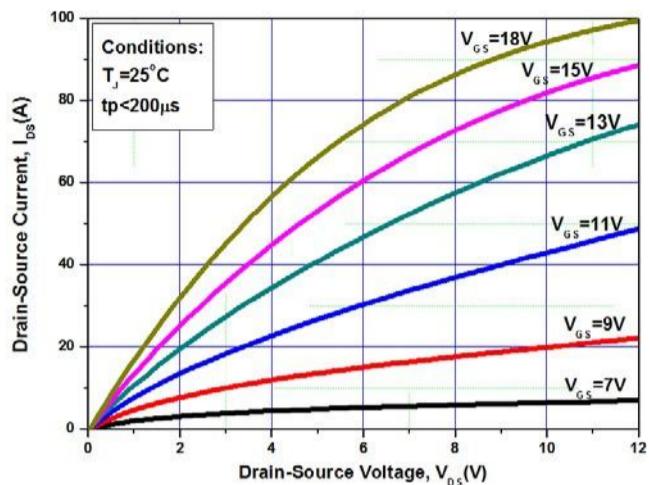


Figure 2. Output Characteristics  $T_J = 25^\circ\text{C}$

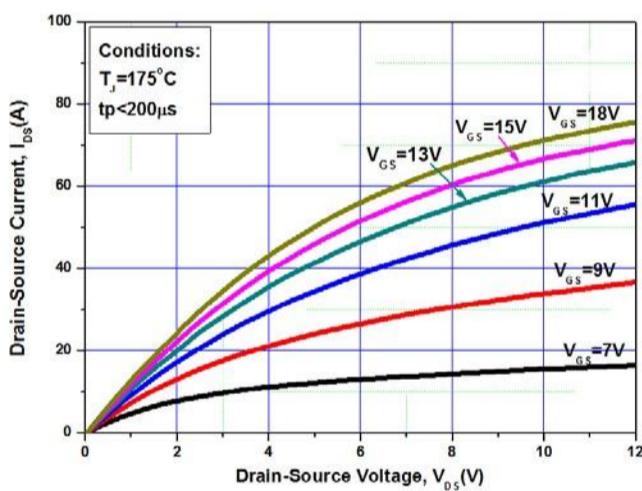


Figure 3. Output Characteristics  $T_J = 175^\circ\text{C}$

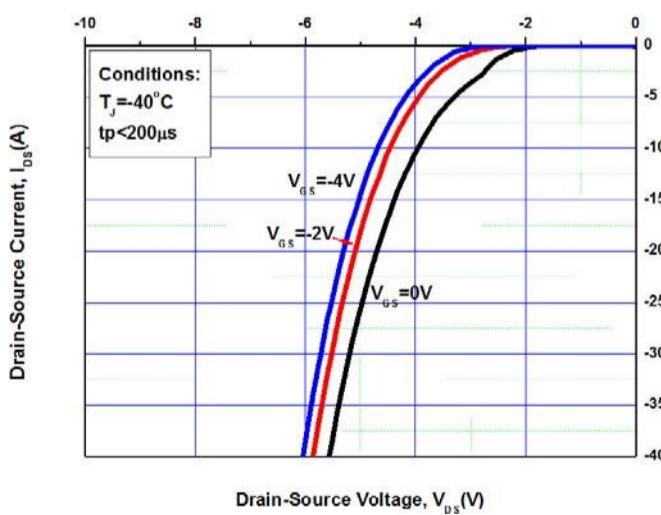
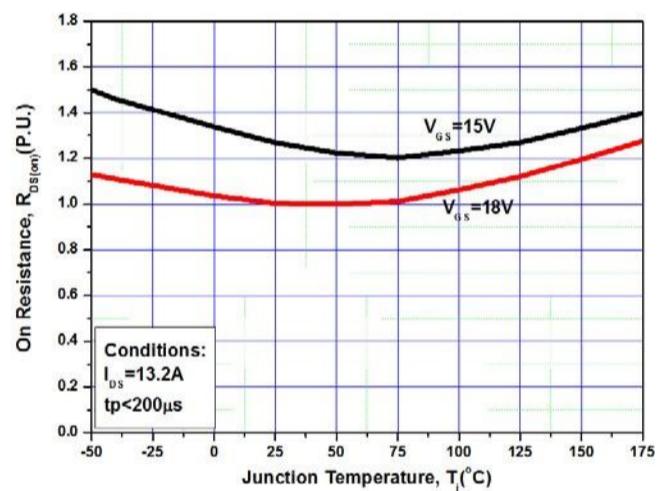


Figure 5. Body Diode Characteristic at  $-40^\circ\text{C}$

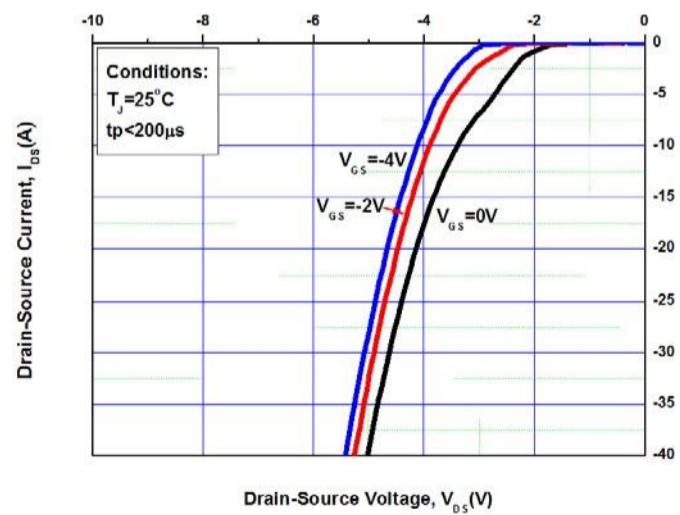


Figure 6. Body Diode Characteristic at  $25^\circ\text{C}$



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## Typical Performance

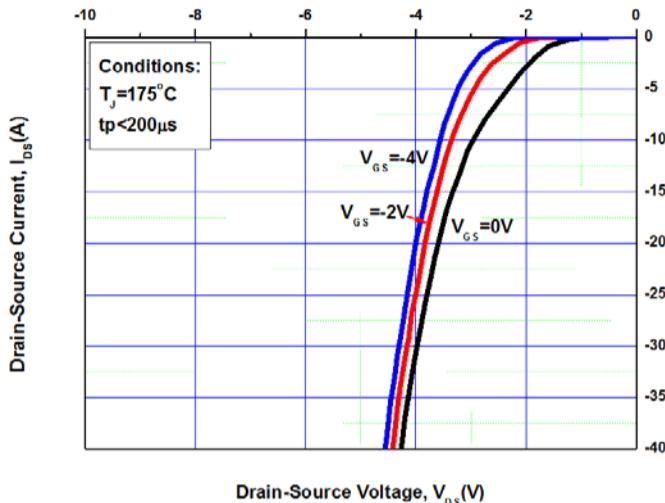


Figure 7. Body Diode Characteristic at  $175^\circ\text{C}$

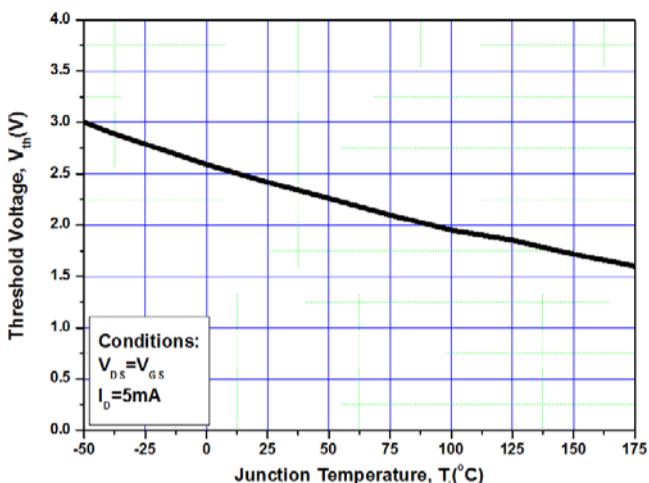


Figure 8. Threshold Voltage vs. Temperature

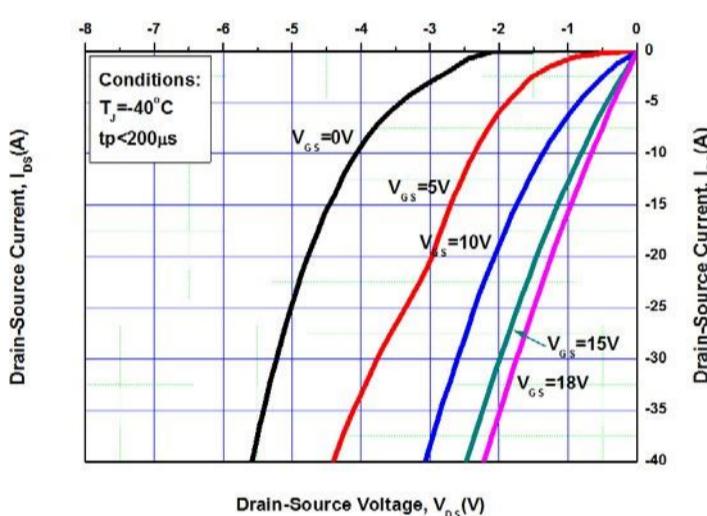


Figure 9. 3rd Quadrant Characteristic at  $-40^\circ\text{C}$

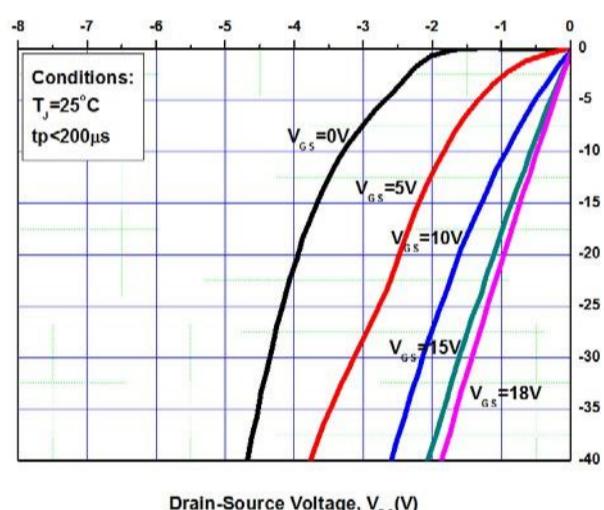


Figure 10. 3rd Quadrant Characteristic at  $25^\circ\text{C}$

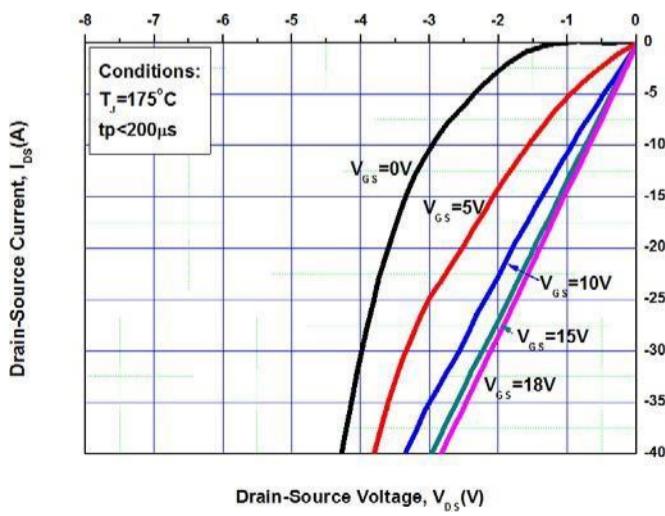


Figure 11. 3rd Quadrant Characteristic at  $175^\circ\text{C}$

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## Typical Performance

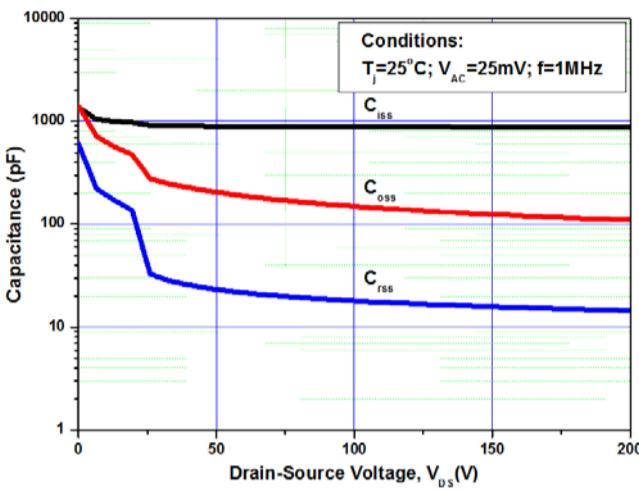


Figure 12. Capacitances vs. Drain-Source Voltage (0 - 200V)

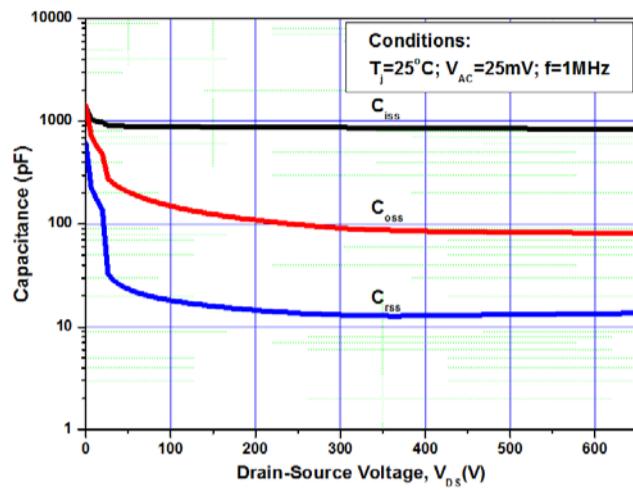


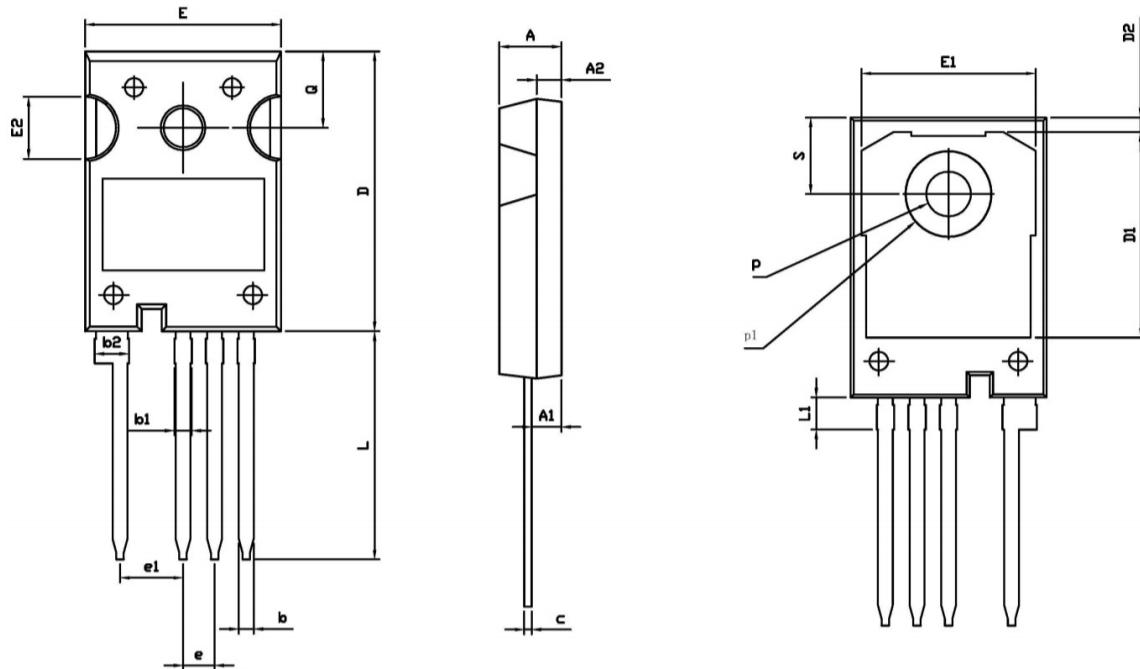
Figure 13. Capacitances vs. Drain-Source Voltage (0 - 650V)



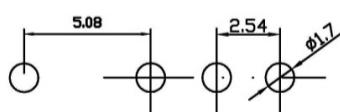
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## Package Dimensions

Package TO-247-4



RECOMMENDED LAND PATTERN



UNIT: mm

	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.25	2.40	2.45
A2	1.85	2.00	2.15
b	1.05	1.20	1.35
b1	1.00	1.30	1.60
b2	2.35	2.65	2.95
c	0.50	0.60	0.70
D	22.34	22.54	22.74
D1	16.00	16.50	17.00
D2	0.97	1.17	1.37
e	2.34	2.54	2.74
e1	4.88	5.08	5.28
E	15.60	15.80	16.00
E1	13.50	14.00	14.50
E2	4.80	5.00	5.20
L	18.08	18.38	18.68
L1	2.38	2.58	2.78
p	3.50	3.60	3.70
p1	6.60	6.80	7.00
Q	6.00	6.15	6.30
S	6.00	6.15	6.30