

# PTDC1065AY

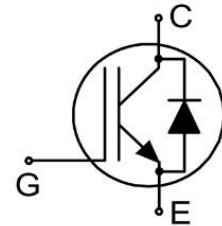
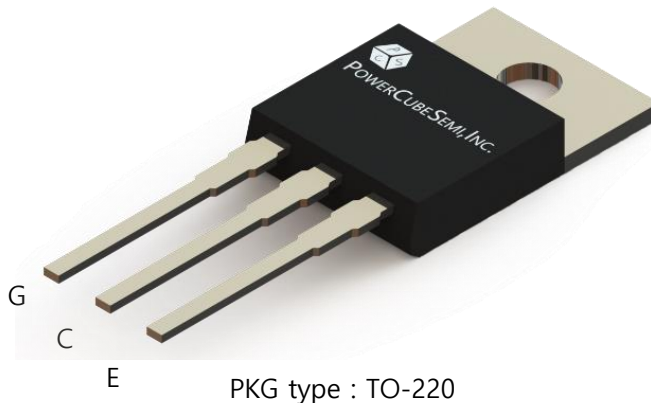
## Features

### IGBT Discrete

- Rated to 650V at 10Amps @ $T_C = 100^\circ\text{C}$
- $V_{CE(sat)} = 1.40\text{V}$  @  $I_C = 10\text{A}$
- Positive Temperature Coefficient
- Maximum Junction Temperature  $175^\circ\text{C}$
- High Speed Smooth Switching device for hard& Soft Switching
- High Ruggedness, Temperature Stable

## Application

- Soft switching applications
- Air Conditioning
- Motor Drive Inverter



## Absolute Maximum Ratings

Symbol	Parameter	Value	Unit	
$BV_{CES}$	Collector-Emitter Breakdown Voltage	650	V	
$I_C$	DC Collector Current	$T_C = 25^\circ\text{C}$	20	
		$T_C = 100^\circ\text{C}$	10	
$I_{CM}$	Pulsed Collector Current	40	A	
$I_F$	Diode Forward Current	$T_C = 25^\circ\text{C}$	20	
		$T_C = 100^\circ\text{C}$	10	
$I_{F, Pulse}$	Diode Pulsed Current	40	A	
$V_{GE}$	Continuous Gate-Emitter Voltage	$\pm 20$	V	
$V_{GE}$	Transient Gate-Emitter Voltage	$\pm 30$		
$P_D$	Power Dissipation	$T_J = 175^\circ\text{C}, T_C = 25^\circ\text{C}$	100	W
$t_{SC}$	Short circuit withstand time	5	$\mu\text{s}$	
$T_J$	Operating Junction Temperature Range	-40 to 175	$^\circ\text{C}$	
$T_S$	Storage Temperature Range	-55 to 150		

## Package Marking and Ordering Information

Device Marking	Device	Package	Packing Method	Tape width	Quantity
PTDC1065AY	PTDC1065	TO-220	TUBE	-	50

## Electrical Characteristics $T_j=25^\circ\text{C}$ Unless Otherwise Specified

### Static Characteristics

Symbol	Parameter	Test Condition	Numerical			Unit	
			Min	Typ	Max		
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$I_C=250\mu\text{A}$ , $V_{GE}=0\text{V}$	650	-	-	V	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=10\text{A}$ , $V_{GE}=15\text{V}$	$T_j=25^\circ\text{C}$	-	1.40	1.70	V
			$T_j=125^\circ\text{C}$	-	1.55	-	
			$T_j=150^\circ\text{C}$	-	1.60	-	
$V_{GE(TH)}$	Gate-Emitter Threshold Voltage	$V_{CE}=V_{GE}$ , $I_C=1\text{mA}$	5.0	5.8	6.5	V	
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{CE}=650\text{V}$ , $V_{GE}=0\text{V}$	$T_j=25^\circ\text{C}$	-	-	0.25	mA
			$T_j=150^\circ\text{C}$	-	-	1.00	
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE}=\pm 20\text{V}$ , $V_{CE}=0\text{V}$	-	-	$\pm 200$	nA	

### Dynamic Characteristics

Symbol	Parameter	Test Condition	Numerical			Unit	
			Min	Typ	Max		
$Q_G$	Total Gate Charge	$V_{CC}=300\text{V}$ , $I_C=10\text{A}$ , $V_{GE}=15\text{V}$	-	0.059	-	$\mu\text{C}$	
$V_F$	Diode Forward Voltage	$I_F=10\text{A}$	$T_j=25^\circ\text{C}$	-	1.70	2.20	V
			$T_j=125^\circ\text{C}$	-	1.50	-	
			$T_j=150^\circ\text{C}$	-	1.40	-	
$C_{IES}$	Input Capacitance	$V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$ , $f=1\text{MHz}$	-	0.89	-	nF	
$C_{OES}$	Output Capacitance		-	0.04	-		
$C_{RES}$	Reverse Transfer Capacitance		-	0.01	-		
$I_{C(SC)}$	Short circuit collector current	$V_{GE}=15\text{V}$ , $t_{SC}\leq 5\mu\text{s}$ , $V_{CC}=400\text{V}$ , $T_{j,start}=25^\circ\text{C}$	-	110	-	A	



## Electrical Characteristics

### Switching Characteristics

Symbol	Parameter	Test Condition		Numerical			Unit
				Min	Typ	Max	
$t_{d(on)}$	Turn-On Delay Time	$V_{GE}=-5\sim 15V,$ $V_{CC}=300V,$ $I_C=10A, R_G=51\Omega$	$T_J=25^\circ C$ $T_J=125^\circ C$ $T_J=150^\circ C$	-	10	-	ns
				-	14	-	
				-	16	-	
$t_r$	Turn-On Rise Time			-	26	-	
				-	35	-	
				-	41	-	
$t_{d(off)}$	Turn-Off Delay Time			-	68	-	
				-	68	-	
				-	69	-	
$t_f$	Turn-Off Fall Time	-	135	-			
		-	162	-			
		-	181	-			
$E_{on}$	Turn-On Switching Energy	-	0.36	-	mJ		
		-	0.42	-			
		-	0.46	-			
$E_{off}$	Turn-Off Switching Energy	-	0.17	-			
		-	0.29	-			
		-	0.33	-			
$E_{rec}$	Reverse Recovery Energy	-	0.05	-		mJ	
		-	0.16	-			
		-	0.19	-			
$I_{rr}$	Reverse Recovery Current	$I_F=10A, V_R=300V,$ $-di/dt=400A/\mu s$	$T_J=25^\circ C$ $T_J=125^\circ C$ $T_J=150^\circ C$	-	9	-	A
				-	12	-	
				-	14	-	
$Q_{rr}$	Reverse Recovery Charge			-	0.16	-	uC
				-	0.63	-	
				-	0.85	-	

### Thermal Characteristics

Symbol	Parameter	Numerical	Unit
$R_{\theta(J-A)}$	Thermal Resistance Junction-to-Ambient	60	K/W
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for IGBT	1.5	
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for Diode	2.0	

# Typical Characteristics

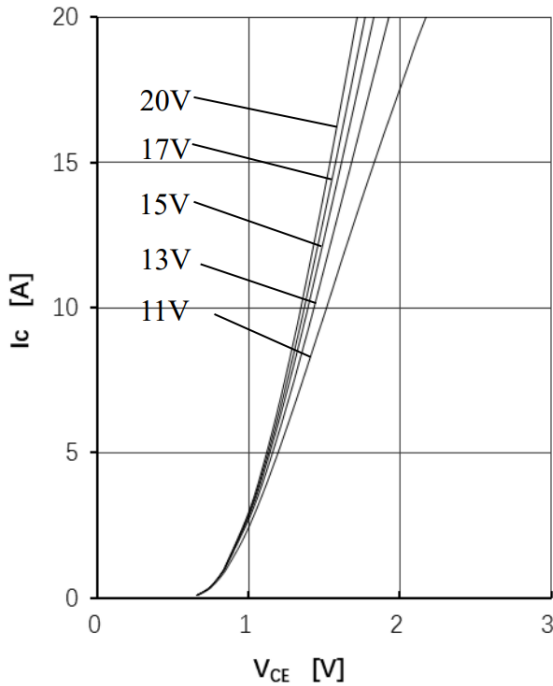


Figure 1. Output Characteristics ( $T_j=25^\circ\text{C}$ )

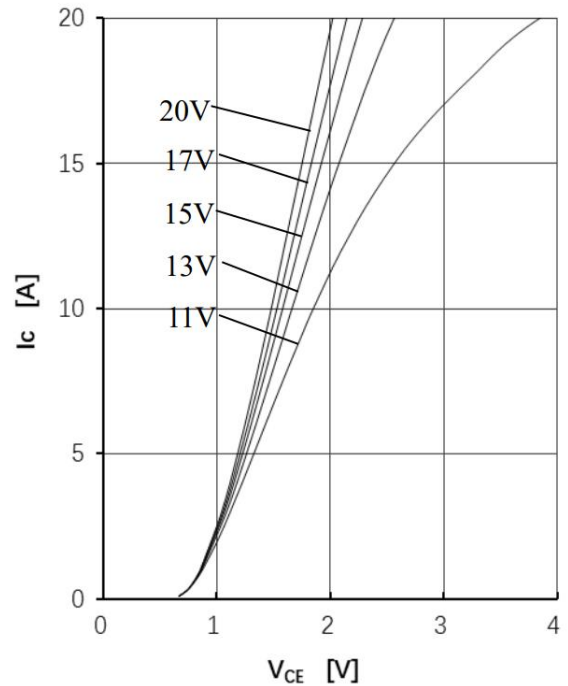


Figure 2. Output Characteristics ( $T_j=150^\circ\text{C}$ )

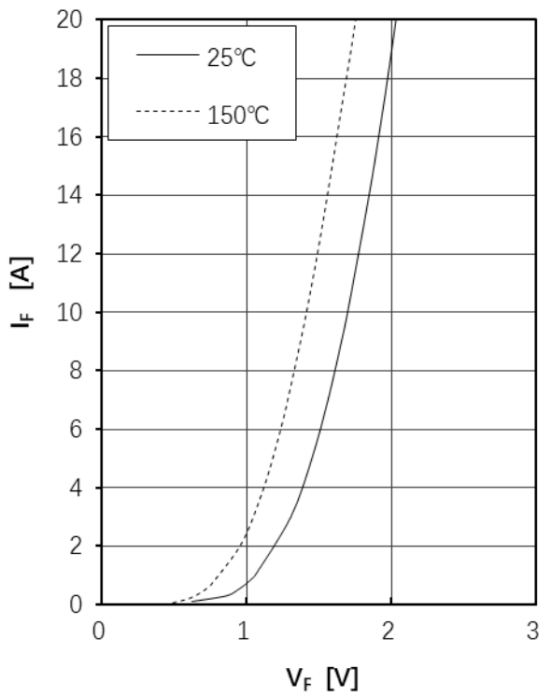


Figure 3. Diode Forward Characteristics

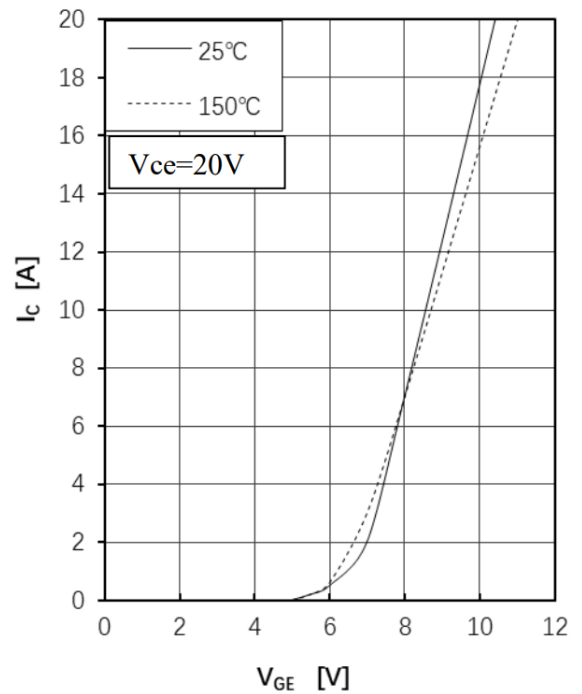


Figure 4. IGBT Transfer Characteristics

# Typical Characteristics

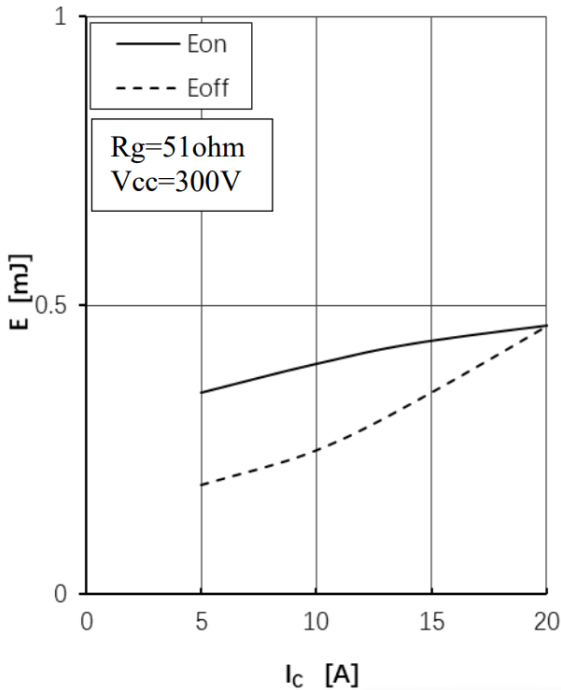


Figure 5. IGBT Switching Loss vs.  $I_c$  (150°C)

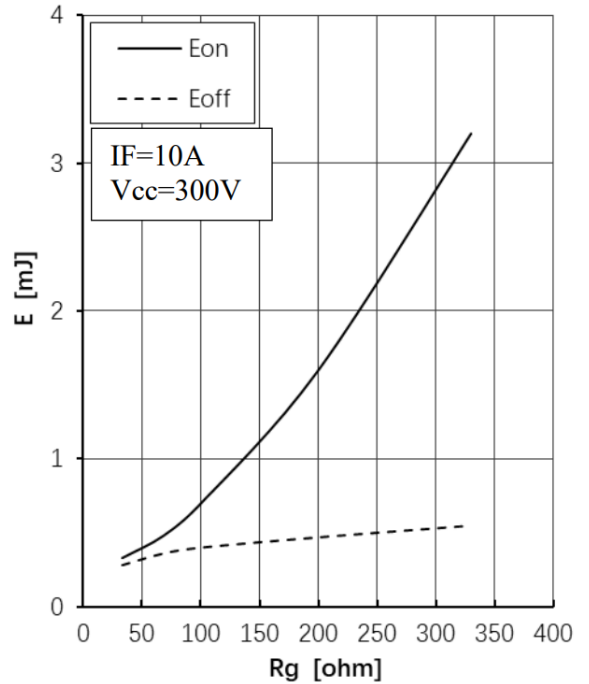


Figure 6. IGBT Switching Loss vs.  $R_G$  (150°C)

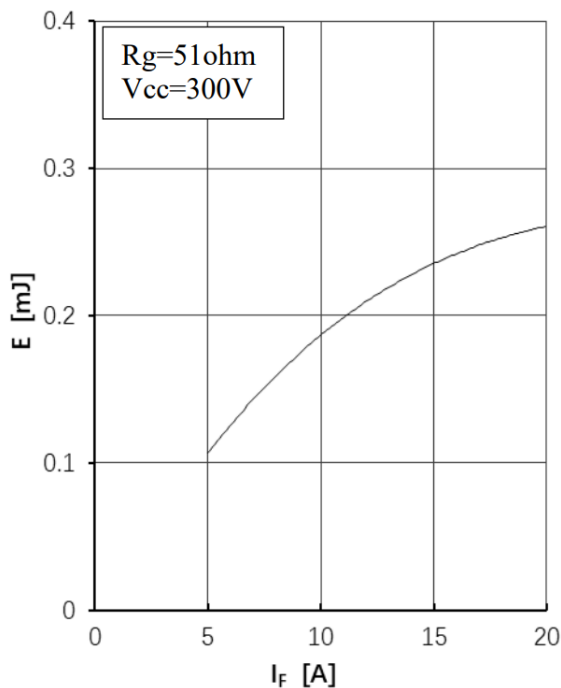


Figure 7. Diode Switching Loss ( $E_{rec}$ ) vs.  $I_f$  (150°C)

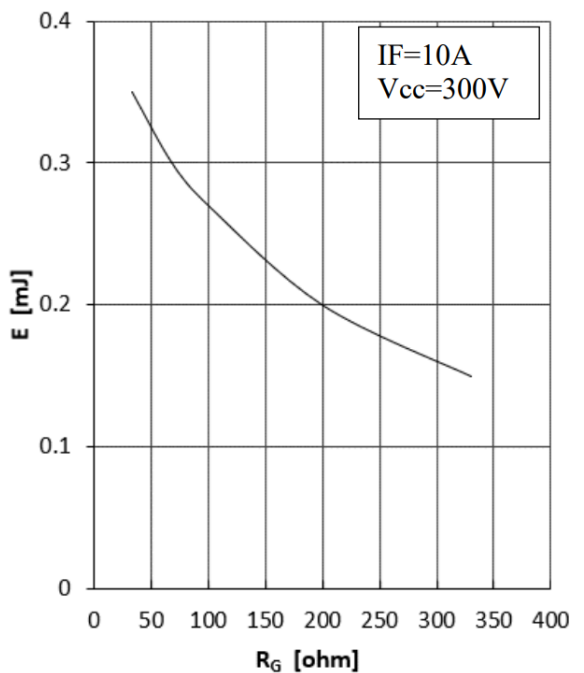


Figure 8. Diode Switching Loss ( $E_{rec}$ ) vs.  $R_G$  (150°C)

# Typical Characteristics

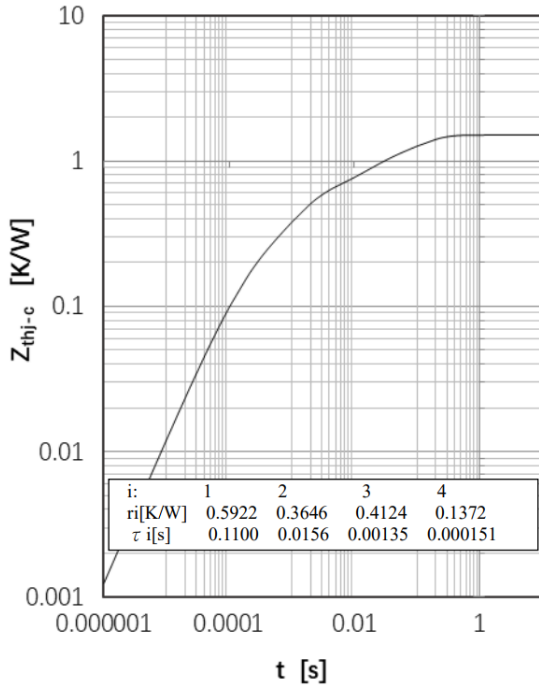


Figure 9. IGBT Transient Thermal Impedance

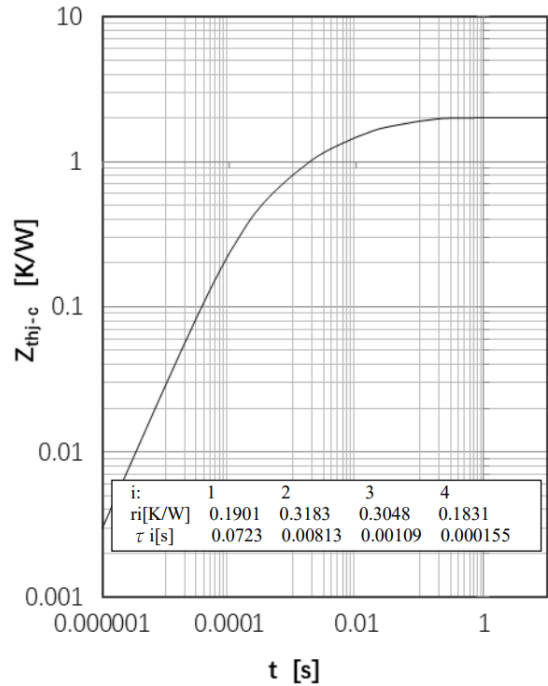
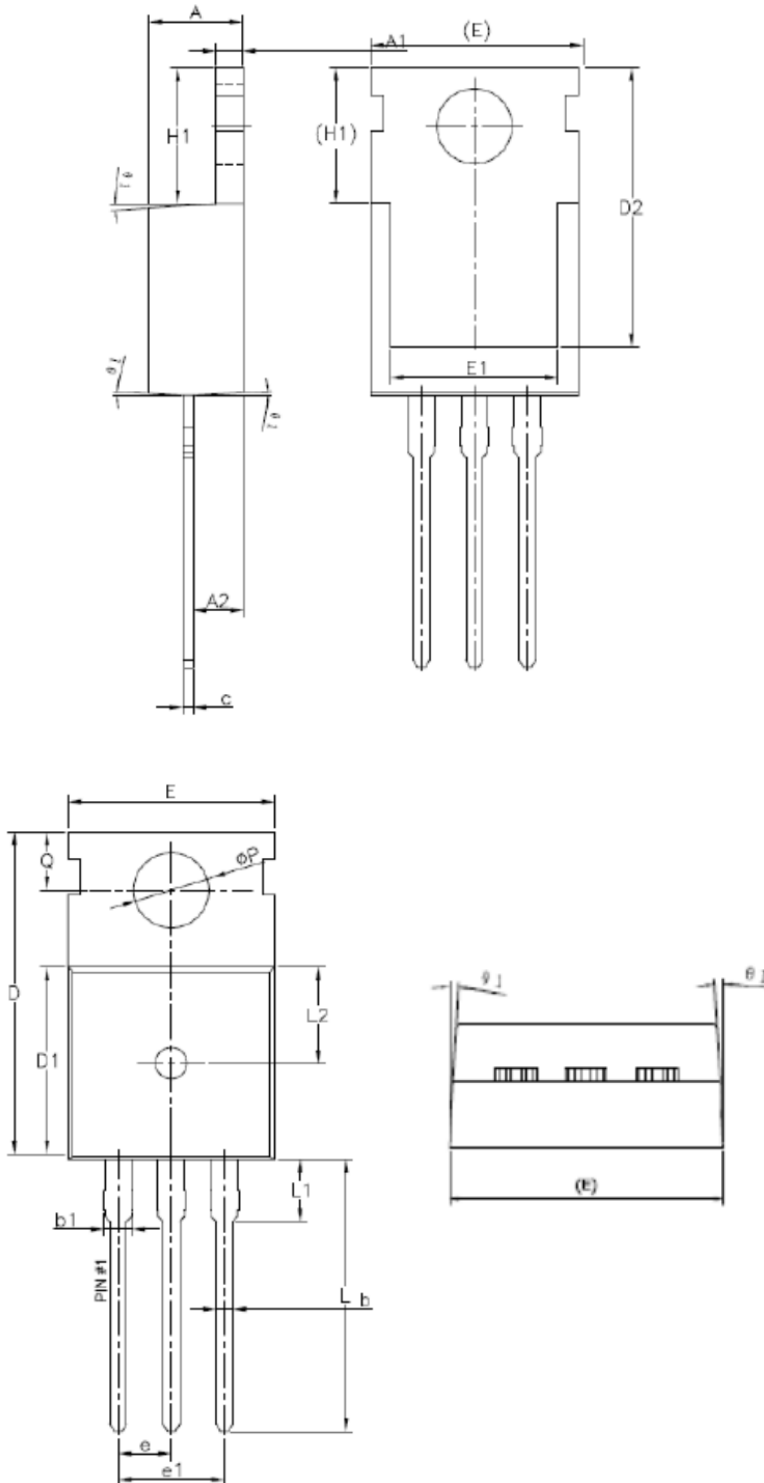


Figure 10. Diode Transient Thermal Impedance

## Package Outline

Unit : mm



SYMBOL	DIMENSIONS		
	MIN	NOM	MAX
<b>A</b>	4.40	4.50	4.60
<b>A1</b>	1.27	1.30	1.33
<b>A2</b>	2.30	2.40	2.50
<b>b</b>	0.70	-	0.90
<b>b1</b>	1.27	-	1.40
<b>c</b>	0.45	0.50	0.60
<b>D</b>	15.30	15.70	16.10
<b>D1</b>	9.10	9.20	9.30
<b>D2</b>	13.10	-	13.70
<b>E</b>	9.70	9.90	10.20
<b>E1</b>	7.80	8.00	8.20
<b>e</b>	2.49	2.54	2.59
<b>e1</b>	5.03	5.08	5.12
<b>H1</b>	6.30	6.50	6.70
<b>L</b>	12.78	13.08	13.38
<b>L1</b>	3.30	-	3.50
<b>L2</b>	4.50	4.60	4.70
<b>ΦP</b>	3.55	3.60	3.65
<b>Q</b>	2.73	-	2.87
<b>θ1</b>	1°	3°	5°