

# PTDC2065BY

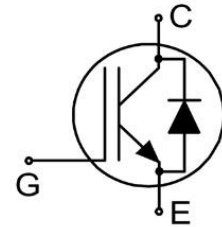
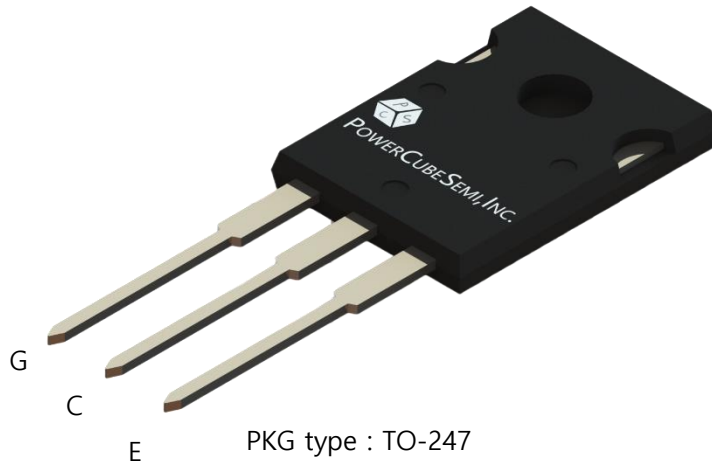
## Features

### IGBT Discrete

- Rated to 650V at 20Amps @ $T_j = 25^{\circ}\text{C}$
- $V_{CE(sat)}=1.60\text{V}$  @  $I_C=20\text{A}$
- Positive Temperature Coefficient
- High Speed Smooth Switching device for hard& Soft Switching
- High Ruggedness, Temperature Stable
- Maximum Junction Temperature  $175^{\circ}\text{C}$

## 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	$T_C=25^{\circ}\text{C}$	40	A
		$T_C=100^{\circ}\text{C}$	20	
$I_{CM}$	Pulsed Collector Current	60	A	
$I_F$	Diode Forward Current	$T_C=25^{\circ}\text{C}$	40	A
		$T_C=100^{\circ}\text{C}$	20	
$I_{F, Pulse}$	Diode Pulsed Current	60	A	
$V_{GE}$	Continuous Gate-Emitter Voltage	$\pm 20$	V	
$V_{GE}$	Transient Gate-Emitter Voltage	$\pm 30$		
$P_D$	Power Dissipation	$T_C=25^{\circ}\text{C}$	120	W
$t_{SC}$	Short circuit withstand time	5	$\mu\text{s}$	
$T_{vj}$	Operating Junction Temperature Range	-40 to 175	$^{\circ}\text{C}$	
$T_{stg}$	Storage Temperature Range	-55 to 150		



## Package Marking and Ordering Information

Device Marking	Device	Package	Packing Method	Tape width	Quantity
PTDC2065BY	PTDC2065	TO-247	TUBE	-	30

## 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	$I_C=20\text{A}$ , $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	-	1.60	1.95	V
			$T_J=125^{\circ}\text{C}$	-	1.75	-	
			$T_J=150^{\circ}\text{C}$	-	1.80	-	
$V_{GE(TH)}$	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	$V_{CE}=600\text{V}$ , $V_{GE}=0\text{V}$	$T_J=25^{\circ}\text{C}$	-	-	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	$V_{CC}=300\text{V}$ , $I_C=20\text{A}$ , $V_{GE}=15\text{V}$	-	0.085	-	$\mu\text{C}$	
$V_F$	Diode Forward Voltage	$I_F=20\text{A}$	$T_J=25^{\circ}\text{C}$	-	2.00	2.50	V
			$T_J=125^{\circ}\text{C}$	-	1.80	-	
			$T_J=150^{\circ}\text{C}$	-	1.70	-	
$C_{IES}$	Input Capacitance	$V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$ , $f=1\text{MHz}$	-	0.90	-	nF	
$C_{OES}$	Output Capacitance		-	0.04	-		
$C_{RES}$	Reverse Transfer Capacitance		-	0.01	-		
$I_{C(SC)}$	Short circuit collector current	$V_{GE}=15\text{V}$ , $t_{SC}\leq 5\mu\text{s}$ , $V_{CC}=400\text{V}$ , $T_{J,start}=25^{\circ}\text{C}$	-	115	-	A	



## Electrical Characteristics

$T_J=25^{\circ}\text{C}$  Unless Otherwise Specified

### Switching Characteristics

Symbol	Parameter	Test Condition		0.86 Numerical			Unit
				Min	Typ	Max	
$t_{d(on)}$	Turn-On Delay Time	$V_{GE}=-5\sim 15\text{V}$ , $V_{CC}=300\text{V}$ , $I_C=20\text{A}$ , $R_G=51\Omega$	$T_J=25^{\circ}\text{C}$ $T_J=125^{\circ}\text{C}$ $T_J=150^{\circ}\text{C}$	-	12	-	ns
$t_r$	Turn-On Rise Time			-	16	-	
				-	18	-	
$t_{d(off)}$	Turn-Off Delay Time			-	68	-	mJ
				-	69	-	
-	69			-			
$t_f$	Turn-Off Fall Time	-	129	-	mJ		
		-	154	-			
		-	173	-			
$E_{on}$	Turn-On Switching Energy	-	0.41	-	mJ		
		-	0.48	-			
		-	0.52	-			
$E_{off}$	Turn-Off Switching Energy	-	0.22	-	mJ		
		-	0.35	-			
		-	0.38	-			
$E_{rec}$	Reverse Recovery Energy	-	0.07	-	mJ		
		-	0.20	-			
		-	0.25	-			
$I_{rr}$	Reverse Recovery Current	$I_F=20\text{A}$ , $V_R=300\text{V}$ , $-di/dt=500\text{A}/\mu\text{s}$	$T_J=25^{\circ}\text{C}$ $T_J=125^{\circ}\text{C}$ $T_J=150^{\circ}\text{C}$	-	11	-	A
				-	14	-	
				-	16	-	
$Q_{rr}$	Reverse Recovery Charge			-	0.20	-	uC
				-	0.75	-	
				-	0.86	-	

### 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	1.25	
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for Diode	1.5	

# Typical Characteristics

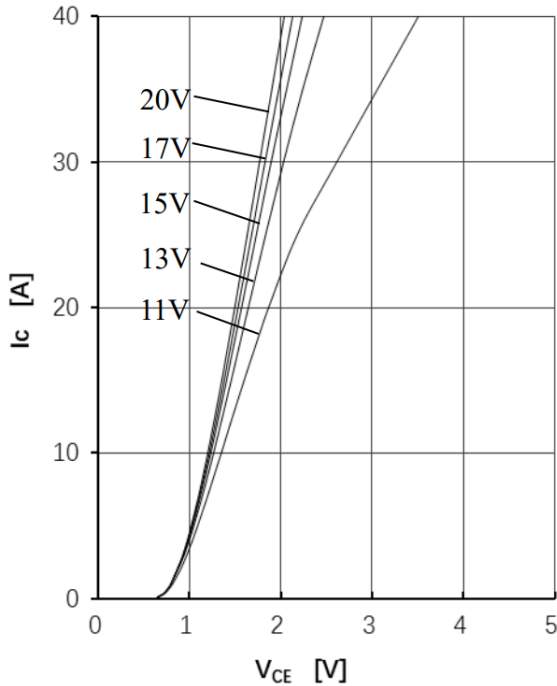


Figure 1. Output Characteristics ( $T_J=25^{\circ}\text{C}$ )

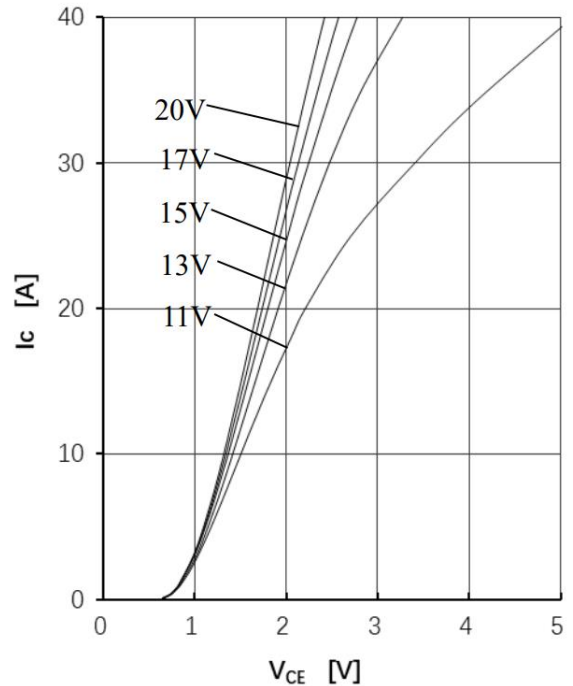


Figure 2. Output Characteristics ( $T_J=150^{\circ}\text{C}$ )

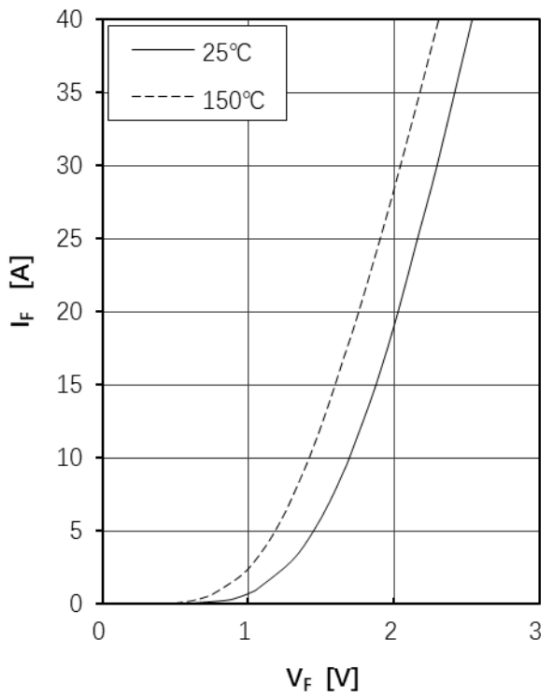


Figure 3. Diode Forward Characteristics

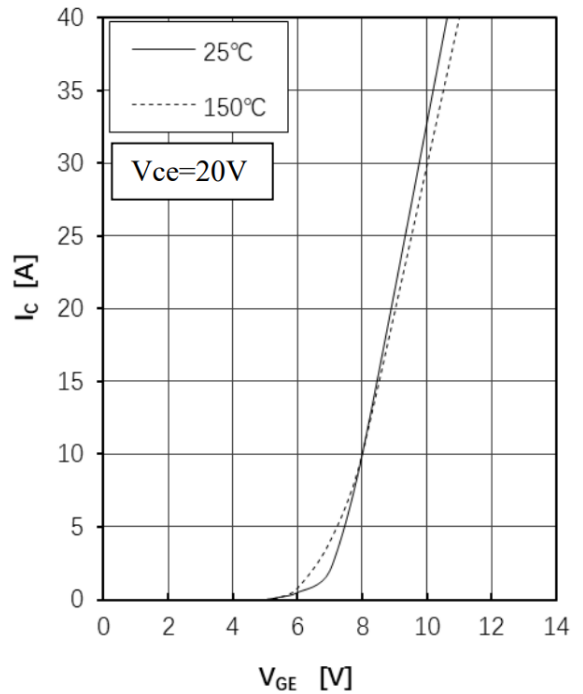


Figure 4. IGBT Transfer Characteristics

# Typical Characteristics

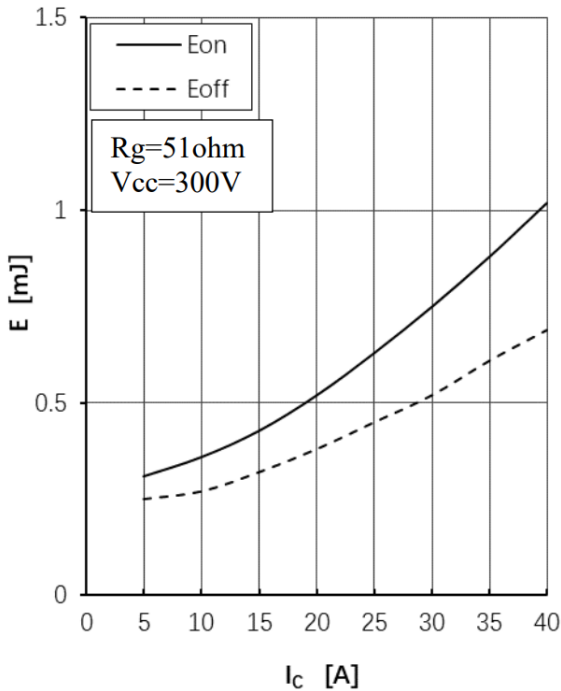


Figure 5. IGBT Switching Loss vs.  $I_c$  (150°C)

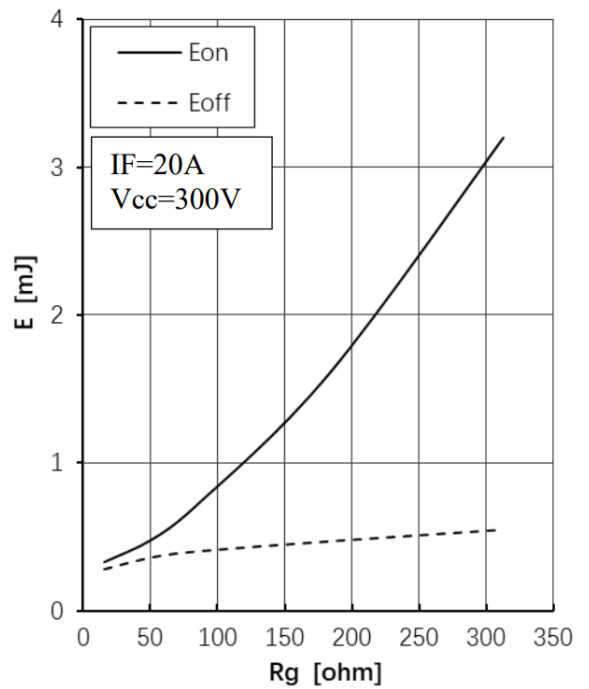


Figure 6. IGBT Switching Loss vs.  $R_g$  (150°C)

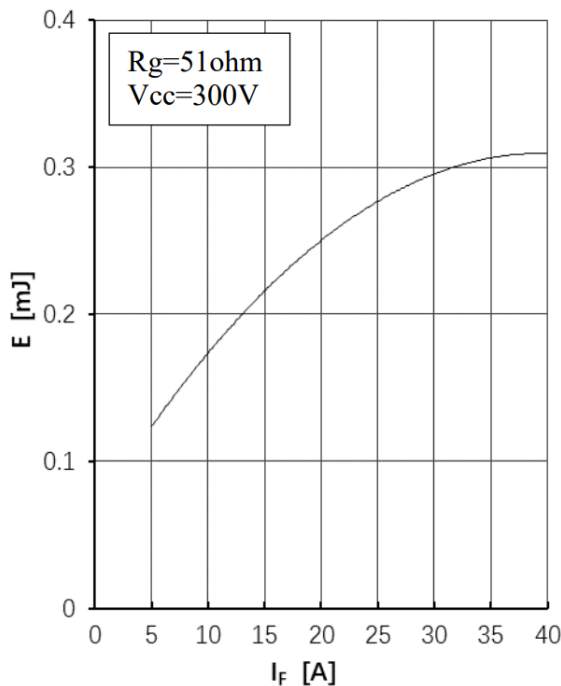


Figure 7. Diode Switching Loss ( $E_{rec}$ ) vs.  $I_f$  (150°C)

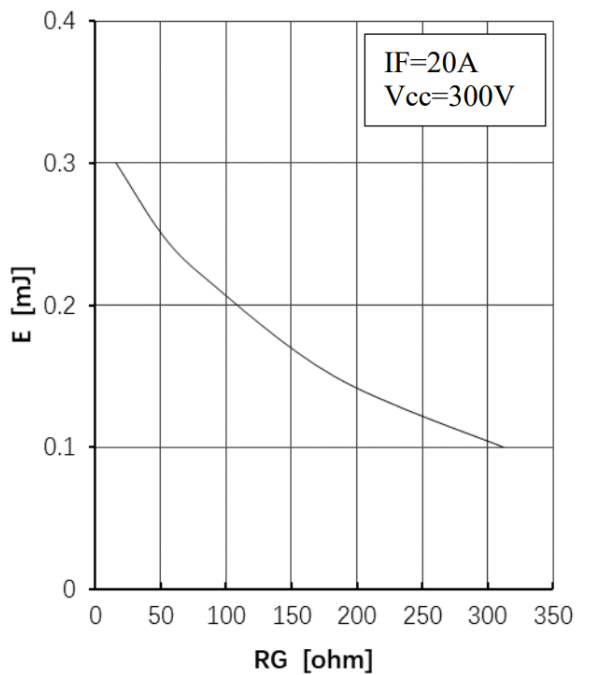


Figure 8. Diode Switching Loss ( $E_{rec}$ ) vs.  $R_g$  (150°C)

# Typical Characteristics

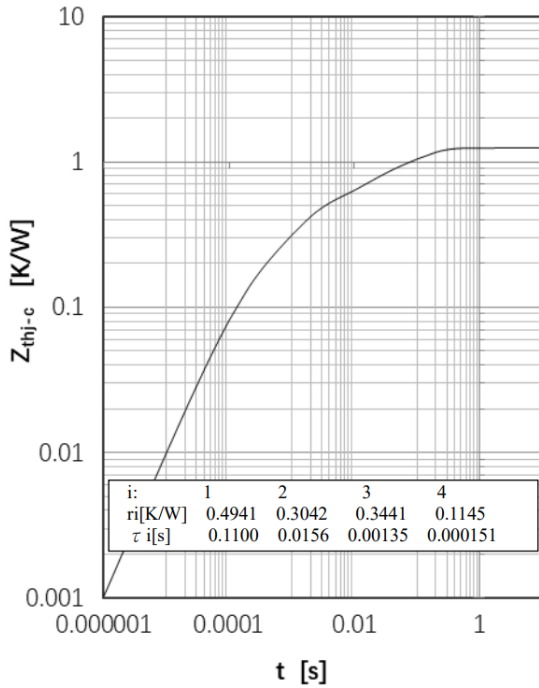


Figure 9. IGBT Transient Thermal Impedance

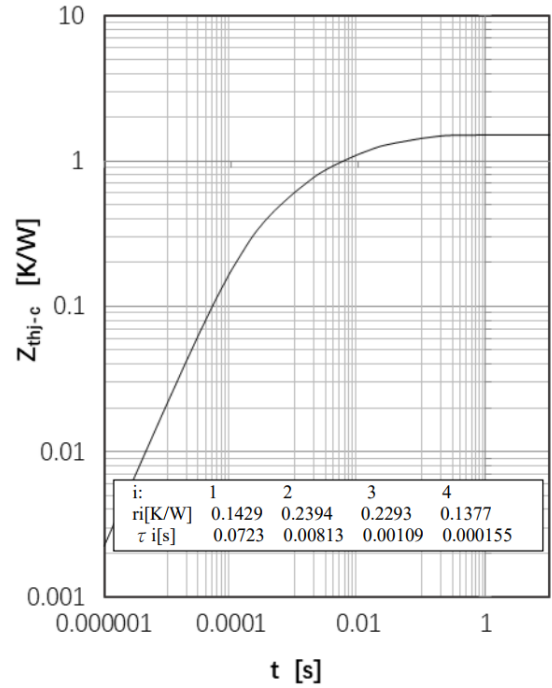
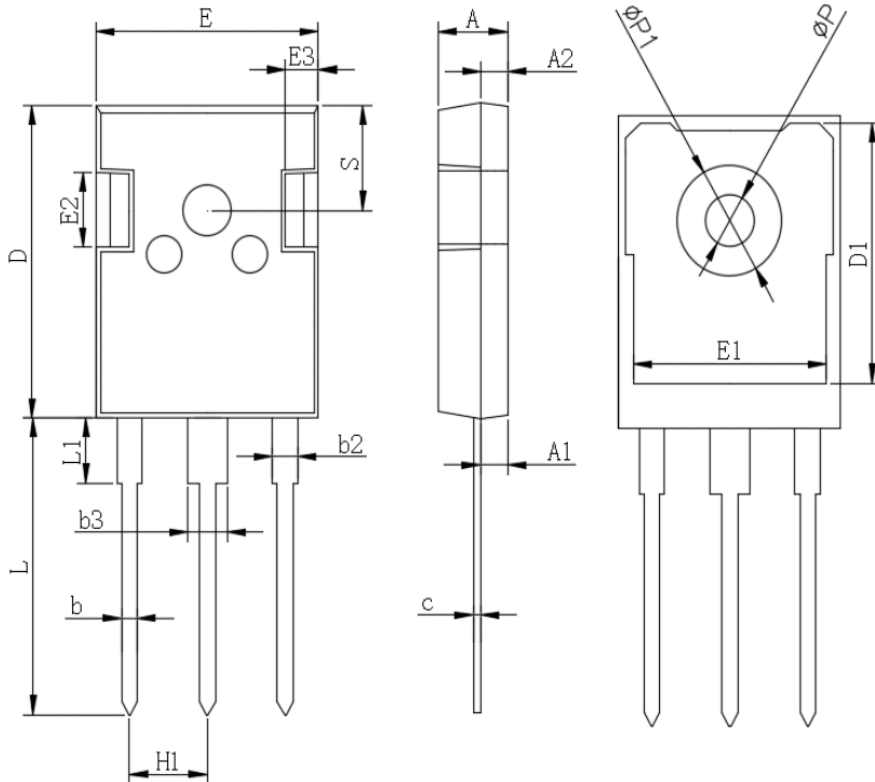


Figure 10. Diode Transient Thermal Impedance



## Package Outline

Unit : mm



SYMBOL	DIMENSIONS	
	MIN	MAX
<b>A</b>	4.80	5.20
<b>A1</b>	2.21	2.61
<b>A2</b>	1.85	2.15
<b>b</b>	1.0	1.4
<b>b2</b>	1.91	2.21
<b>C</b>	0.5	0.7
<b>D</b>	20.70	21.30
<b>D1</b>	16.25	16.85
<b>E</b>	15.50	16.10
<b>E1</b>	13.0	13.6
<b>E2</b>	4.80	5.20
<b>E3</b>	2.30	2.70
<b>L</b>	19.62	20.22
<b>L1</b>	-	4.30
<b><math>\phi P</math></b>	3.40	3.80
<b><math>\phi P1</math></b>	-	7.30
<b>S</b>	6.15 Typ	
<b>H1</b>	5.44 Typ	
<b>b3</b>	2.80	3.20