

# PTDC10120BY

1200V 10A Si IGBT Discrete

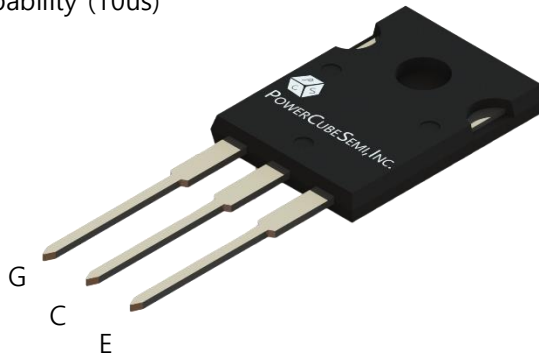
## Features

### IGBT Discrete

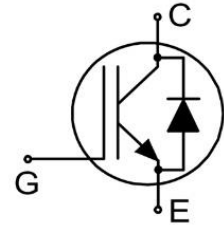
- Rated to 1200V at 10Amps @ $T_j = 25^\circ\text{C}$
- $V_{CE(sat)} = 1.85\text{V}$  @  $I_C = 10\text{A}$
- Low  $V_{CE(sat)}$  Trench-FS IGBT Technology
- Maximum Junction Temperature  $175^\circ\text{C}$
- Positive Temperature Coefficient
- Including fast & soft recovery anti-parallel FWD
- High Short circuit capability (10us)

## Application

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply



PKG type : TO-247



## Absolute Maximum Ratings

Symbol	Parameter	Value	Unit	
$BV_{CES}$	Collector-Emitter Breakdown Voltage	1200	V	
$I_C$	DC Collector Current	$T_C = 25^\circ\text{C}$	20	A
		$T_C = 100^\circ\text{C}$	10	
$I_{C, Pulse}$	Pulsed Collector Current	40	A	
$I_F$	Diode Forward Current	$T_C = 25^\circ\text{C}$	20	A
		$T_C = 100^\circ\text{C}$	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	$T_C = 25^\circ\text{C}$	157	W
$t_{SC}$	Short circuit withstand time	10	$\mu\text{s}$	
$T_{vj}$	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
PTDC10120BY	PTDC10120	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	$I_C=250\mu\text{A}$ , $V_{GE}=0\text{V}$	1200	-	-	V	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=10\text{A}$ , $V_{GE}=15\text{V}$	$T_j=25^\circ\text{C}$	-	1.85	2.20	V
			$T_j=125^\circ\text{C}$	-	2.15	-	
			$T_j=150^\circ\text{C}$	-	2.25	-	
$V_{GE(TH)}$	Gate-Emitter Threshold Voltage	$V_{CE}=V_{GE}$ , $I_C=500\mu\text{A}$	5.0	5.8	6.6	V	
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{CE}=1200\text{V}$ , $V_{GE}=0\text{V}$	$T_j=25^\circ\text{C}$	-	-	0.25	mA
			$T_j=150^\circ\text{C}$	-	-	5.00	
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE}=\pm 20\text{V}$ , $V_{CE}=0\text{V}$	-	-	400	nA	

### Dynamic Characteristics

Symbol	Parameter	Test Condition	Numerical			Unit	
			Min	Typ	Max		
$Q_G$	Total Gate Charge	$V_{CC}=960\text{V}$ , $I_C=10\text{A}$ , $V_{GE}=15\text{V}$	-	0.08	-	$\mu\text{C}$	
$V_F$	Diode Forward Voltage	$I_F=10\text{A}$	$T_j=25^\circ\text{C}$	-	2.0	-	V
			$T_j=125^\circ\text{C}$	-	2.1	-	
			$T_j=150^\circ\text{C}$	-	2.1	-	
$C_{IES}$	Input Capacitance	$V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$ , $f=1\text{MHz}$	-	0.75	-	nF	
$C_{RES}$	Reverse Transfer Capacitance		-	0.035	-		
$I_{C(SC)}$	Short circuit collector current	$V_{GE}=15\text{V}$ , $t_{SC}\leq 10\mu\text{s}$ , $V_{CC}=900\text{V}$ , $T_j\leq 150^\circ\text{C}$	-	50	-	A	



## Electrical Characteristics

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

### Switching Characteristics

Symbol	Parameter	Test Condition	Numerical			Unit	
			Min	Typ	Max		
$t_{d(on)}$	Turn-On Delay Time	$V_{GE}=-15\sim 15\text{V}$ , $V_{CC}=600\text{V}$ , $I_C=10\text{A}$ , $R_G=47\Omega$	-	85	-	ns	
			-	90	-		
			-	95	-		
$t_r$	Turn-On Rise Time		$T_j=25^{\circ}\text{C}$ $T_j=125^{\circ}\text{C}$ $T_j=150^{\circ}\text{C}$	-	50	-	ns
				-	60	-	
				-	65	-	
$t_{d(off)}$	Turn-Off Delay Time			$T_j=25^{\circ}\text{C}$ $T_j=125^{\circ}\text{C}$ $T_j=150^{\circ}\text{C}$	-	262	-
		-			285	-	
		-			308	-	
$t_f$	Turn-Off Fall Time	$T_j=25^{\circ}\text{C}$ $T_j=125^{\circ}\text{C}$ $T_j=150^{\circ}\text{C}$			-	140	-
			-		150	-	
			-		160	-	
$E_{on}$	Turn-On Switching Energy		$T_j=25^{\circ}\text{C}$ $T_j=125^{\circ}\text{C}$ $T_j=150^{\circ}\text{C}$		-	0.98	-
				-	1.33	-	
				-	1.68	-	
$E_{off}$	Turn-Off Switching Energy			$T_j=25^{\circ}\text{C}$ $T_j=125^{\circ}\text{C}$ $T_j=150^{\circ}\text{C}$	-	0.48	-
		-			0.9	-	
		-			1.05	-	
$E_{rec}$	Reverse Recovery Energy	$I_F=10\text{A}$ , $V_R=600\text{V}$ , $-di/dt=500\text{A}/\mu\text{s}$			-	0.25	-
			-		0.5	-	
			-		0.58	-	
$I_{rr}$	Reverse Recovery Current		$I_F=10\text{A}$ , $V_R=600\text{V}$ , $-di/dt=500\text{A}/\mu\text{s}$		-	12.5	-
				-	14.4	-	
				-	15.3	-	
$Q_{rr}$	Reverse Recovery Charge			$I_F=10\text{A}$ , $V_R=600\text{V}$ , $-di/dt=500\text{A}/\mu\text{s}$	-	0.9	-
		-			1.7	-	
		-			2.0	-	

### Thermal Characteristics

Symbol	Parameter	Numerical	Unit
$R_{\theta(j-A)}$	Thermal Resistance Junction-to-Ambient	40	K/W
$R_{\theta(j-C)}$	Thermal Resistance Junction-to-Case for IGBT	0.95	
$R_{\theta(j-C)}$	Thermal Resistance Junction-to-Case for Diode	1.70	

# Typical Characteristics

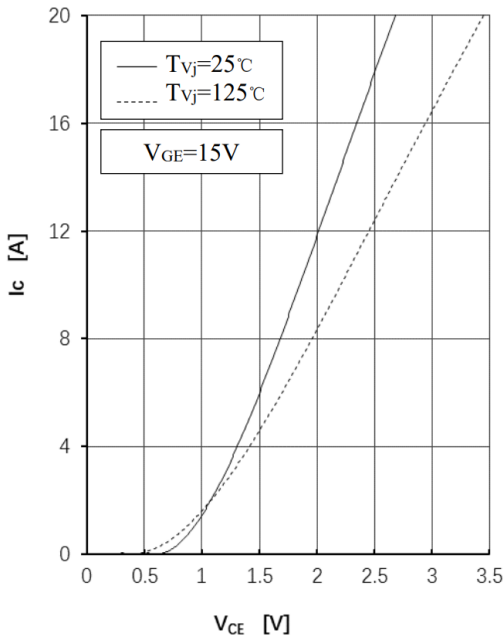


Figure 1. IGBT Output Characteristics

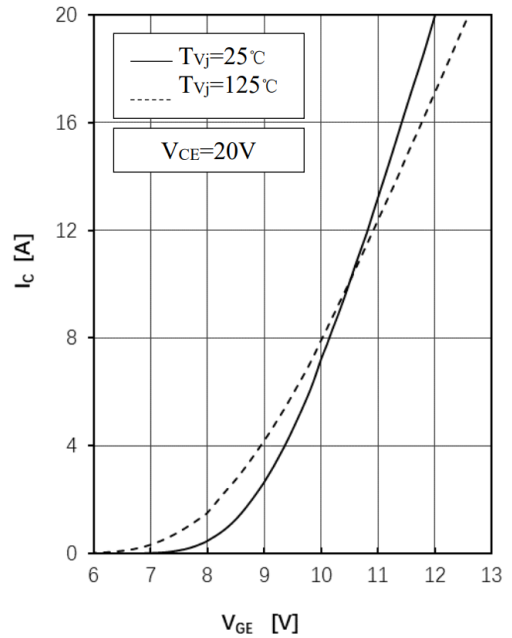


Figure 2. IGBT Transfer Characteristics

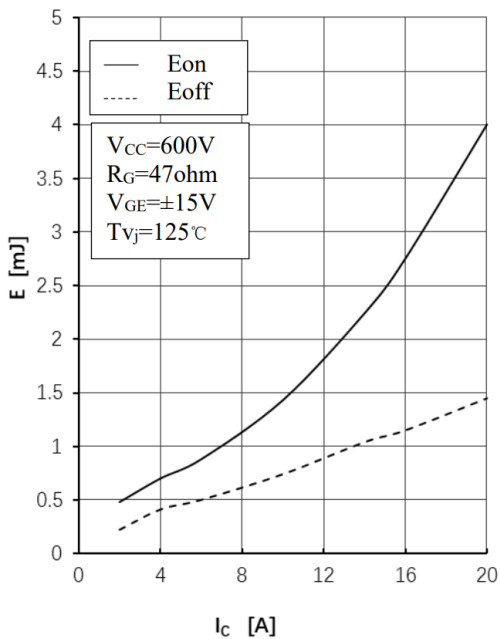


Figure 3. IGBT switching loss vs.  $I_c$

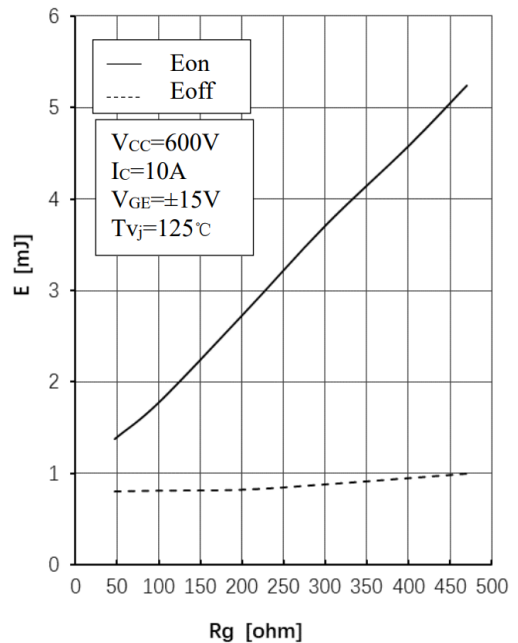


Figure 4. IGBT switching loss vs.  $R_g$

# Typical Characteristics

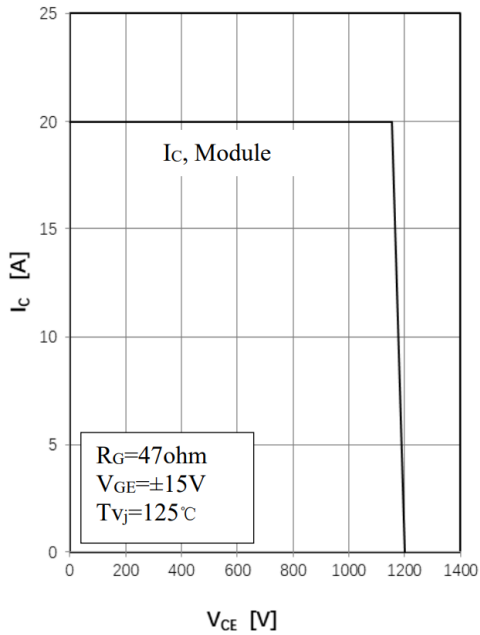


Figure 5. RBSOA

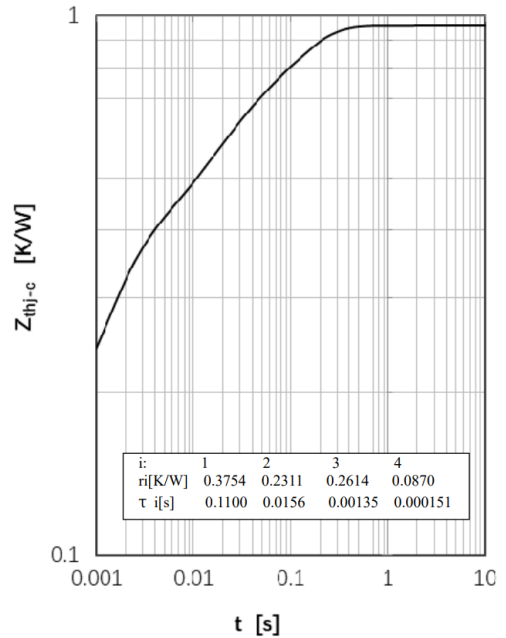


Figure 6. IGBT Transient Thermal Impedance

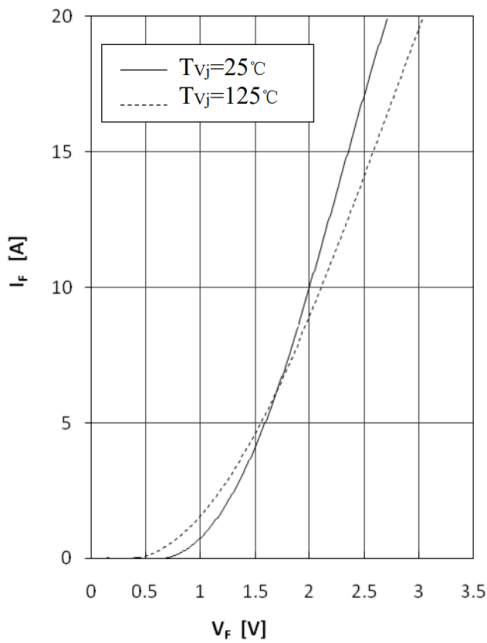


Figure 7. Diode forward characteristics

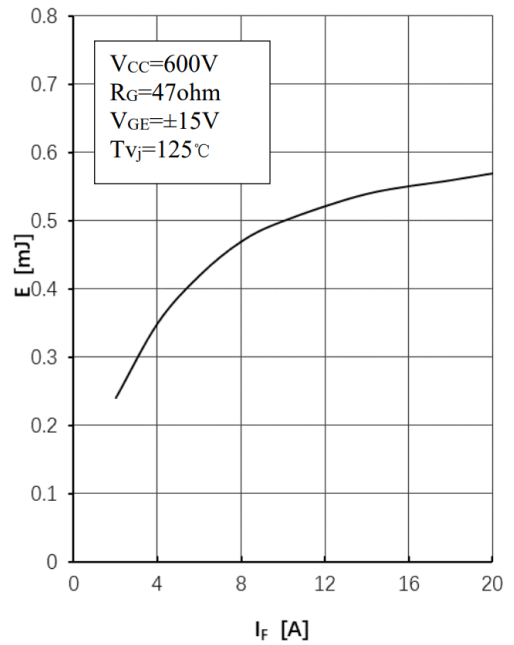


Figure 8. Diode switching loss( $E_{rec}$ ) vs.  $I_F$

# Typical Characteristics

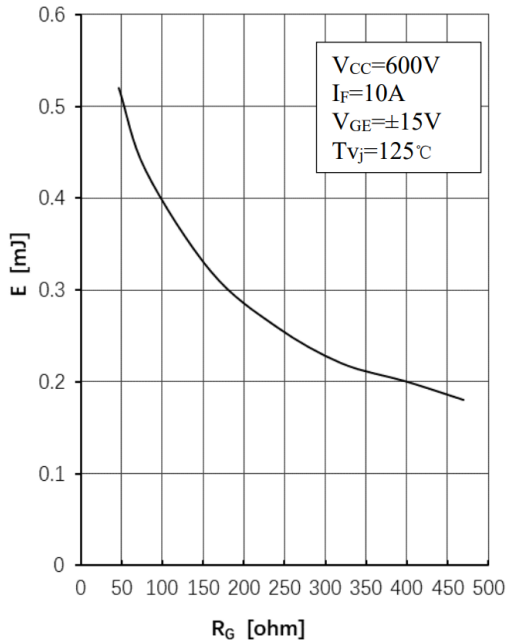


Figure 9. Diode switching loss( $E_{rec}$ ) vs.  $R_G$

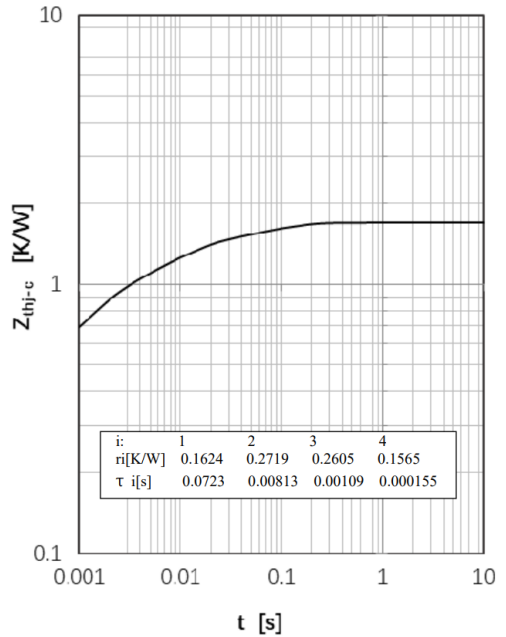
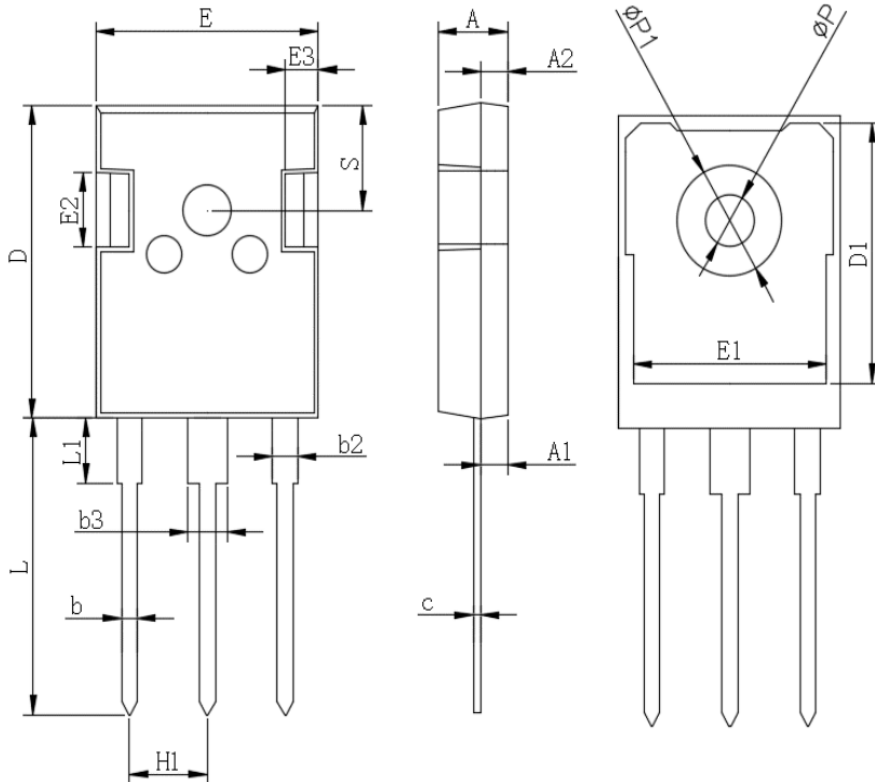


Figure 10. Diode Transient Thermal Impedance

## 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>ΦP</b>	3.40	3.80
<b>ΦP1</b>	-	7.30
<b>S</b>	6.15 Typ	
<b>H1</b>	5.44 Typ	
<b>b3</b>	2.80	3.20