PTDCS40120BY

1200V 40A Si IGBT Discrete

PowerCubeSemi, Inc.
Potential · Convergence · Smart

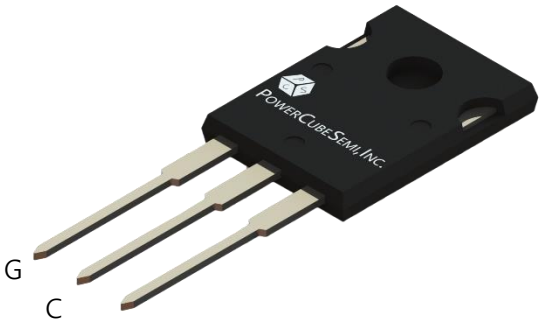
Features

Si IGBT Discrete

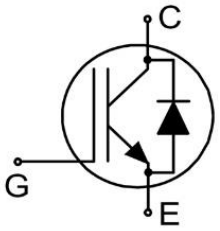
- Rated to 1200V at 40Amps @T_J = 25℃
- $V_{CE(sat)}$=1.85V @ I_C=40A
- High Breakdown voltage to 1200V for improved reliability
- Maximum junction temperature 175℃
- Positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD

Application

- High frequency Switching
- Resonant Converters
- Uninterruptible power supply
- Welding Converters



PKG type : TO-247



Halogen-Free

RoHS

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
BV_{CES}	Collector-Emitter Breakdown Voltage		1200	V
I_C	DC Collector Current	T_C=25℃	80	A
		T_C=100℃	40	
$I_{C, Pulse}$	Pulsed Collector Current		160	A
I_F	Diode Forward Current	T_C=25℃	80	A
		T_C=100℃	40	
$I_{F, Pulse}$	Diode Pulsed Current		160	A
V_{GE}	Continuous Gate-Emitter Voltage		±20	V
V_{GE}	Transient Gate-Emitter Voltage		±30	
P_D	Power Dissipation	T_C=25℃	375	W
T_{vj}	Operating Junction Temperature Range		-40 to 175	℃
T_{stg}	Storage Temperature Range		-55 to 150	

Package Marking and Ordering Information

Device Marking	Device	Package	Packing Method	Tape width	Quantity
PTDCS40120BY	PTDCS40120	TO-247	TUBE	-	30

Electrical Characteristics

T_J=25℃ Unless Otherwise Specified

Static Characteristics

Symbol	Parameter	Test Condition		Numerical			Unit
				Min	Typ	Max	
BV_{CES}	Collector-Emitter Breakdown Voltage	I_C=250uA, V_{GE}=0V		1200	-	-	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40A, V_{GE}=15V	T_j=25℃	-	1.85	2.15	V
			T_j=125℃	-	2.15	-	
			T_j=150℃	-	2.25	-	
$V_{GE(TH)}$	Gate-Emitter Threshold Voltage	V_{CE}=V_{GE}, I_C=1.4mA		5.2	5.8	6.5	V
I_{CES}	Zero Gate Voltage Collector Current	V_{CE}=1200V, V_{GE}=0V	Tj=25℃	-	-	0.25	mA
			Tj=150℃	-	-	4	
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=±20V, V_{CE}=0V		-	-	100	nA

Dynamic Characteristics

Symbol	Parameter	Test Condition		Numerical			Unit
				Min	Typ	Max	
Q_G	Total Gate Charge	V_{CC}=600V, I_C=40A, V_{GE}=15V		-	0.27	-	uC
V_F	Diode Forward Voltage	I_F=40A	Tj=25℃	-	2.05	2.70	V
			Tj=125℃	-	1.85	-	
			Tj=150℃	-	1.75	-	
C_{IES}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=1MHz		-	5.52	-	nF
C_{RES}	Reverse Transfer Capacitance			-	0.05	-	

Electrical Characteristics

T_j=25℃ Unless Otherwise Specified

Switching Characteristics

Symbol	Parameter	Test Condition		Numerical			Unit
				Min	Typ	Max	
$t_{d(on)}$	Turn-On Delay Time	V_{GE}=-5~15V, V_{CC}=600V, I_C=40A, R_G=20Ω	T_j=25℃	-	60	-	ns
			T_j=125℃	-	52	-	
			T_j=150℃	-	49	-	
t_r	Turn-On Rise Time		T_j=25℃	-	106	-	
			T_j=125℃	-	94	-	
			T_j=150℃	-	87	-	
$t_{d(off)}$	Turn-Off Delay Time		T_j=25℃	-	200	-	
			T_j=125℃	-	210	-	
			T_j=150℃	-	223	-	
t_f	Turn-Off Fall Time		T_j=25℃	-	129	-	
			T_j=125℃	-	187	-	
			T_j=150℃	-	210	-	
E_{on}	Turn-On Switching Energy		T_j=25℃	-	5.13	-	mJ
			T_j=125℃	-	5.18	-	
			T_j=150℃	-	5.24	-	
E_{off}	Turn-Off Switching Energy		T_j=25℃	-	1.38	-	
			T_j=125℃	-	2.02	-	
			T_j=150℃	-	2.23	-	
E_{rec}	Reverse Recovery Energy	I_F=40A, V_R=600V, dI/dt=-520A/μs	T_j=25℃	-	0.36	-	mJ
			T_j=125℃	-	1.10	-	
			T_j=150℃	-	1.26	-	
I_{rr}	Reverse Recovery Current		T_j=25℃	-	11	-	A
			T_j=125℃	-	14	-	
			T_j=150℃	-	16	-	
Q_{rr}	Reverse Recovery Charge		T_j=25℃	-	1.43	-	uC
			T_j=125℃	-	3.58	-	
			T_j=150℃	-	4.25	-	
T_{rr}	Reverse Recovery Time		T_j=25℃	-	229	-	ns
			T_j=125℃	-	307	-	
			T_j=150℃	-	352	-	

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	0.40	
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for Diode	0.65	

Typical Characteristics

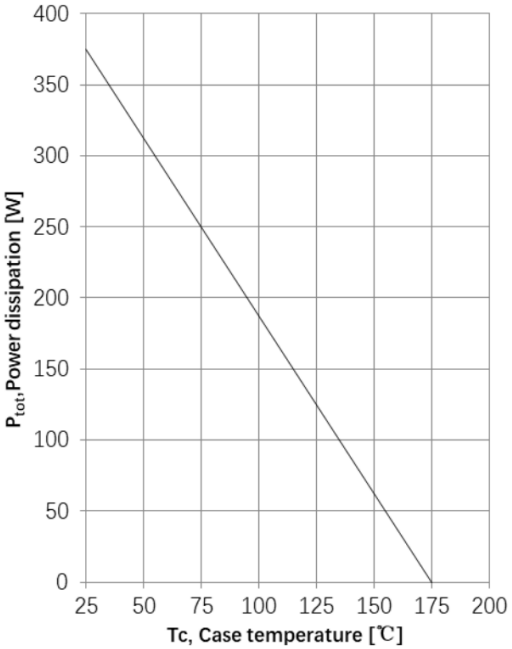


Figure 1. Power dissipation as a function of case temperature (T_J≤175℃)

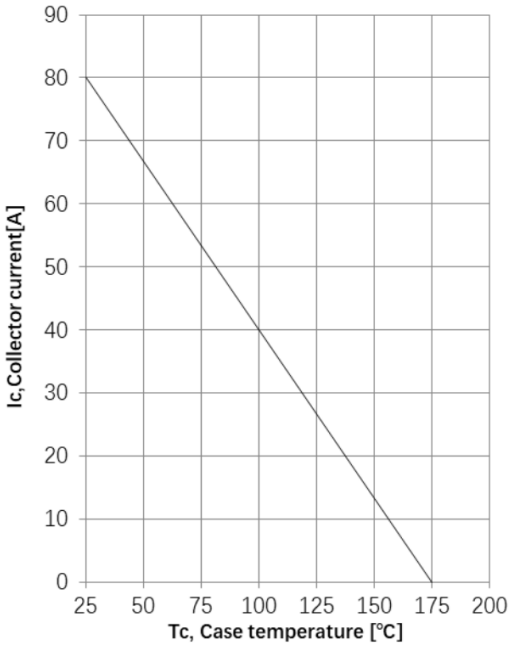


Figure 2. Collector current as a function of case temperature (V_{GE}≥15V, T_J≤175℃)

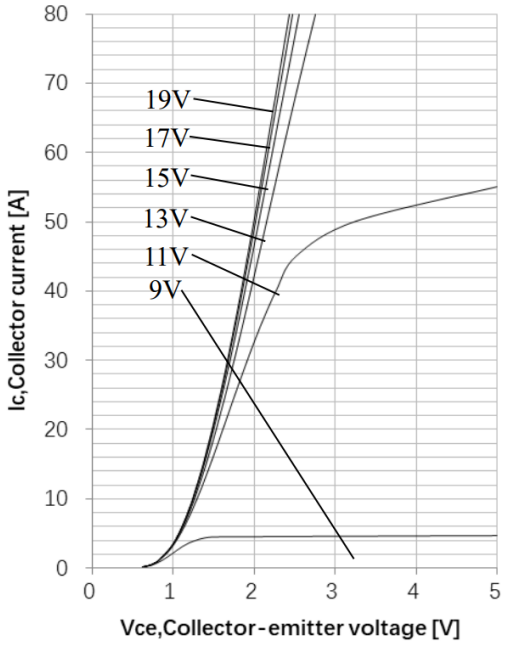


Figure 3. Typical output Characteristics (T_J=25℃)

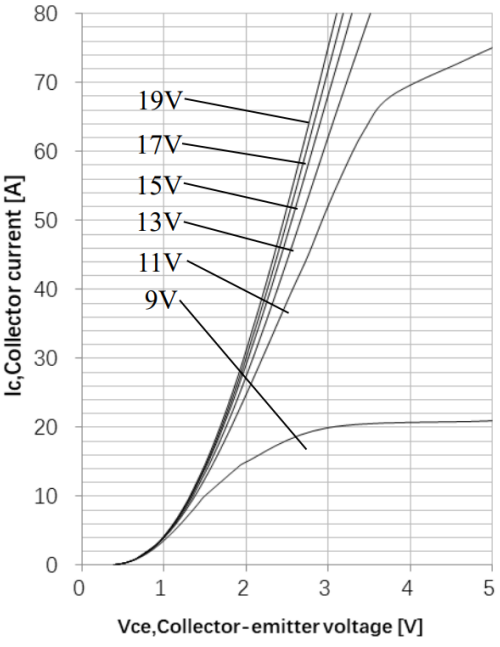


Figure 4. Typical output Characteristics (T_J=150℃)

Typical Characteristics

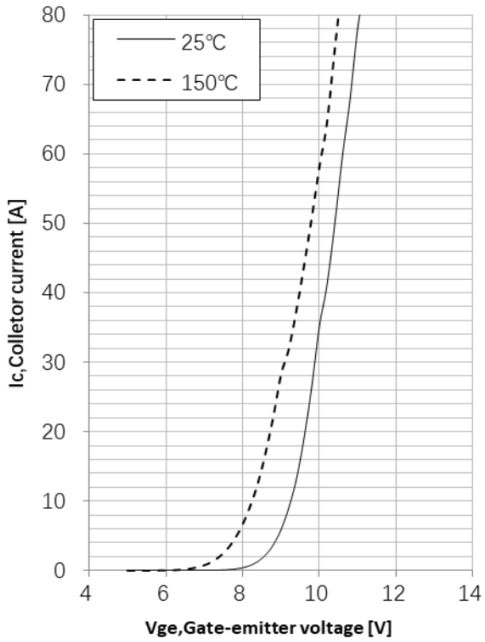


Figure 5. Typical transfer characteristics (V_{CE}=20V)

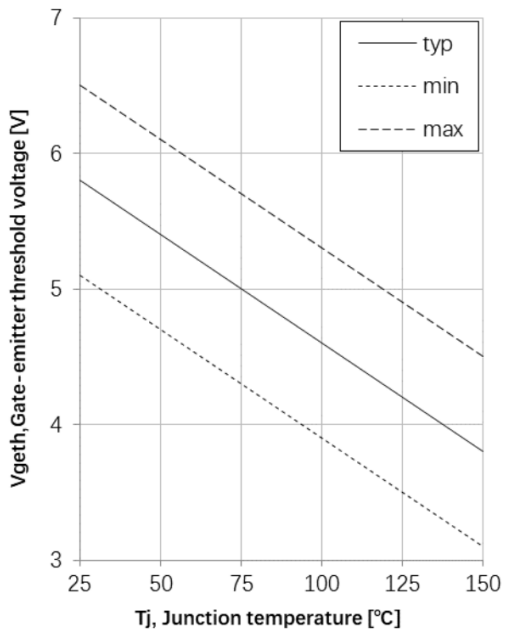


Figure 6. Gate-Emitter threshold voltage as a function of junction temperature

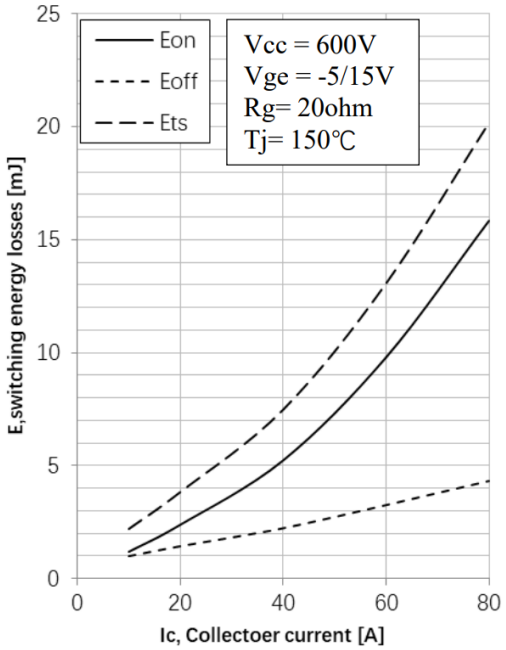


Figure 7. Typical Switching Energy losses as a function of collect current

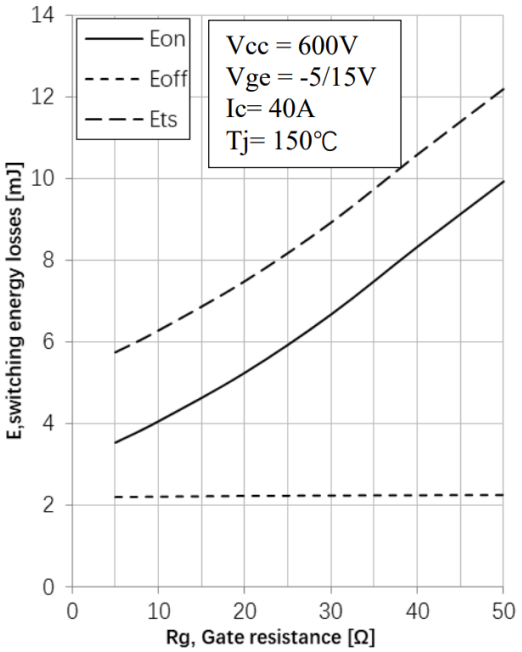


Figure 8. Typical Switching Energy losses as a function of gate resistance

Typical Characteristics

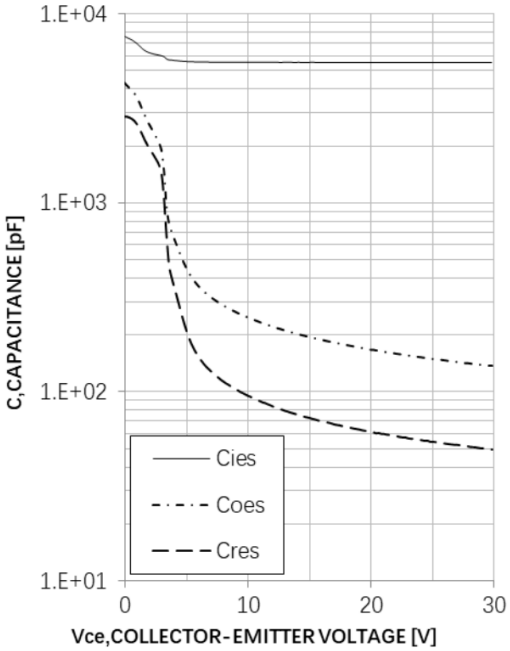


Figure 9. Typical Capacitance as a function of collector-emitter voltage

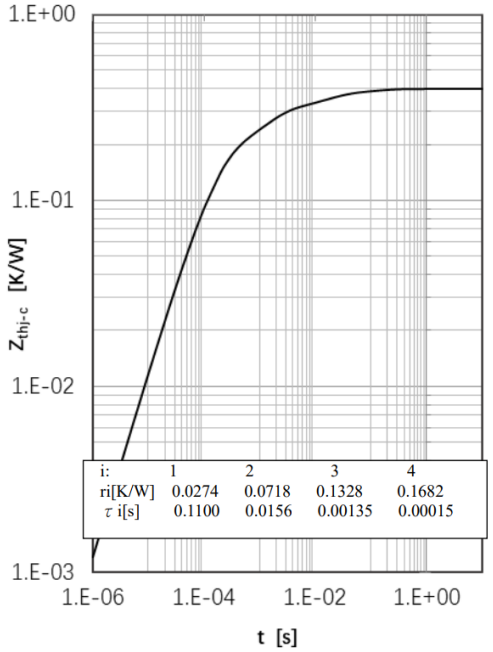


Figure 10. IGBT Transient Thermal Impedance

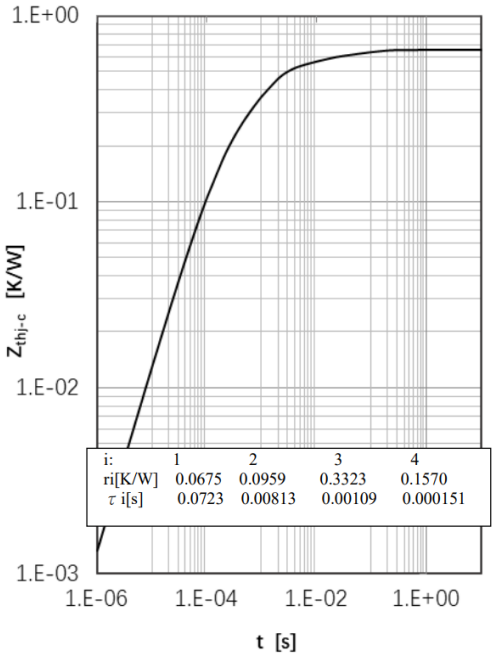


Figure 11. Diode Transient Thermal Impedance

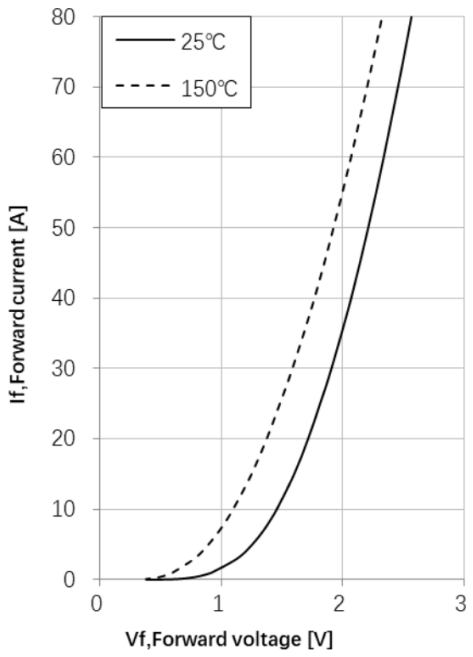
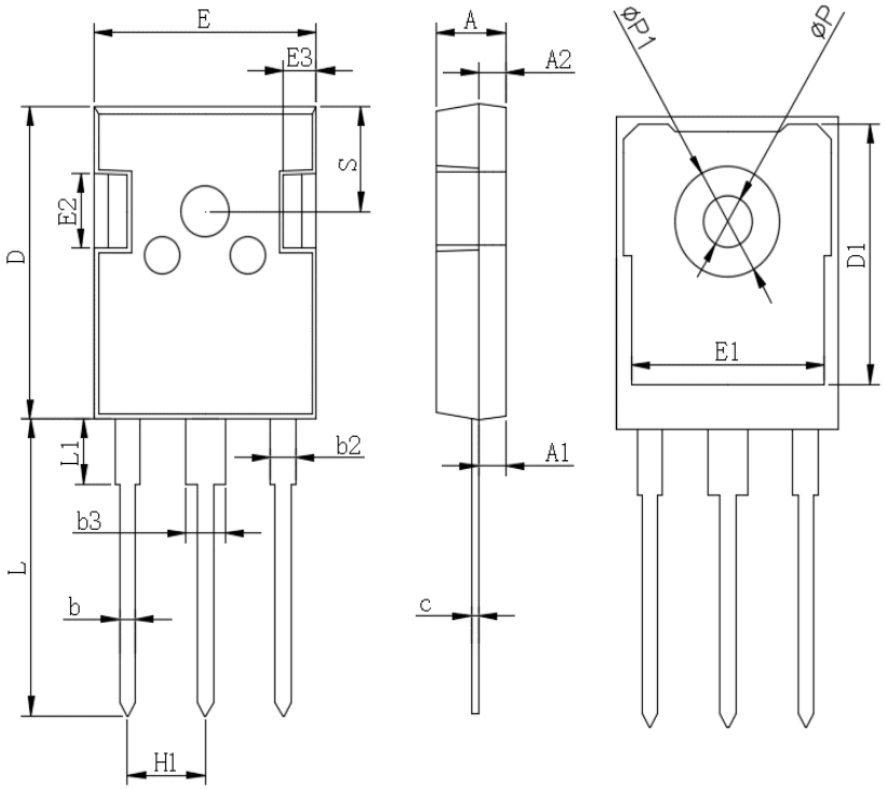


Figure 12. Diode forward current as a function of forward voltage

Package Outline



Unit : mm

SYMBOL	DIMENSIONS	
	MIN	MAX
A	4.80	5.20
A1	2.21	2.61
A2	1.85	2.15
b	1.0	1.4
b2	1.91	2.21
C	0.5	0.7
D	20.70	21.30
D1	16.25	16.85
E	15.50	16.10
E1	13.0	13.6
E2	4.80	5.20
E3	2.30	2.70
L	19.62	20.22
L1	-	4.30
ΦP	3.40	3.80
ΦP1	-	7.30
S	6.15 Typ	
H1	5.44 Typ	
b3	2.80	3.20