PTGH4065BY

PowerCubeSemi, Inc.
Potential · Convergence · Smart

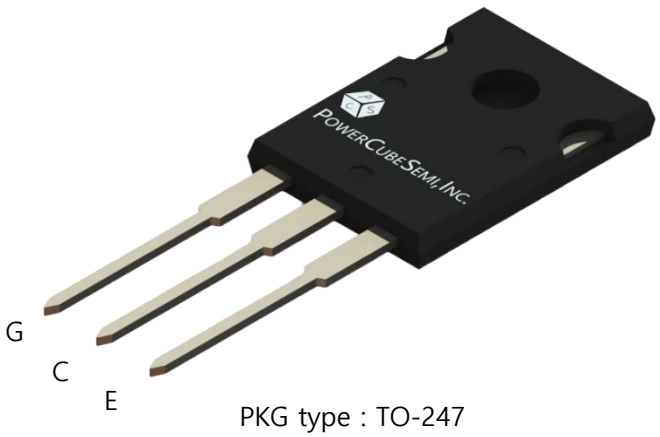
Features

IGBT Discrete

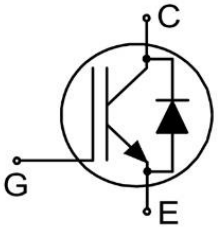
- Rated to 650V at 40Amps @T_J = 25℃
- $V_{CE(sat)}$=1.95V @ I_C=40A
- Low switching losses
- Positive Temperature Coefficient
- High Ruggedness, Temperature Stable
- Maximum Junction Temperature 175℃
- High short circuit capability (5us)

Application

- High frequency switching application
- Medical applications
- Uninterruptible power supply, UPS
- Motion/Servo control



PKG type : TO-247



Halogen-Free

RoHS

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
BV_{CES}	Collector-Emitter Breakdown Voltage		650	V
I_C	DC Collector Current	T_C=25℃	80	A
		T_C=100℃	40	
I_{CM}	Pulsed Collector Current		160	A
I_F	Diode Forward Current	T_C=25℃	60	A
		T_C=100℃	30	
$I_{F,\ Pulse}$	Diode Pulsed Current		120	A
V_{GE}	Continuous Gate-Emitter Voltage		±20	V
V_{GE}	Transient Gate-Emitter Voltage		±30	
P_D	Power Dissipation	T_C=25℃	250	W
t_{SC}	Short circuit withstand time		5	μs
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
PTGH4065BY	PTGH4065	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		650	-	-	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40A, V_{GE}=15V	T_J=25℃	-	1.95	2.40	V
			T_J=125℃	-	2.30	-	
			T_J=150℃	-	2.40	-	
$V_{GE(TH)}$	Gate-Emitter Threshold Voltage	V_{CE}=V_{GE}, I_C=0.64mA		4.1	4.7	6.1	V
I_{CES}	Zero Gate Voltage Collector Current	V_{CE}=650V, V_{GE}=0V	T_J=25℃	-	-	0.25	mA
			T_J=150℃	-	-	4.00	
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}=300V, I_C=40A, V_{GE}=15V		-	0.16	-	uC
V_F	Diode Forward Voltage	I_F=30A	T_J=25℃	-	1.90	2.60	V
			T_J=125℃	-	1.85	-	
			T_J=150℃	-	1.75	-	
C_{IES}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=1MHz		-	1.56	-	nF
C_{RES}	Reverse Transfer Capacitance			-	0.06	-	
$I_{C\ (SC)}$	Short circuit collector current	V_{GE}=15V, t_{SC}≤5μs, V_{CC}=300V, T_J≤150℃		-	200	-	A

Electrical Characteristics

Switching Characteristics

Symbol	Parameter	Test Condition		Numerical			Unit
				Min	Typ	Max	
$t_{d(on)}$	Turn-On Delay Time	V_{GE}=0~15V, V_{CC}=400V, L_S=60nH, I_C=40A, R_G=10Ω	T_J=25℃	-	12	-	ns
			T_J=125℃	-	11	-	
			T_J=150℃	-	11	-	
t_r	Turn-On Rise Time		T_J=25℃	-	31	-	
			T_J=125℃	-	30	-	
			T_J=150℃	-	30	-	
$t_{d(off)}$	Turn-Off Delay Time		T_J=25℃	-	124	-	
			T_J=125℃	-	132	-	
			T_J=150℃	-	137	-	
t_f	Turn-Off Fall Time		T_J=25℃	-	54	-	
			T_J=125℃	-	84	-	
			T_J=150℃	-	102	-	
E_{on}	Turn-On Switching Energy		T_J=25℃	-	1.55	-	mJ
			T_J=125℃	-	1.57	-	
			T_J=150℃	-	1.6	-	
E_{off}	Turn-Off Switching Energy		T_J=25℃	-	0.59	-	
			T_J=125℃	-	0.83	-	
			T_J=150℃	-	0.88	-	
E_{rec}	Reverse Recovery Energy	I_F=30A, V_R=300V, dI/dt=-350A/μs	T_J=25℃	-	0.09	-	mJ
			T_J=125℃	-	0.22	-	
			T_J=150℃	-	0.26	-	
I_{rr}	Reverse Recovery Current		T_J=25℃	-	7	-	A
			T_J=125℃	-	13	-	
			T_J=150℃	-	15	-	
Q_{rr}	Reverse Recovery Charge		T_J=25℃	-	0.14	-	uC
			T_J=125℃	-	0.94	-	
			T_J=150℃	-	1.26	-	

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	0.60	
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for Diode	1.05	

Typical Characteristics

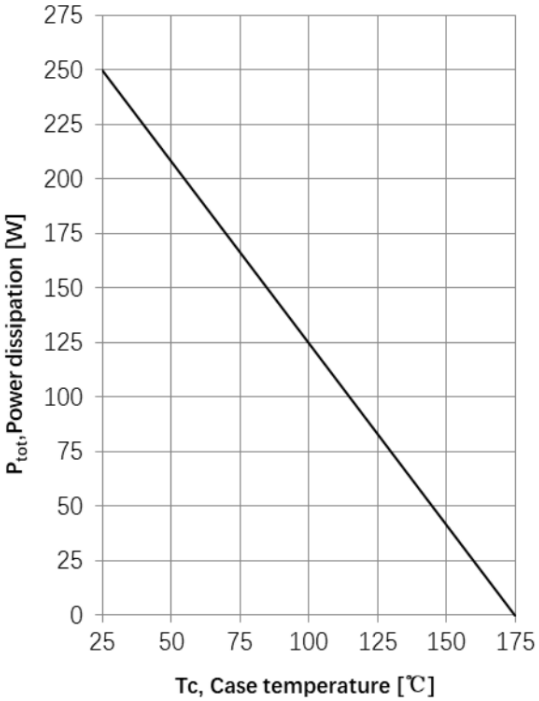


Figure 1. Power dissipation as a function of case temperature (T_J≤175℃)

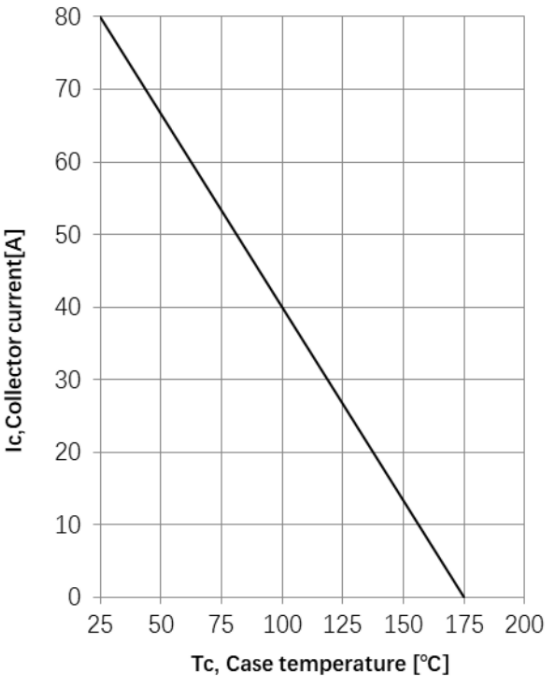


Figure 2. Collector current as a function of case temperature (V_{GE}≥15V, T_J≤175℃)

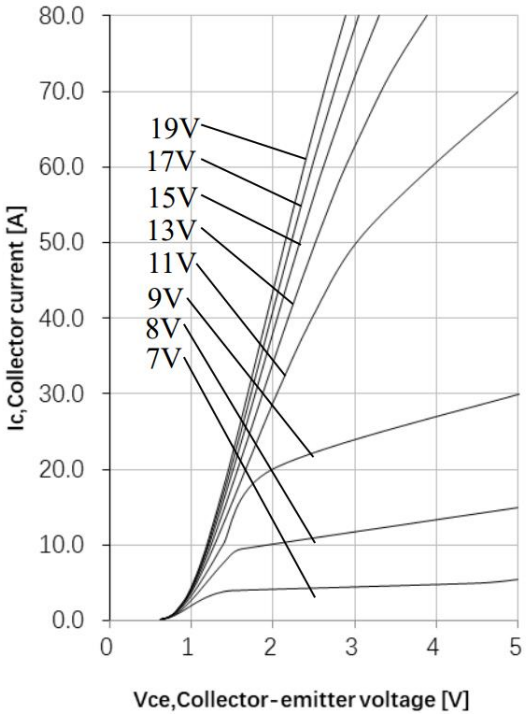


Figure 3. Typical output Characteristics (T_J=25℃)

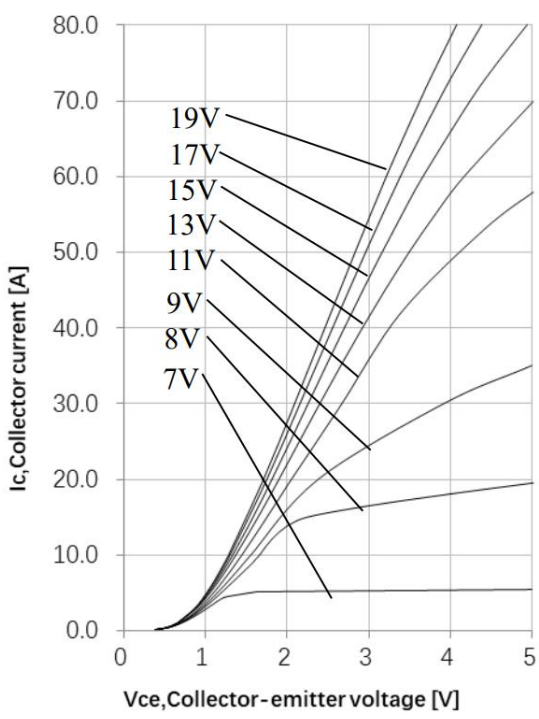


Figure 4. Typical output Characteristics (T_J=150℃)

Typical Characteristics

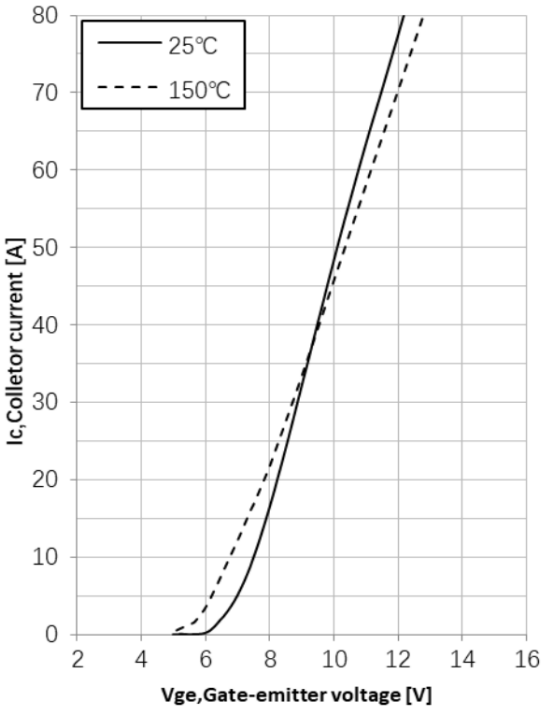


Figure 5. Typical transfer characteristic (V_{GE}=20V)

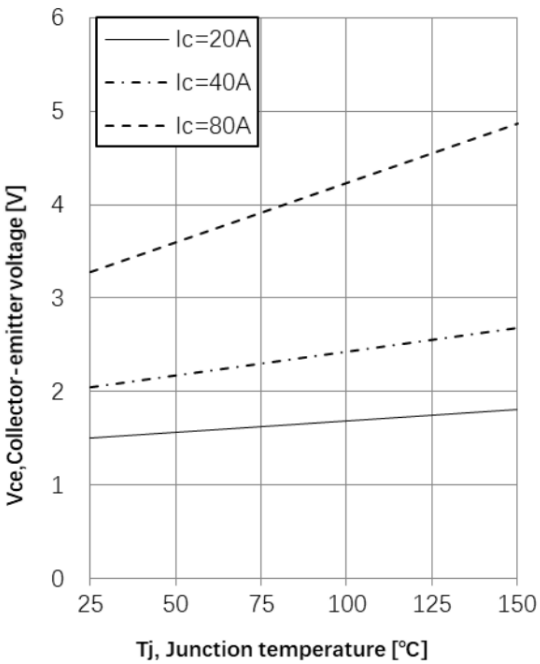


Figure 6. Typical collector-emitter saturation voltage as a function of junction temperature (V_{GE}=15V)

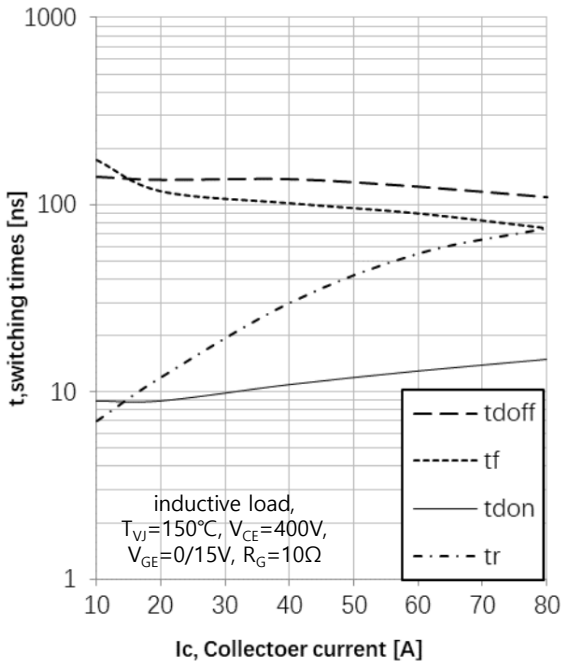


Figure 7. Typical switching time as a function of collect current

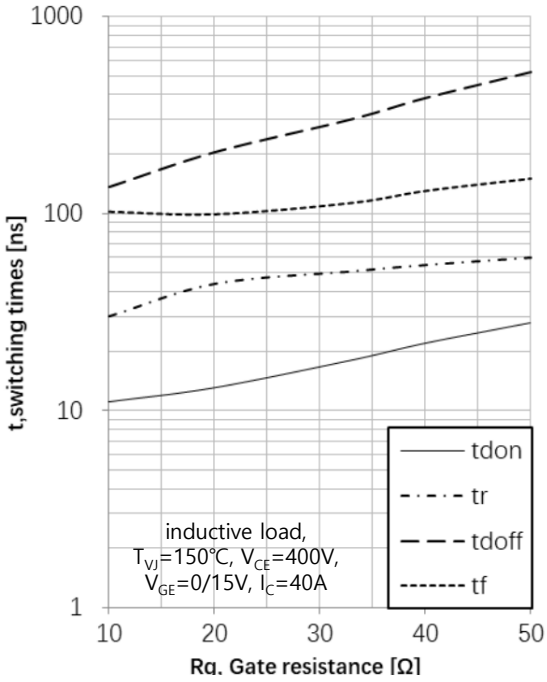


Figure 8. Typical switching times as a function of gate resistance

Typical Characteristics

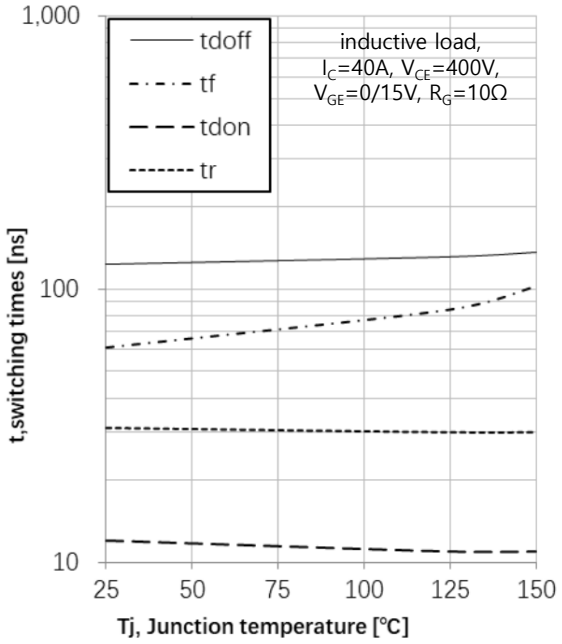


Figure 9. Typical switching times as a function of junction temperature

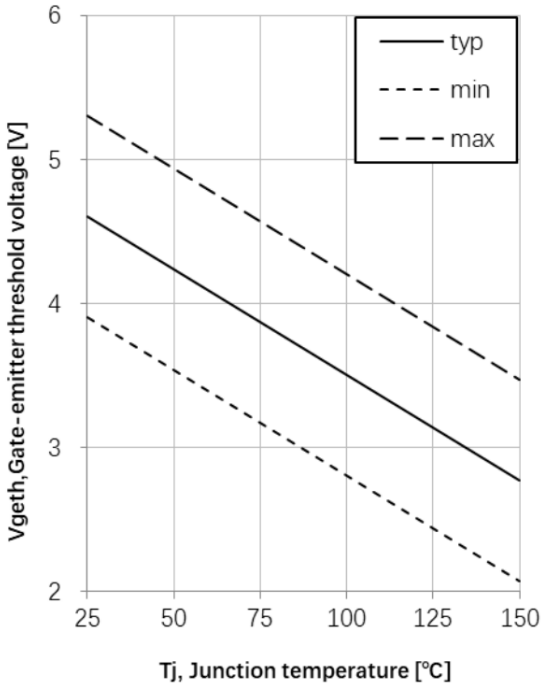


Figure 10. Gate to emitter threshold voltage as a function of junction temperature (I_C=0.75mA)

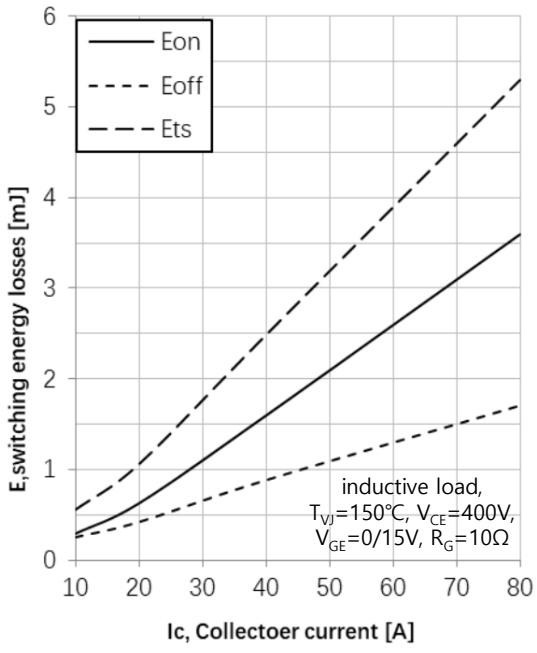


Figure 11. Typical switching energy losses as a function of collect current

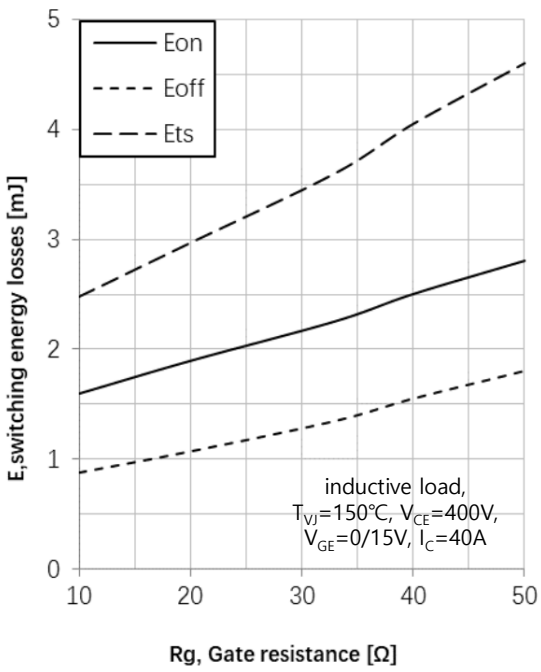


Figure 12. Typical switching energy losses as a function of gate resistance

Typical Characteristics

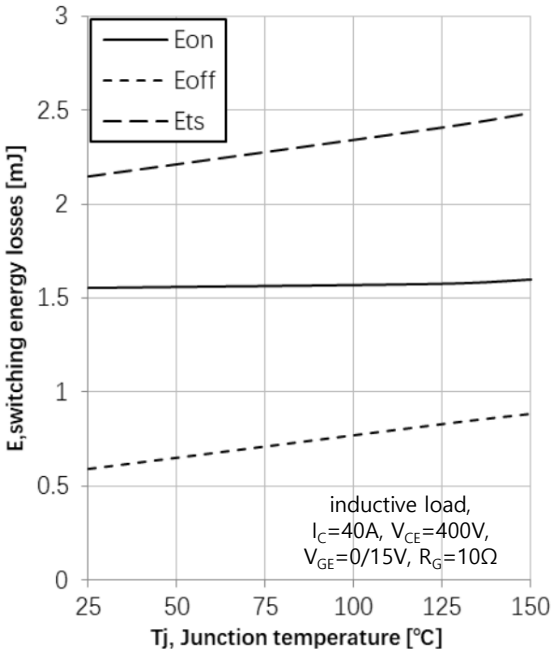


Figure 13. Typical switching energy losses as a function of junction temperature

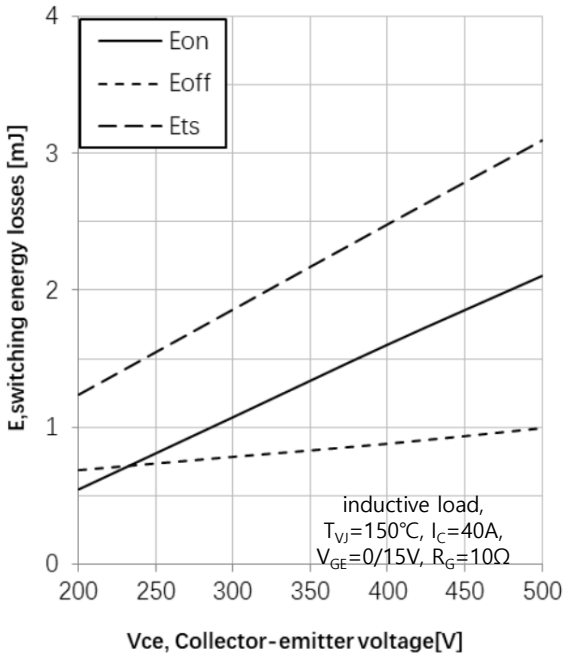


Figure 14. Typical switching energy losses as a function of collector to emitter voltage

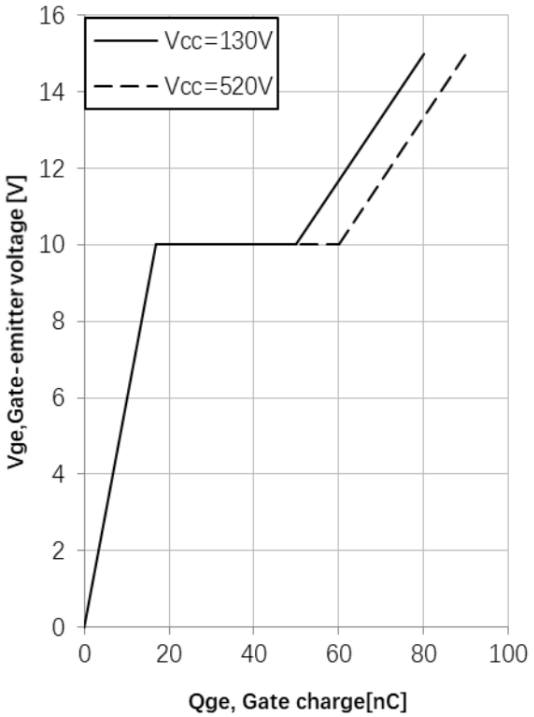


Figure 15. Typical gate charge (I_C=40A)

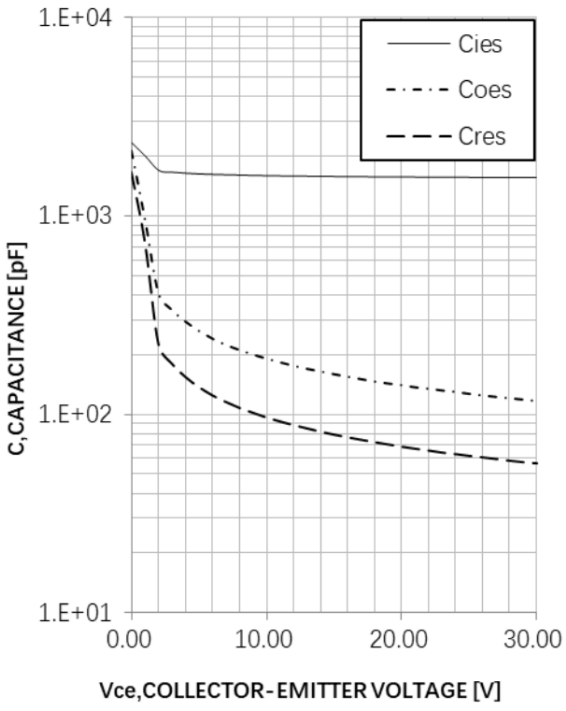


Figure 16. Typical capacitance as a function of collector to emitter voltage

Typical Characteristics

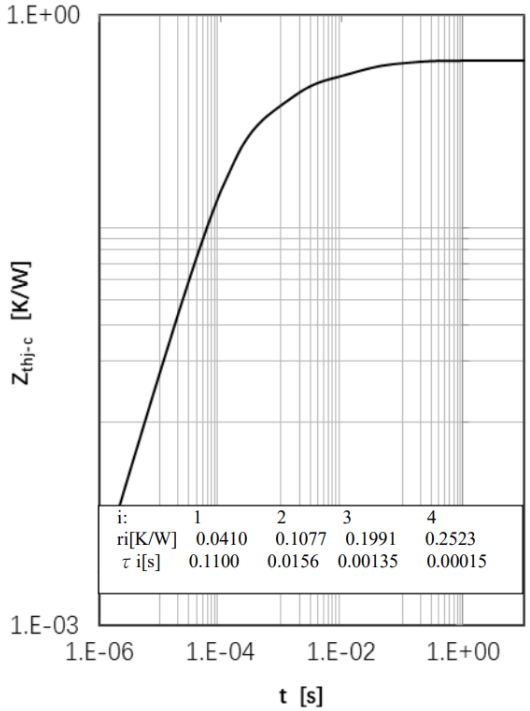


Figure 17. IGBT Transient Thermal Impedance

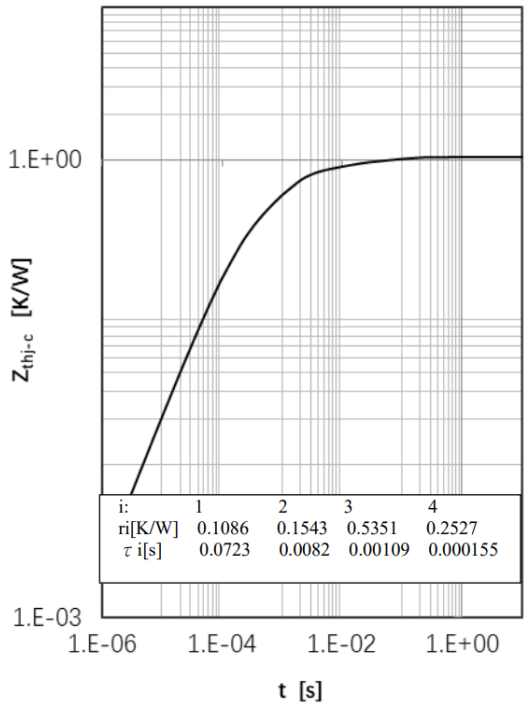


Figure 18. Diode Transient Thermal Impedance

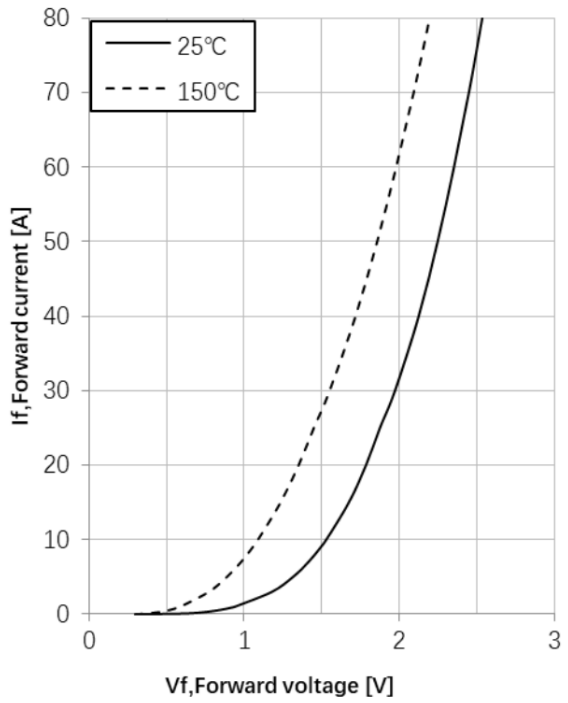


Figure 19. Diode forward current as a function of forward voltage

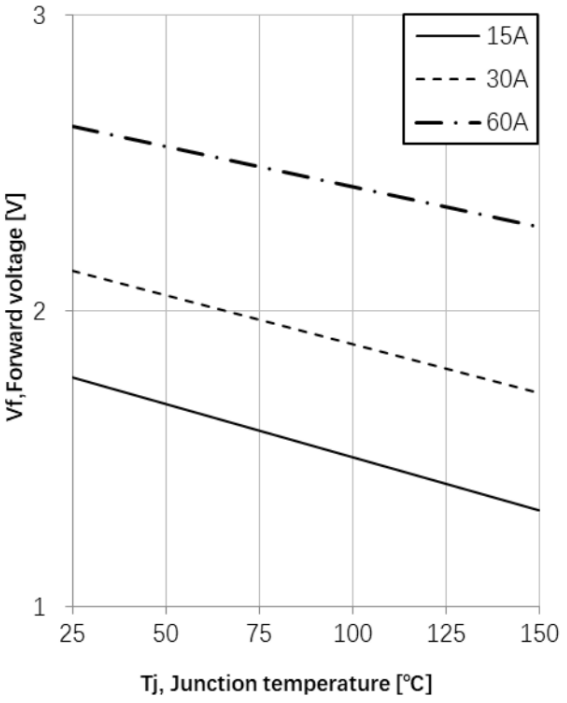


Figure 20. Typical diode forward voltage as a function of junction temperature

Typical Characteristics

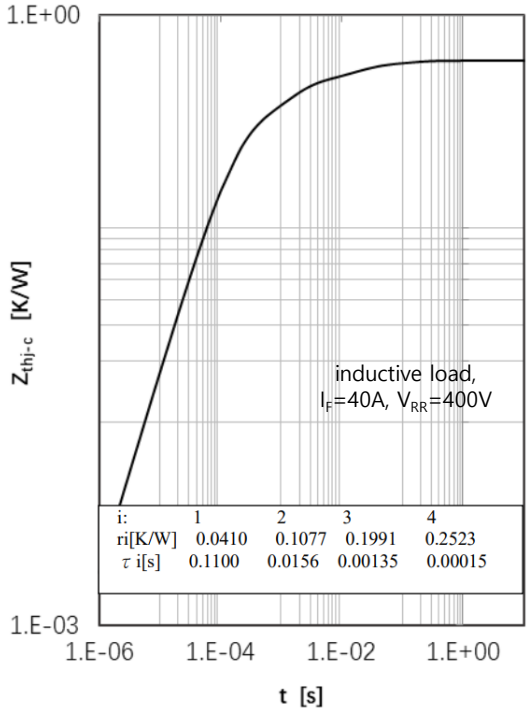


Figure 21. Typical diode reverse recovery energy losses as a function of junction temperature

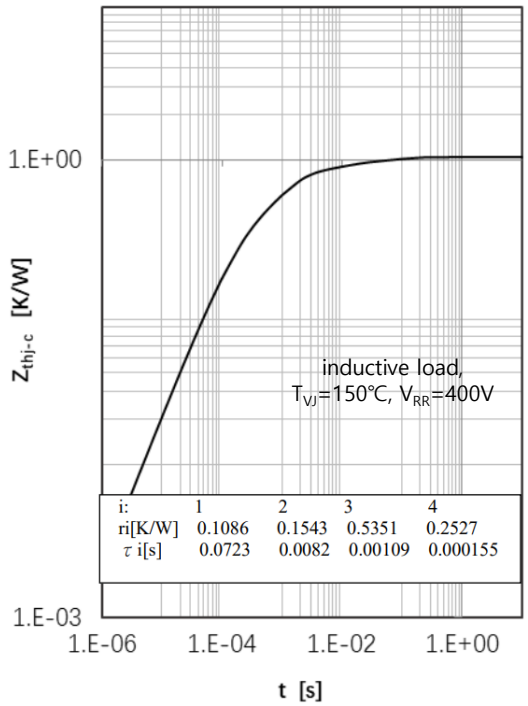
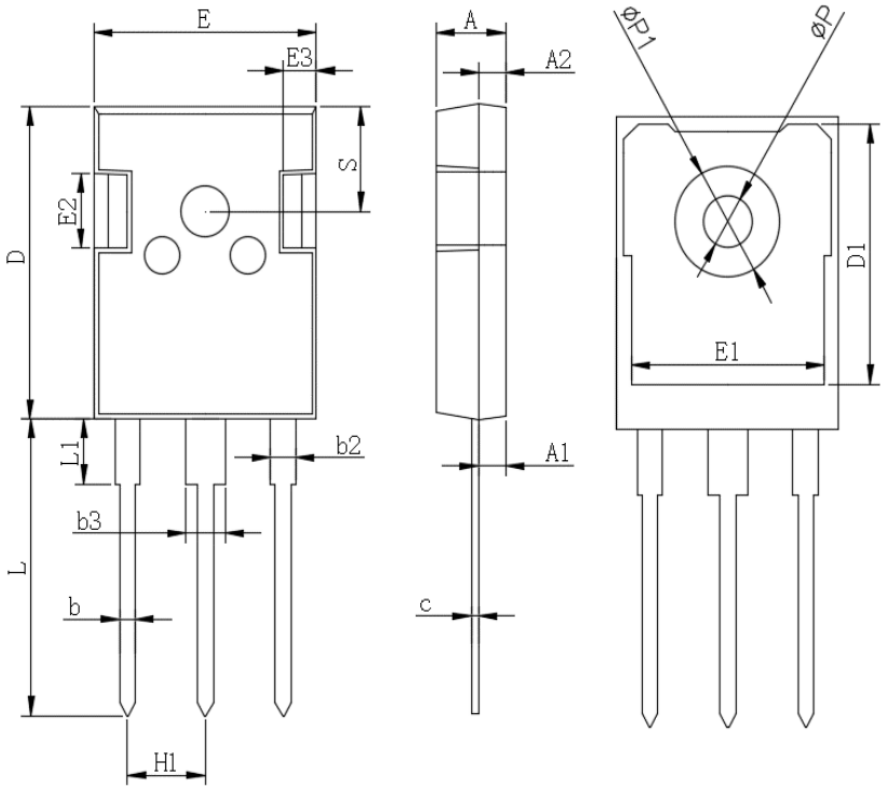


Figure 22. Typical diode reverse recovery energy losses as a function of collect current

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