

PTDH5065BY

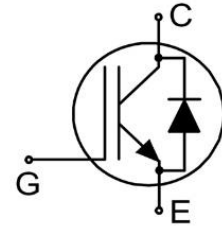
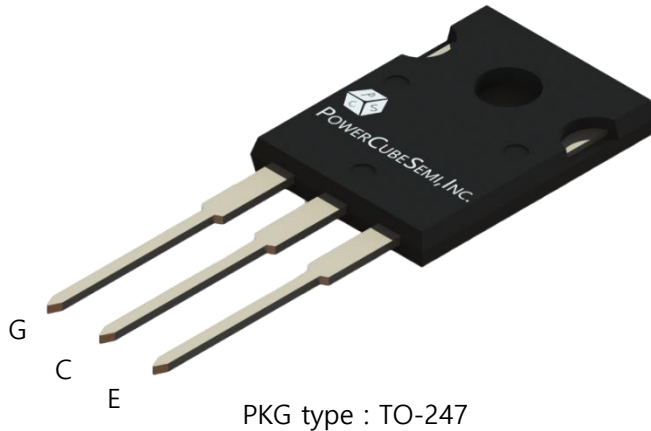
Features

IGBT Discrete

- Rated to 650V at 50Amps @ $T_j = 25^\circ\text{C}$
- $V_{CE(sat)} = 1.95\text{V}$ @ $I_C = 50\text{A}$
- Low switching losses
- Positive Temperature Coefficient
- High Ruggedness, Temperature Stable
- Maximum Junction Temperature 175°C
- High short circuit capability (5us)

Application

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



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit	
BV_{CES}	Collector-Emitter Breakdown Voltage	650	V	
I_C	DC Collector Current	$T_C = 25^\circ\text{C}$	100	A
		$T_C = 100^\circ\text{C}$	50	
I_{CM}	Pulsed Collector Current	200	A	
I_F	Diode Forward Current	$T_C = 25^\circ\text{C}$	80	A
		$T_C = 100^\circ\text{C}$	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	$T_C = 25^\circ\text{C}$	300	W
t_{SC}	Short circuit withstand time	5	μs	
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
PTDH5065BY	PTDH50065	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	$I_C=50\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	-	1.95	2.40	V
			$T_J=125^{\circ}\text{C}$	-	2.30	-	
			$T_J=150^{\circ}\text{C}$	-	2.40	-	
$V_{GE(TH)}$	Gate-Emitter Threshold Voltage	$V_{CE}=V_{GE}$, $I_C=0.8\text{mA}$	4.1	5.1	6.1	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
			$T_J=150^{\circ}\text{C}$	-	-	4.00	
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$	-	-	100	nA	

Dynamic Characteristics

Symbol	Parameter	Test Condition	Numerical			Unit	
			Min	Typ	Max		
Q_G	Total Gate Charge	$V_{CC}=300\text{V}$, $I_C=50\text{A}$, $V_{GE}=15\text{V}$	-	0.21	-	μC	
V_F	Diode Forward Voltage	$I_F=50\text{A}$	$T_J=25^{\circ}\text{C}$	-	1.75	2.30	V
			$T_J=125^{\circ}\text{C}$	-	1.60	-	
			$T_J=150^{\circ}\text{C}$	-	1.55	-	
C_{IES}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=1\text{MHz}$	-	2.07	-	nF	
C_{RES}	Reverse Transfer Capacitance		-	0.83	-		
$I_{C(SC)}$	Short circuit collector current	$V_{GE}=15\text{V}$, $t_{SC}\leq 5\mu\text{s}$, $V_{CC}=400\text{V}$, $T_J\leq 150^{\circ}\text{C}$	-	250	-	A	



Electrical Characteristics

Switching Characteristics

Symbol	Parameter	Test Condition		Numerical			Unit		
				Min	Typ	Max			
$t_{d(on)}$	Turn-On Delay Time	$V_{GE}=0\sim 15V,$ $V_{CC}=400V,$ $L_S=60nH, I_C=50A,$ $R_G=10\Omega$	$T_J=25^\circ C$ $T_J=125^\circ C$ $T_J=150^\circ C$	-	17	-	ns		
t_r	Turn-On Rise Time			-	16	-			
$t_{d(off)}$	Turn-Off Delay Time			-	15	-			
t_f	Turn-Off Fall Time					-	50	-	mJ
E_{on}	Turn-On Switching Energy			-	48	-			
E_{off}	Turn-Off Switching Energy			-	46	-			
E_{rec}	Reverse Recovery Energy					-	167	-	mJ
I_{rr}	Reverse Recovery Current	$I_F=50A, V_R=300V,$ $di/dt=-750A/\mu s$	$T_J=25^\circ C$ $T_J=125^\circ C$ $T_J=150^\circ C$	-	172	-			
Q_{rr}	Reverse Recovery Charge			-	179	-			
				-	64	-			
				-	72	-	A		
				-	81	-			
				-	2.20	-			
				-	2.18	-	mJ		
				-	2.16	-			
				-	0.93	-			
				-	1.06	-	mJ		
				-	1.21	-			
				-	0.12	-			
				-	0.25	-	mJ		
				-	0.31	-			
				-	12	-			
				-	18	-	A		
				-	20	-			
				-	0.71	-			
				-	1.41	-	uC		
				-	1.56	-			
				-		-			

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	0.50	
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for Diode	0.60	

Typical Characteristics

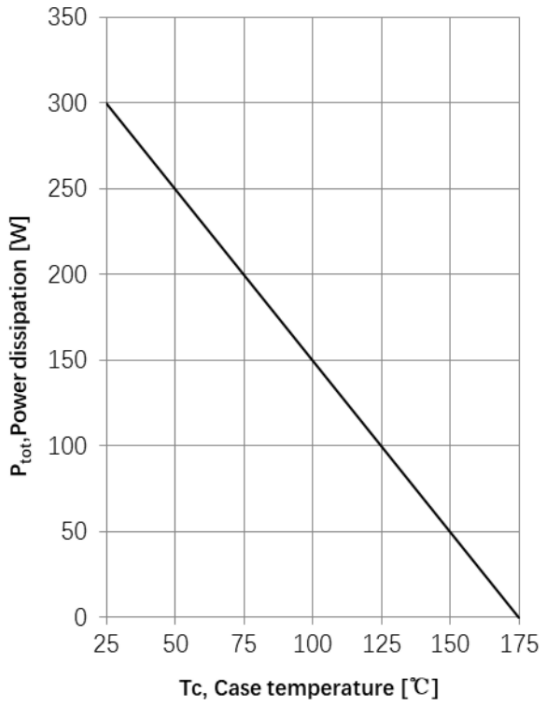


Figure 1. Power dissipation as a function of case temperature ($T_J \leq 175^\circ\text{C}$)

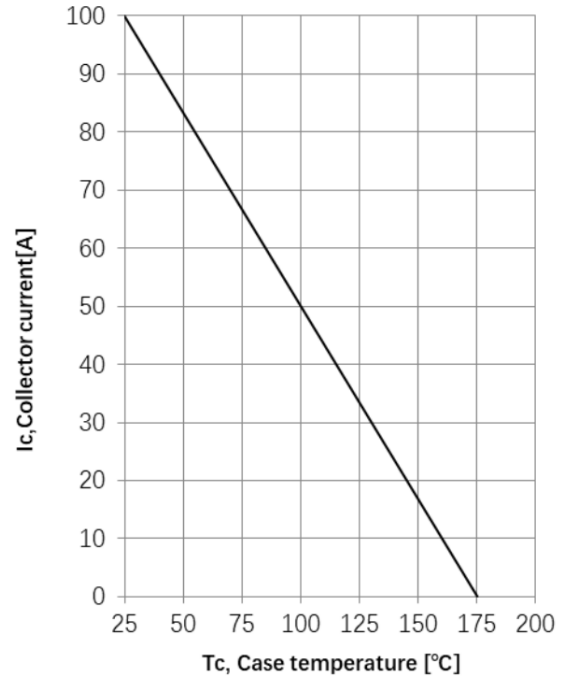


Figure 2. Collector current as a function of case temperature ($V_{GE} \geq 15\text{V}$, $T_J \leq 175^\circ\text{C}$)

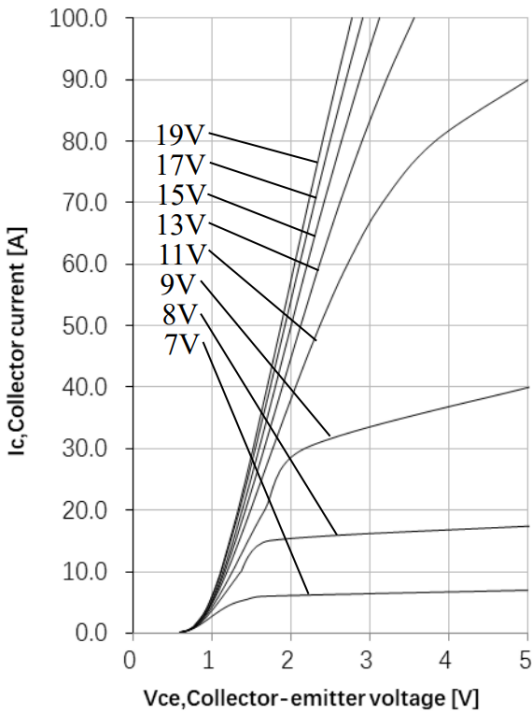


Figure 3. Typical output Characteristics ($T_J = 25^\circ\text{C}$)

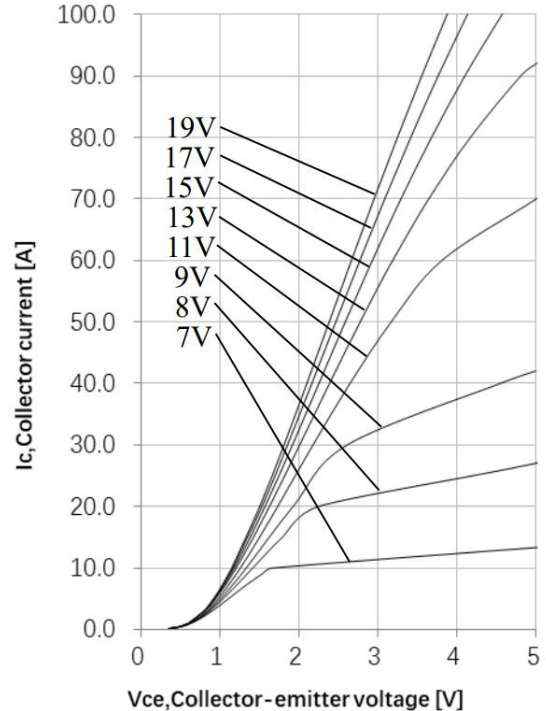


Figure 4. Typical output Characteristics ($T_J = 150^\circ\text{C}$)

Typical Characteristics

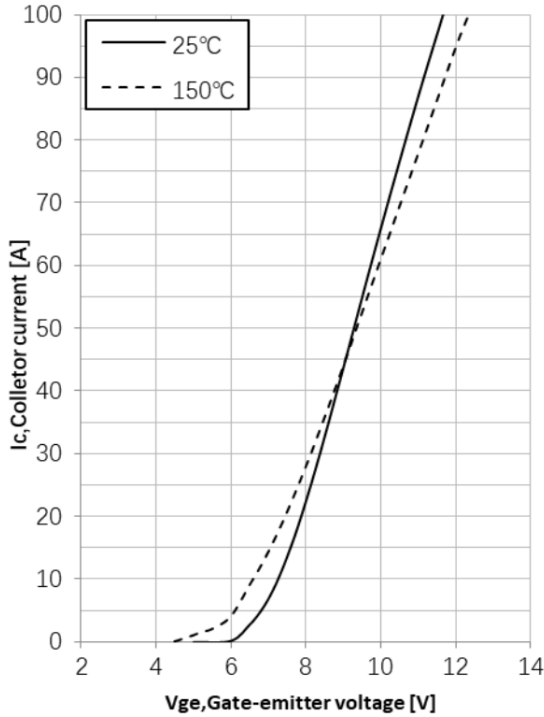


Figure 5. Typical transfer characteristic ($V_{GE}=20V$)

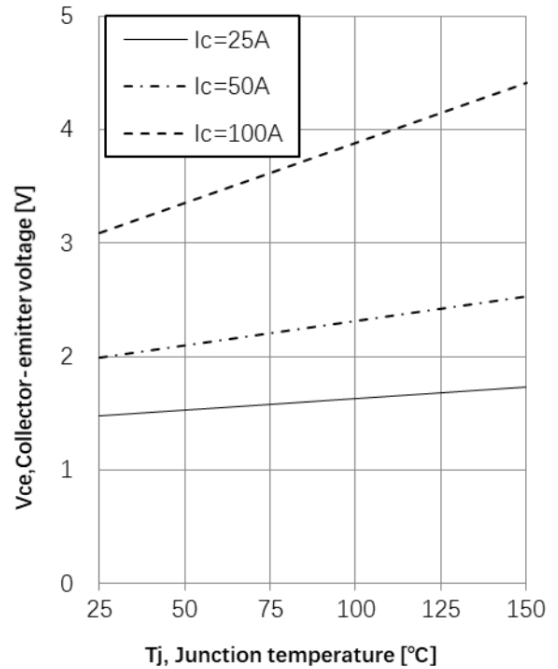


Figure 6. Typical collector-emitter saturation voltage as a function of T_j ($V_{GE}=15V$)

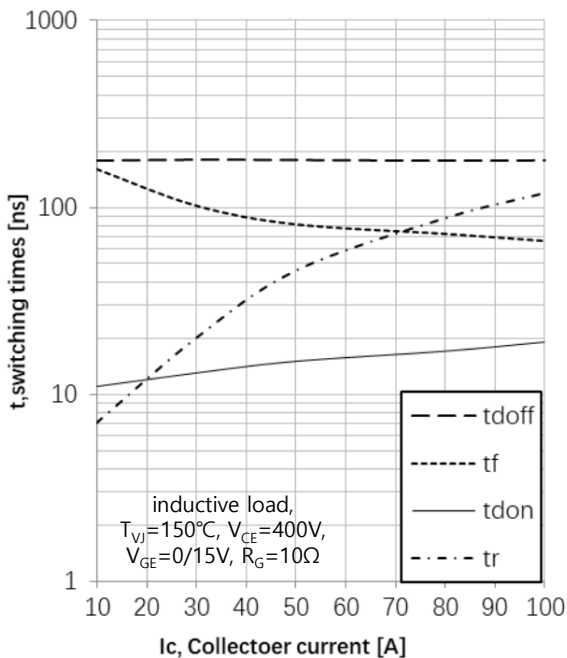


Figure 7. Typical switching time as a function of collector current

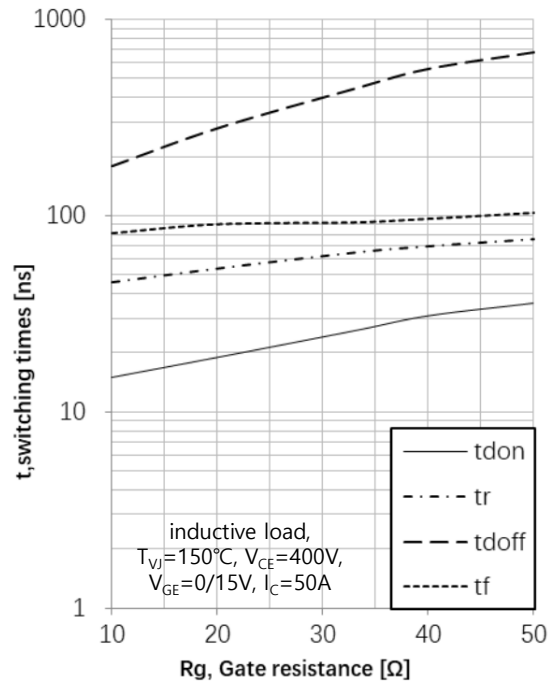


Figure 8. Typical switching times as a function of gate resistance

Typical Characteristics

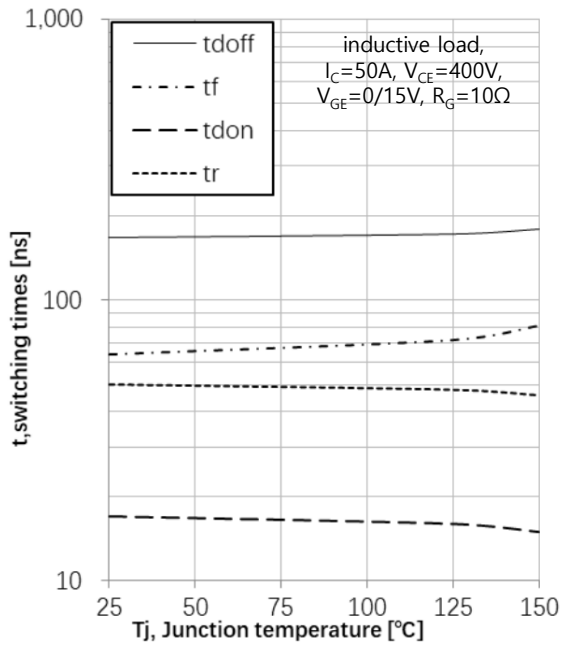


Figure 9. Typical switching times as a function of junction temperature

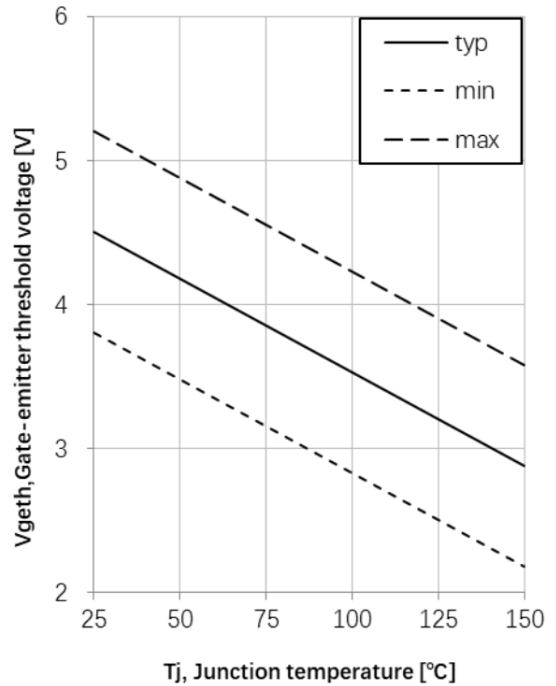


Figure 10. Gate to emitter threshold voltage as a function of junction temperature ($I_C=0.8mA$)

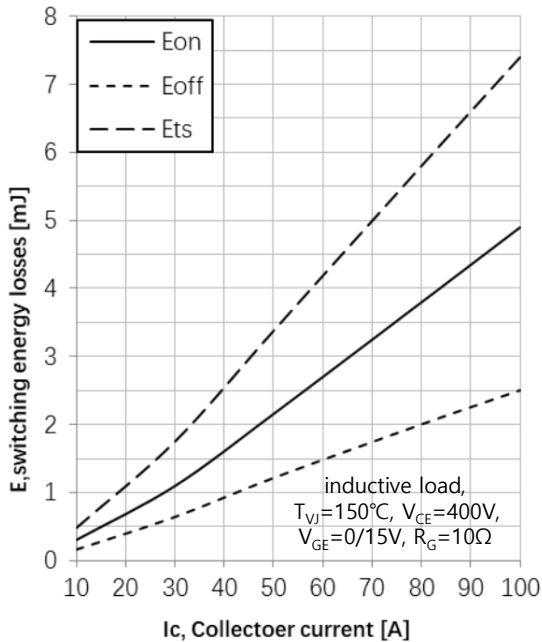


Figure 11. Typical switching energy losses as a function of collector current

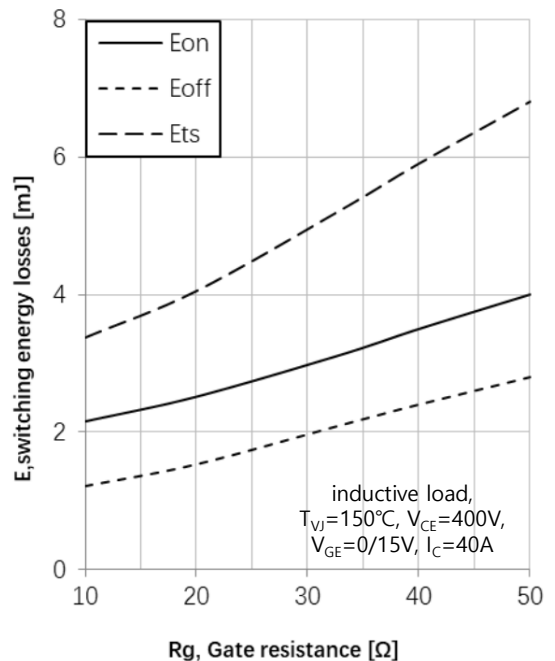


Figure 12. Typical switching energy losses as a function of gate resistance

Typical Characteristics

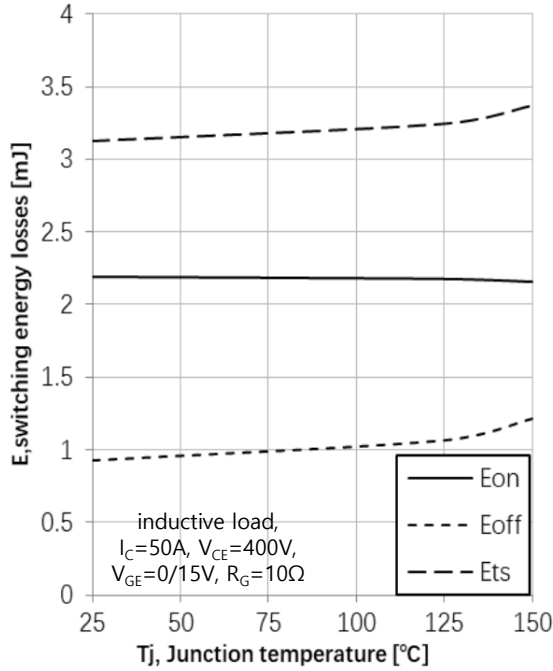


Figure 13. Typical switching energy losses as a function of junction temperature

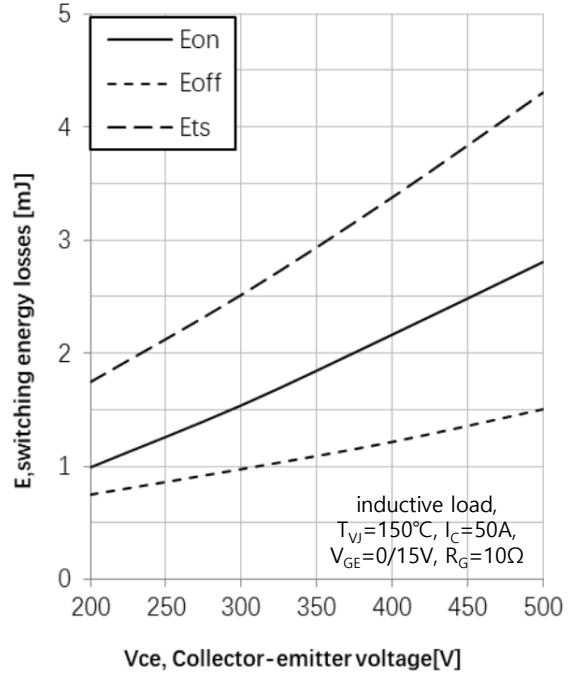


Figure 14. Typical switching energy losses as a function of collector to emitter voltage

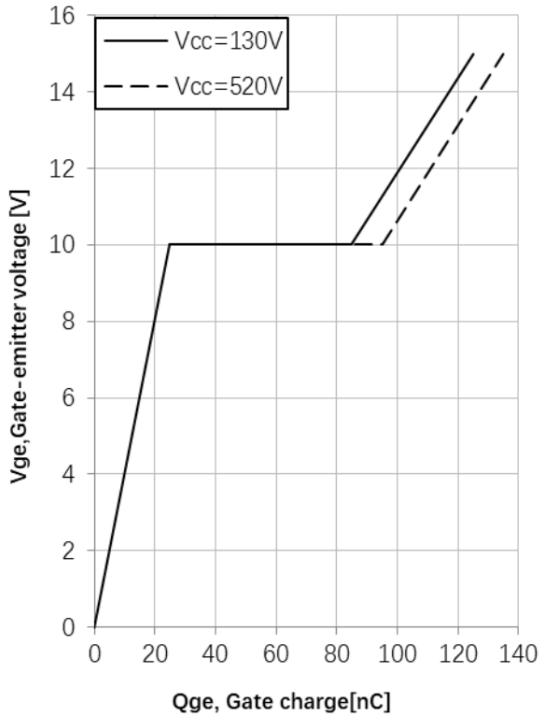


Figure 15. Typical gate charge ($I_c=50A$)

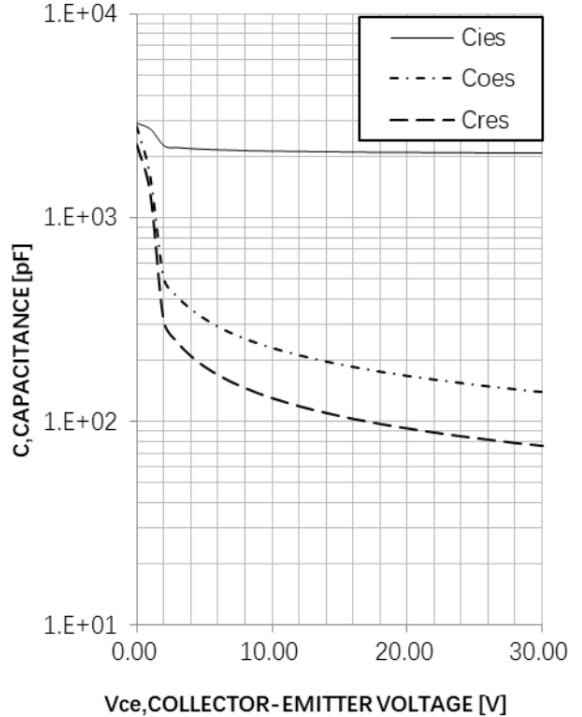


Figure 16. Typical capacitance as a function of collector to emitter voltage

Typical Characteristics

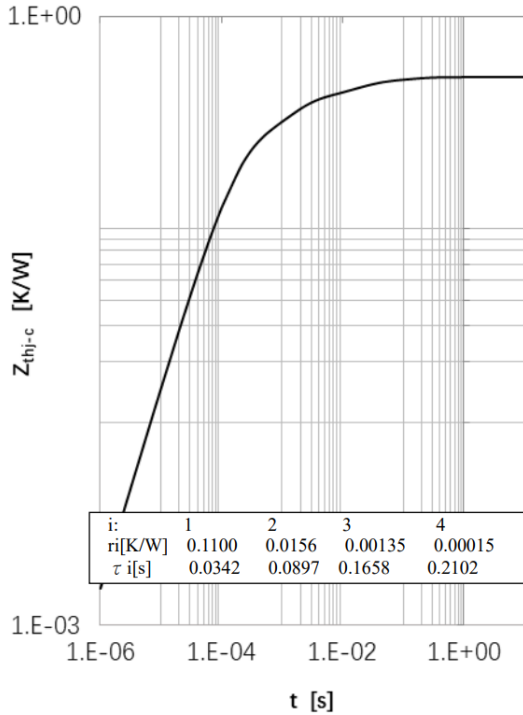


Figure 17. IGBT Transient Thermal Impedance

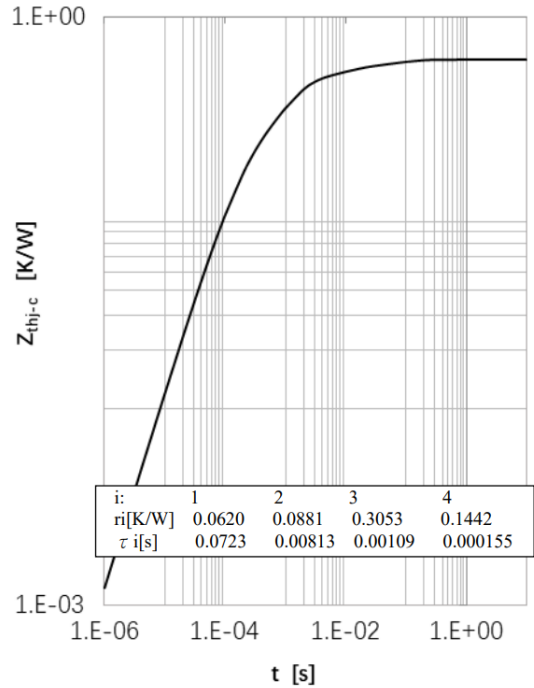


Figure 18. Diode Transient Thermal Impedance

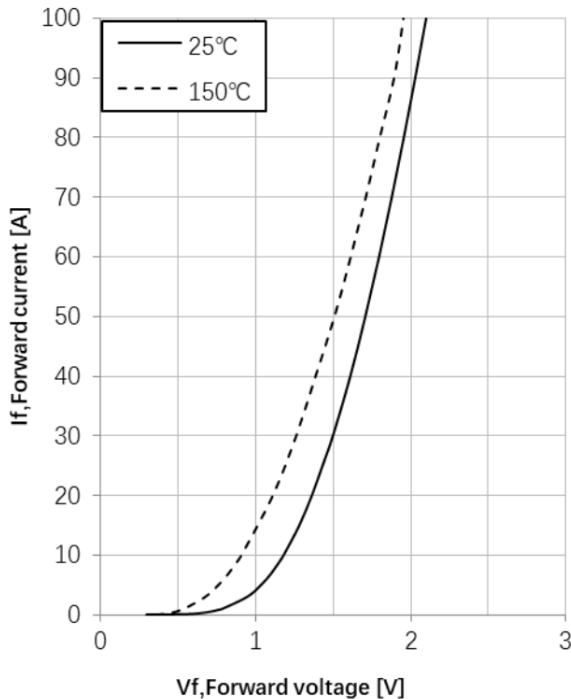


Figure 19. Diode forward current as a function of forward voltage

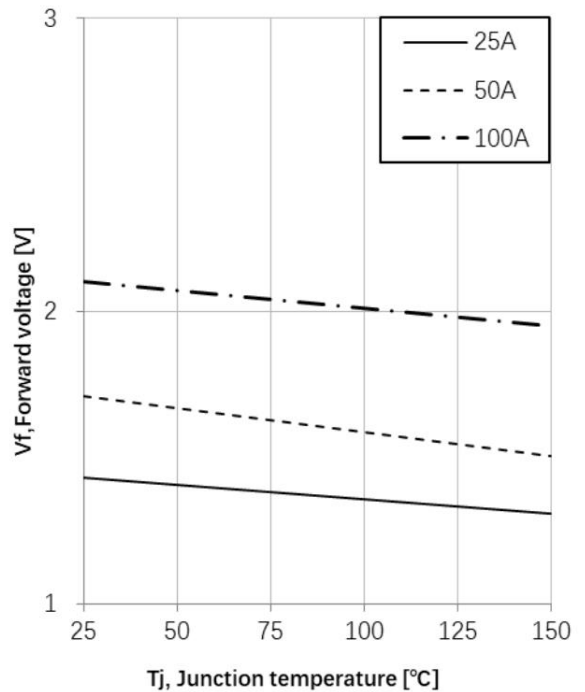
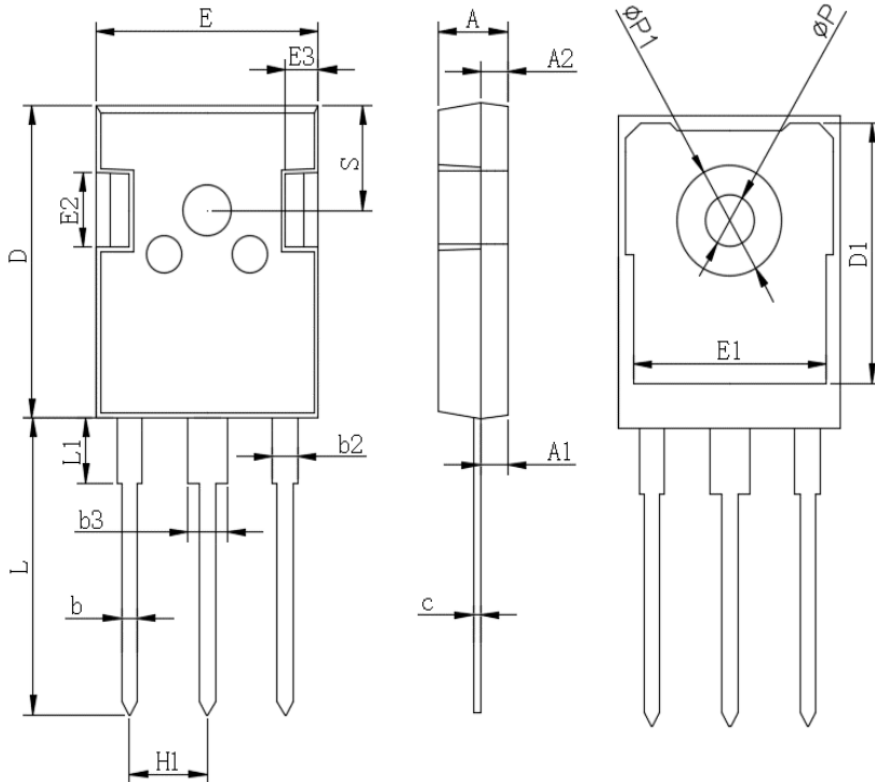


Figure 20. Typical diode forward voltage as a function of junction temperature



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