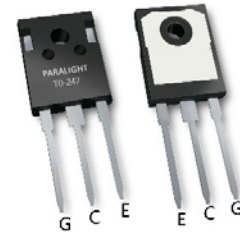
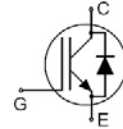


650V 50A CoolFAST™ 7 Technology IGBT**Features:**

- Low switching power loss
- Low switching surge and noise
- Advanced field stop technology
- Low EMI
- Maximum junction temperature 175°C
- Qualified according to JEDEC for target applications
- Pb-free lead plating, halogen-free mold compound, RoHS compliant

Applications:

- Industrial UPS
- Welding machine
- Solar converters
- Energy storage
- EV charger

**Key Performance and Package Parameters**

Type	V _{CE}	I _C	V _{CEsat} , T _{Vj} =25°C	T _{Vjmax}	T _{sc}	Marking	Package
PC50N065AH7S	650V	50A	1.6V	175°C	5μs	PC50N065AH7S	TO247-3

Maximum Ratings and Characteristics**Absolute Maximum Ratings at T_{Vj}= 25°C (unless otherwise specified)**

Parameter	Symbols	Value	Units
Collector-emitter voltage	V _{CEs}	650	V
DC collector current, limited by T _{Vjmax} T _C = 25°C	I _C	100	A
T _C = 100°C		50	
Pulsed collector current, t _p limited by T _{Vjmax}	I _{Cpuls}	200	A
Turn-off safe operating area V _{CEs} ≤ 650V, T _{Vj} ≤ 175°C, t _p = 1μs	-	200	A
Diode forward current, limited by T _{Vjmax} T _C = 25°C	I _F	50	A
T _C = 100°C		30	
Short circuit withstand time, V _{GE} = 15V, V _{CE} ≤ 400V	T _{SC}	5	μs
Gate-emitter voltage	V _{GES}	±20	V
Transient gate-emitter voltage (t _p ≤ 10μs, D < 0.010)		±30	
IGBT max. power dissipation	P _{D_IGBT}	300	W
FWD max. power dissipation	P _{D_FWD}	250	W
Operating junction temperature	T _{Vj}	-40 ~ +175	°C
Storage temperature	T _{stg}	-40 ~ +175	°C

Thermal Resistance

Parameter	Symbols	Value			Unit
		Min	Typ	Max	
Rth Characteristics					
Thermal resistance, junction-ambient	Rth(j-a)	-	-	40	°C /W
Thermal resistance, IGBT junction-case	Rth(j-c)	-	-	0.5	
Thermal resistance, diodes junction-case	Rth(i-c)	-	-	0.6	

Electrical Characteristics at $T_{vj}= 25^{\circ}\text{C}$ (unless otherwise specified)

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Static Characteristic						
Collector-emitter breakdown voltage	V _{(BR)CES}	V _{GE} =0V, I _C =0.50mA	650	-	-	V
Collector-emitter saturation voltage	V _{CEsat}	V _{GE} = 15V, I _C =50A	-	1.6	2.0	V
		T _{vj} = 25°C	-	2.2	-	
Diode forward voltage	V _F	I _F = 50A	-	2.1	3.0	V
		T _{vj} = 25°C	-	1.5	-	
		T _{vj} = 175°C				
Gate-emitter threshold voltage	V _{GE(th)}	V _{CE} = V _{GE} , I _C = 250uA	5.0	5.8	6.6	V
Zero gate voltage collector current	I _{CES}	V _{CE} = 650V, V _{GE} = 0V	-	-	250	μA
Gate-emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	±200	nA

Electrical Characteristics at $T_{vj}= 25^{\circ}\text{C}$ (unless otherwise specified)

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Dynamic Characteristic						
Input capacitance	C _{ies}	V _{CE} = 25V, V _{GE} = 0V f= 1MHz	-	6800	-	pF
Output capacitance	C _{oes}		-	200	-	pF
Reverse transfer capacitance	C _{res}		-	72	-	pF
Gate charge	Q _G	V _{CC} = 520V, I _C = 50A, V _{GE} = 15V	-	215	-	nC

Switching Characteristics at $T_{vj}= 25^{\circ}\text{C}$

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}= 400V$ $I_C= 50A$ $V_{GE}= 15V$ $R_G= 10\Omega$ Inductive load	-	85	-	ns
Rise time	t_r		-	42	-	ns
Turn-off delay time	$t_{d(off)}$		-	180	-	ns
Fall time	t_f		-	100	-	ns
Turn-on energy	E_{on}		-	1.0	-	mJ
Turn-off energy	E_{off}		-	0.7	-	mJ
Total switching energy	E_{ts}		-	1.7	-	mJ

Switching Characteristics at $T_{vj}= 25^{\circ}\text{C}$

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Diode Characteristics						
Diode reverse recovery time	t _{rr}	V _R = 400V	-	40	-	ns
Diode reverse recovery charge	Q _{rr}	I _F = 50A	-	0.35	-	μC
Diode peak reverse recovery current	I _{rrm}	di _F /dt= 500A/μs	-	7.7	-	A

Switching Characteristics at $T_{vj}= 175^{\circ}\text{C}$

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	t _{d(on)}	V _{CC} = 400V I _C = 50A V _{GE} = 15V R _G = 10Ω Inductive load	-	77	-	ns
Rise time	t _r		-	43	-	ns
Turn-off delay time	t _{d(off)}		-	200	-	ns
Fall time	t _f		-	122	-	ns
Turn-on energy	E _{on}		-	1.1	-	mJ
Turn-off energy	E _{off}		-	0.8	-	mJ
Total switching energy	E _{ts}		-	1.9	-	mJ

Switching Characteristics at $T_{vj}= 175^{\circ}\text{C}$

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Diode Characteristics						
Diode reverse recovery time	t _{rr}	V _R = 400V I _F = 50A di _F /dt= 500A/μs	-	58	-	ns
Diode reverse recovery charge	Q _{rr}		-	0.7	-	μC
Diode peak reverse recovery current	I _{rrm}		-	28	-	A

Typical Characteristics

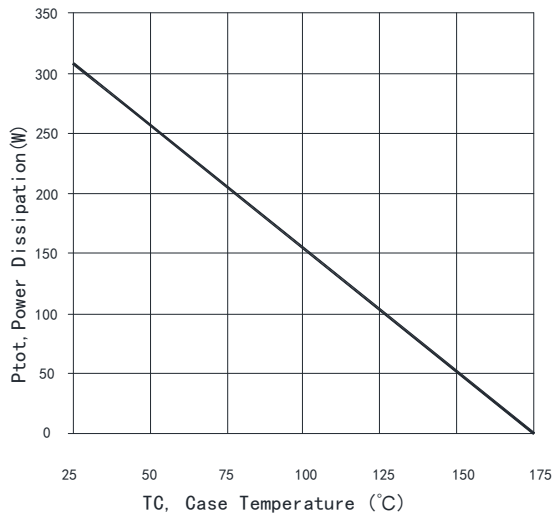


Fig. 1 Power dissipation vs. case temperature (Tvj≤175°C)

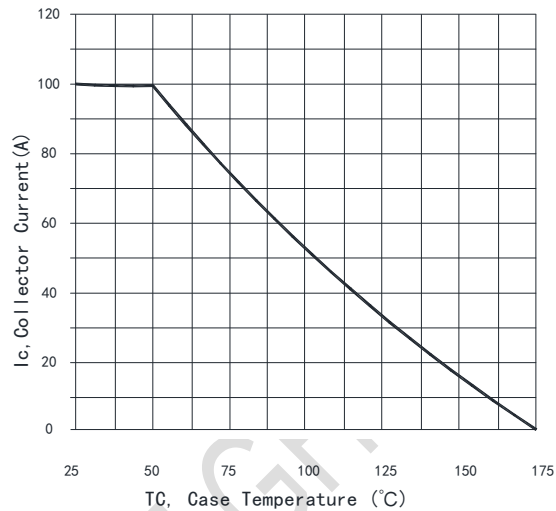


Fig. 2 Collector current vs. case temperature (Vge≤15V, Tvj≤175°C)

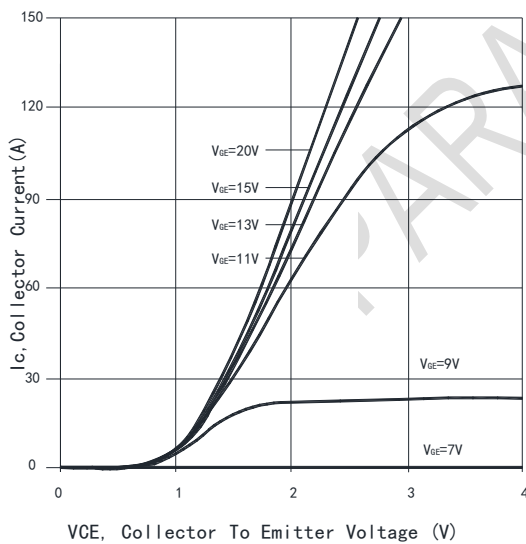


Fig. 3 output characteristic (Tvj=25°C)

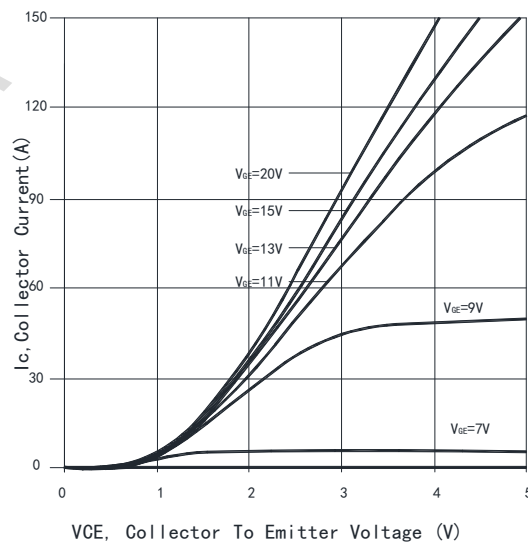


Fig. 4 Typical output characteristic (Tvj=175°C)

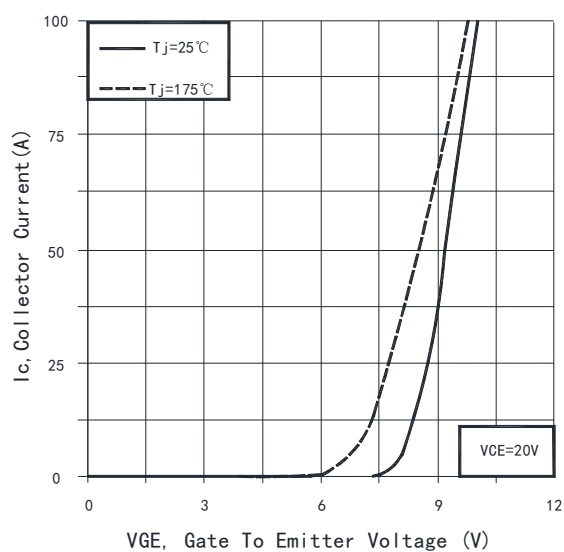


Fig. 5 Typical transfer characteristic ($V_{CE}=20\text{V}$)

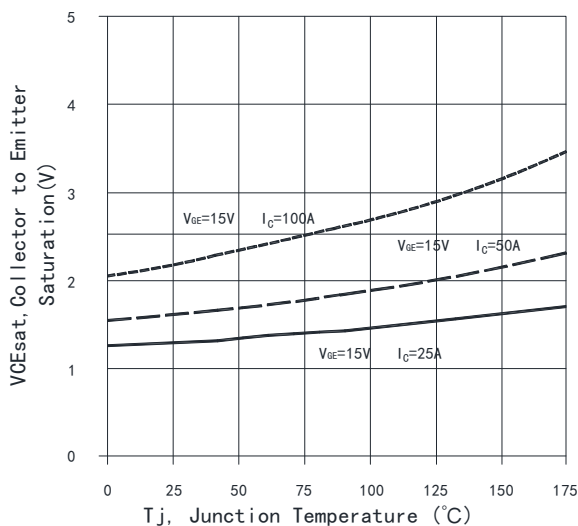


Fig. 6 Typical collector-emitter saturation voltage vs. T_j ($V_{GE}=15\text{V}$)

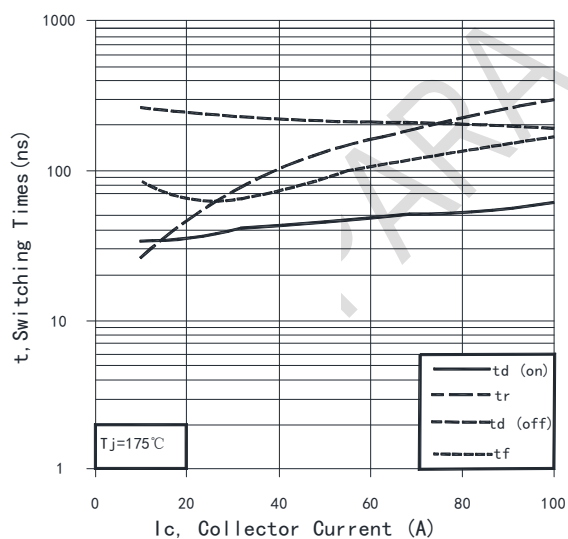


Fig. 7 Typical switching times vs. collector current ($T_j=175^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_g=10\Omega$)

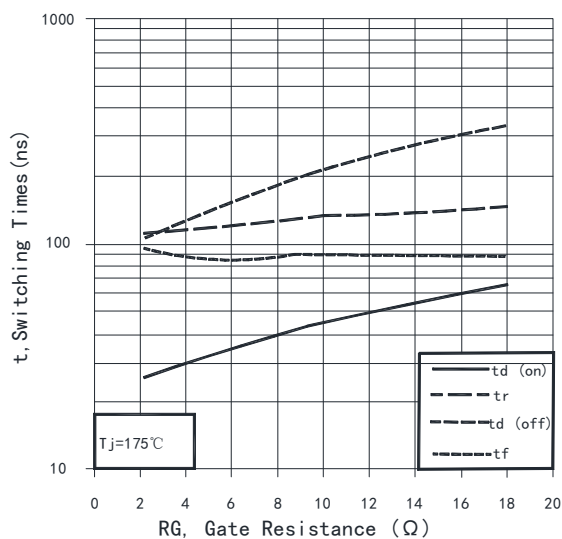


Fig. 8 Typical switching times vs. gate resistor ($T_j=175^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $I_c=50\text{A}$)

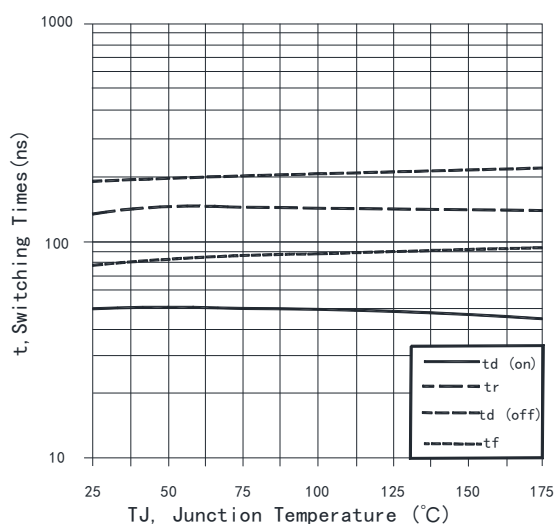


Fig. 9 Typical switching times vs. T_j
($V_{CE}=400V$, $V_{GE}=15V$, $I_C=50A$, $R_g=10\Omega$)

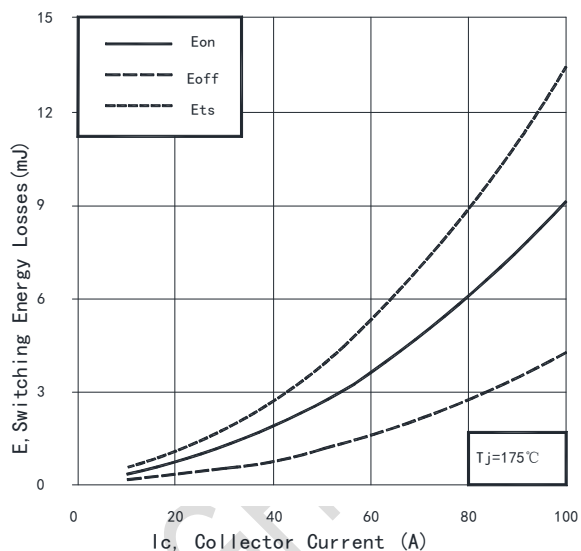


Fig. 10 Typical switching times vs. I_C
($T_{vj}=175^\circ C$, $V_{CE}=400V$, $V_{GE}=15V$, $R_g=10\Omega$)

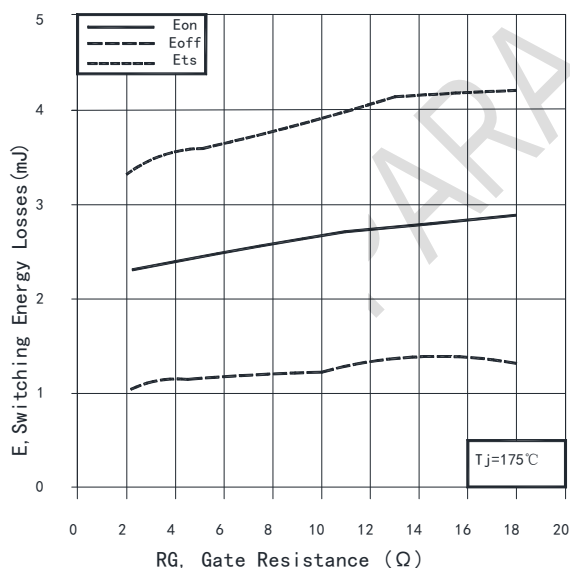


Fig. 11 Typical switching losses vs. R_g
($T_{vj}=175^\circ C$, $V_{CE}=400V$, $V_{GE}=15V$, $I_C=50A$)

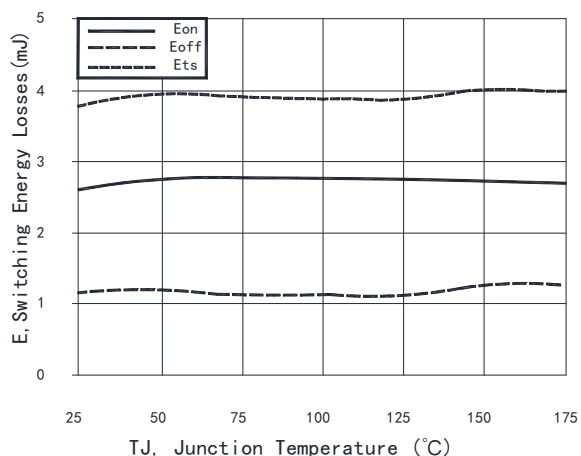


Fig. 12 Typical switching losses vs. T_j
($V_{CE}=400V$, $V_{GE}=15V$, $I_C=50A$, $R_g=10\Omega$)

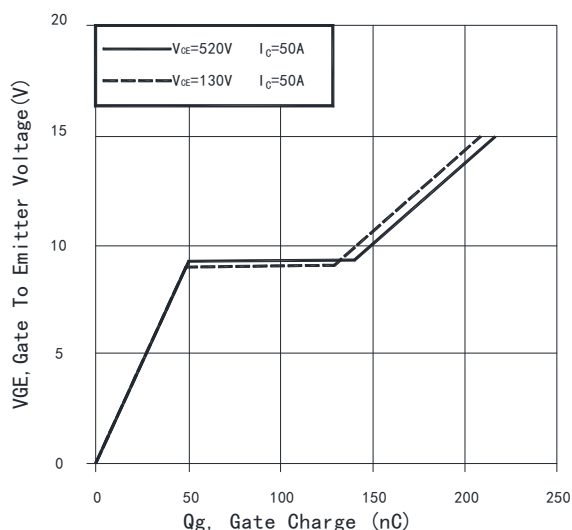


Fig. 13 Typical gate charge($I_c=50A$, $V_{ce}=520V$ & $V_{ce}=130V$, $T_{vj}=25^\circ C$)

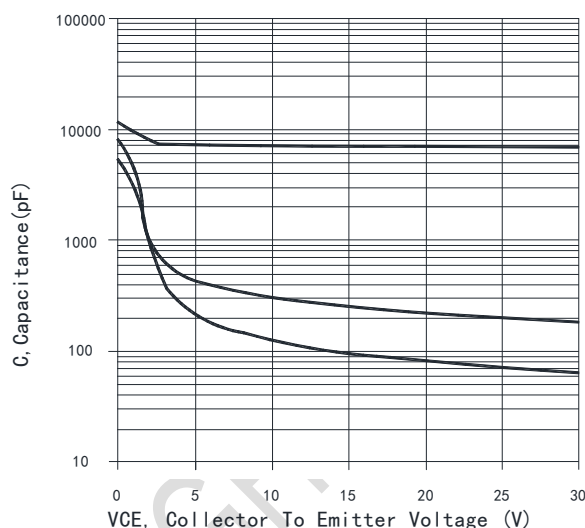


Fig. 14 Typical capacitance vs. collector-emitter voltage ($V_{ge}=0V$, $f=1MHz$)

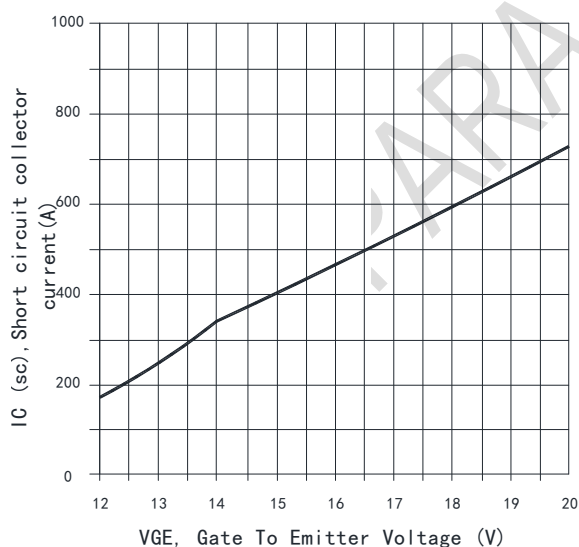


Fig. 15 Typical short circuit collector current vs. gate-emitter voltage ($V_{ce} \leq 400V$, start at $T_{vj}=25^\circ C$)

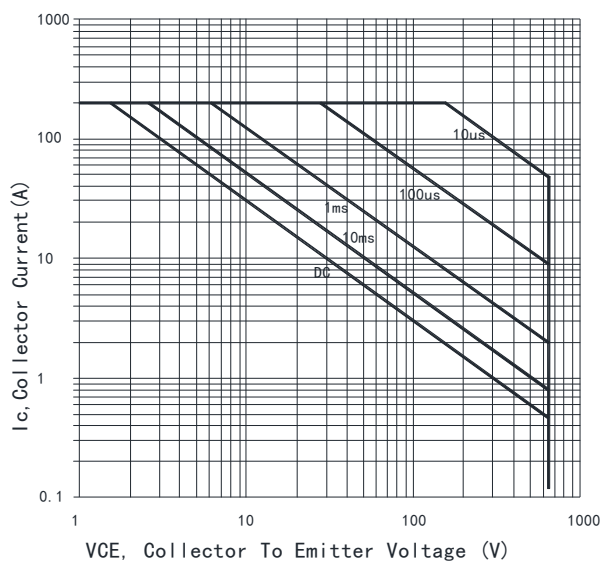


Fig. 16 Forward bias safe operating area ($V_d=0$, $T_c = 25^\circ C$, $T_j = 175^\circ C$, $V_{ge}=15V$)

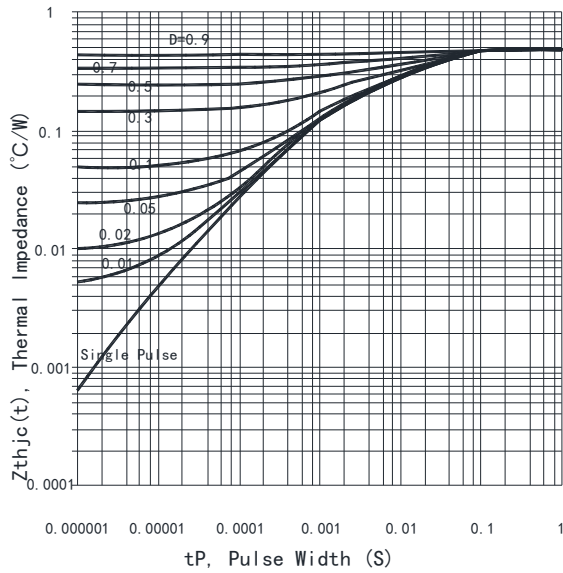


Fig. 17 IGBT transient thermal impedance ($D=t_P/T$)

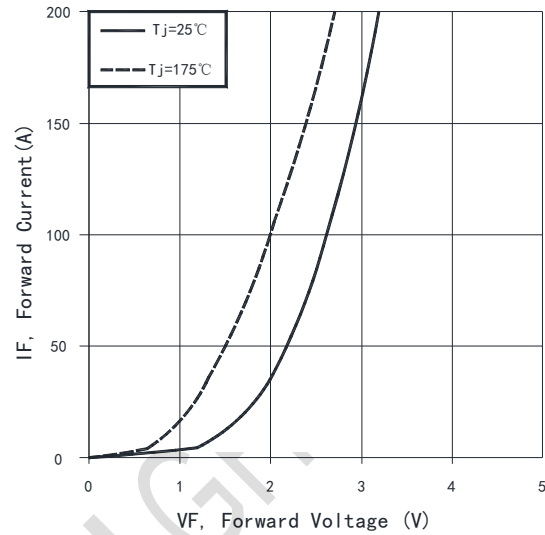


Fig. 18 Typical diode forward current vs. forward

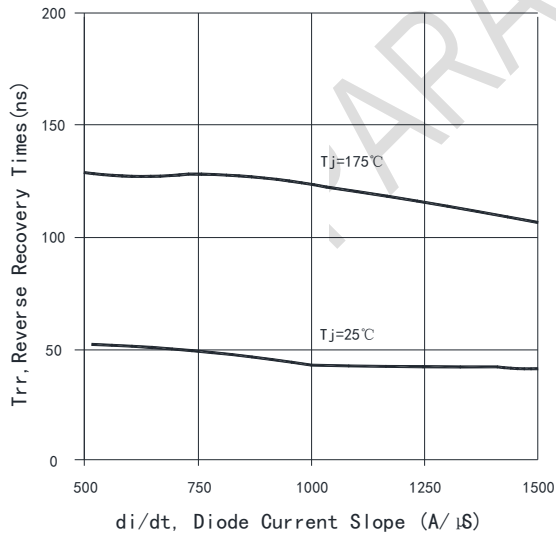


Fig. 19. Typical reverse recovery time vs. diode current slope ($V_R=400\text{V}$)

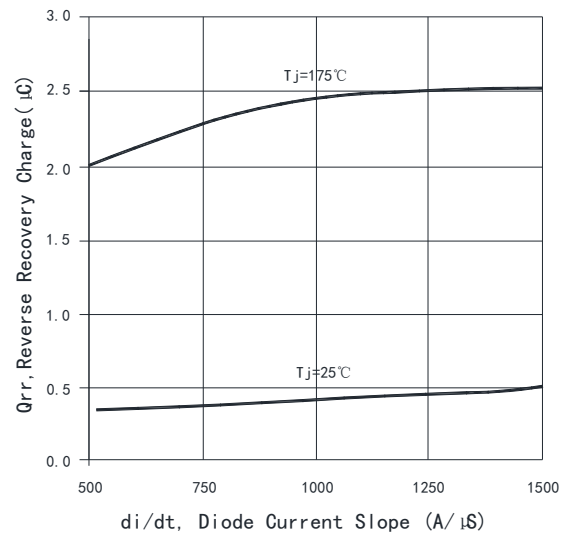


Fig. 20. Typical reverse recovery charge vs. diode current slope ($V_R=400\text{V}$)

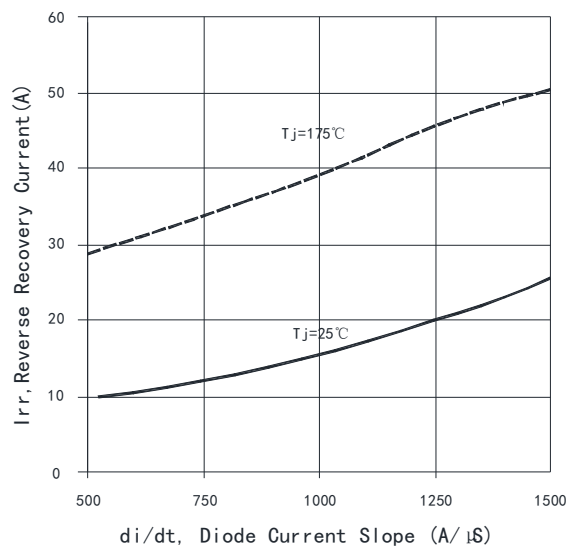
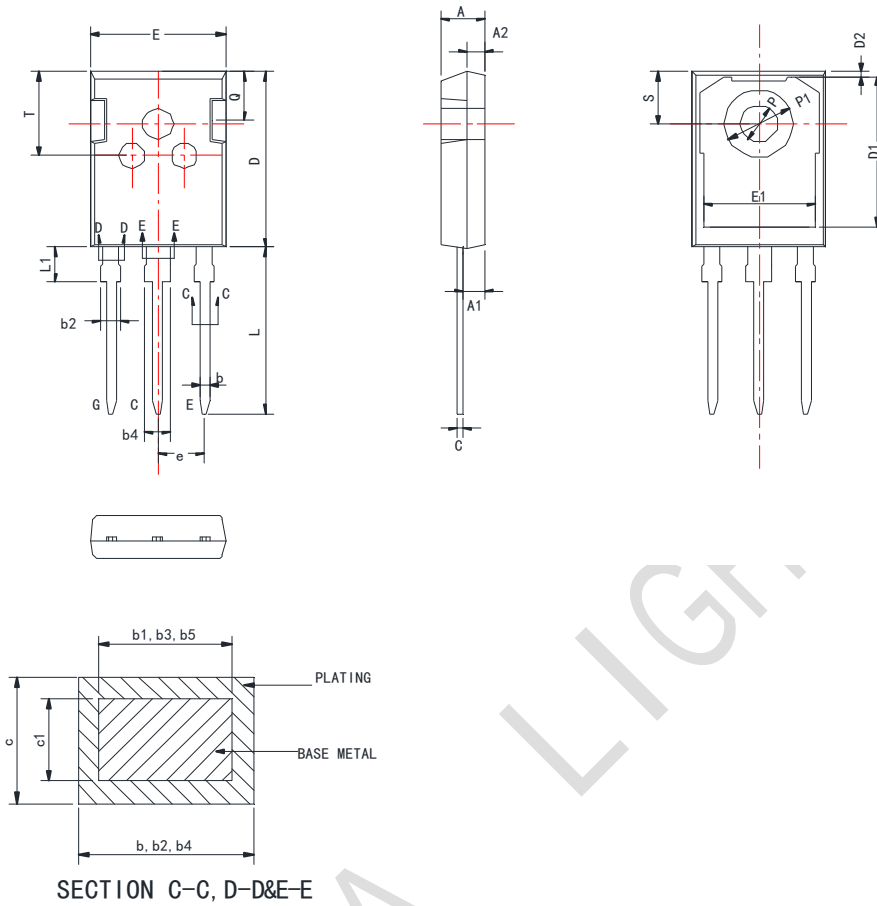


Fig. 21. Typical reverse recovery current vs. diode current slope ($V_R=400\text{V}$)

Package Dimensions



Common dimensions(mm)							
Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	4.83	-	5.21	E	15.7	15.9	16.13
A1	2.27	2.41	2.54	E1	13.1	-	14.15
A2	1.85	-	2.16	e	5.4TYP		
b	1.07	-	1.33	Q	5.49	5.7	6.0
b2	1.9	-	2.41	S	6.15 BSC		
b4	2.87	-	3.38	L	19.8	19.92	20.3
c	0.55	-	0.68	L1	4.1	-	4.47
D	20.9	21.0	21.1	P	3.51	3.6	3.65
D1	16.25	-	17.65	P1	-	-	7.4
D2	0.95	1.17	1.35	-	-	-	-

PART NO. SYSTEM :

P C 50 N 065 A H 7 S

Short circuit withstand time:
S:5μs

Internal code

Package type :

"A": TO-247; "B": TO-220; "C": TO-252;
"D": TO-263; "E": TO-3PN;
"G": TO-247 plus; "H": TO247iPS

Voltage: 010=100V;
065=650V; 120=1200V

Chip type : "N": N Channel IGBT+FRD ;
"P": P Channel IGBT+FRD ;
"I": Si IGBT; "F": FRD ; "M": Si MOS ;
"S": SiC MOS; "C": SiC IGBT+SBD

Current :

(a) < 100A; 05=5A; 15=15A; 40=40A;
(b) ≥ 100A; 2B=100A; 3B=150A;
4B=200A

PIN : "C" : 3 PIN ; "D": 4 PIN; "F" : 5PIN

PARA LIGHT

Revision history

Document revision history

Date	Version	Changes
2023.11.17	A / 0	First release.
2024.01.24	A / 1	Present version