GOSTONE

RoHS COMPLIANT

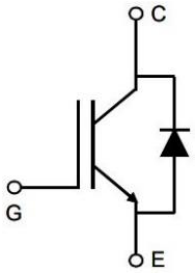
GA50F06K1BK

650V, 50A IGBT with soft and fast recovery anti-parallel diode

Product Summary

Parameter	Value
V_{CE}	650V
I_C(T_C=100℃)	50A
$V_{CE\ (sat)}$ (T_J=25℃)	1.8V

Equivalent circuit

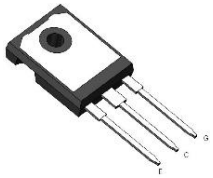


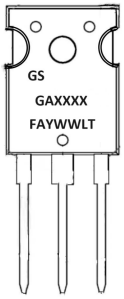
Features

- Trench and field-stop technology.
- Easy parallel switching capability.
- High efficiency for inverters.
- High ruggedness performance.
- RoHS compliant.

Application

- PFC applications
- Uninterruptible power supplies
- Solar inverters





TO247

NOTE:
LOGO - GS
GAXXXX - Part number code
F - Fab location code
A - Assembly location code
Y - Year code
WW - Week code
L&T - Assembly lot code

Note : This Gostone product is Consumer grade product and applicable for Solar Inverters and other similar end devices. Please also read Important Notice at the end of this document.

Absolute Maximum ratings Ta = 25°C

Symbol	Parameter	Values	Unit
V_{CES}	Collector-emitter voltage	650	V
V_{GES}	Gate-emitter voltage	±20	V
I_C	Continuous collector current (T_C=25℃)	100	A
	Continuous collector current (T_C=100℃)	50	A
I_{CM}	Pulsed collector current, t_p limited by T_{vjmax}	200	A
I_F	Diode continuous forward current (T_C=100℃)	50	A
I_{FM}	Diode maximum current, t_p limited by T_{vjmax}	200	A
P_{tot}	Power dissipation (T_C=25℃)	535	W
	Power dissipation (T_C=100℃)	267	W
T_{vj}	Operating junction temperature range	-40 to +175	℃
T_{stg}	Storage temperature range	-55 to +150	℃

Thermal Characteristic

Symbol	Parameter	Values		Unit
		Typ.	Max.	
$R_{th(j-c)}$	Thermal resistance, junction to case for IGBT	-	0.28	K/ W
$R_{th(j-c)}$	Thermal resistance, junction to case for Diode	-	0.42	K/ W
$R_{th(j-a)}$	Thermal resistance, junction to ambient	-	40	K/ W

Electrical characteristics of IGBT (Tvj=25℃ unless otherwise specified)

Static characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
BV_{CES}	Collector-emitter breakdown voltage	V_{GE}=0V, I_C=250μA	650	-	-	V
I_{CES}	Collector-emitter leakage current	V_{CE}=650V, V_{GE}=0V	-	-	50	μA
I_{GES}	Gate leakage current, forward	V_{GE}=20V, V_{CE}=0V	-	-	100	nA
	Gate leakage current, reverse	V_{GE}=-20V, V_{CE}=0V	-	-	-100	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	V_{GE}=V_{CE}, I_C=1mA	5.0	5.4	5.6	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE}=15 V, I_C=60A	-	1.8	-	V
		V_{GE}=15V, I_C=60A, T_{vj}=175℃	-	2.3	-	V

Dynamic characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
C_{ies}	Input capacitance	V_{CE}=30V V_{GE}=0V f=1MHz	-	4820	-	pF
C_{oes}	Output capacitance		-	170	-	pF
C_{res}	Reverse transfer capacitance		-	34	-	pF
Q_g	Total gate charge	V_{CC}=520V V_{GE}=15V I_C=60A	-	154	-	nC

Switching characteristicsElectrical

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	V_{CC}=400V V_{GE}=0/15V I_C=50A R_G=10Ω Inductive load	-	52	-	ns
t_r	Rise time		-	82	-	ns
$t_{d(off)}$	Turn-off delay time		-	193	-	ns
t_f	Fall time		-	61	-	ns
E_{on}	Turn-on energy		-	1.7	-	mJ
E_{off}	Turn-off energy		-	1.0	-	mJ
E_{ts}	Total switching energy		-	2.7	-	mJ
$t_{d(on)}$	Turn-on delay time	V_{CC}=400V V_{GE}=0/15V I_C=50A R_G=10Ω Inductive load T_{vj} =175℃	-	49	-	ns
t_r	Rise time		-	85	-	ns
$t_{d(off)}$	Turn-off delay time		-	210	-	ns
t_f	Fall time		-	68	-	ns
E_{on}	Turn-on energy		-	2.5	-	mJ
E_{off}	Turn-off energy		-	1.0	-	mJ
E_{ts}	Total switching energy		-	3.5	-	mJ

Electrical characteristics of Diode (T_{vj}=25℃ unless otherwise specified)

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
V_F	Diode forward voltage	I_F=50A	-	1.8	-	V
		I_F=50A,T_{vj}=175℃	-	1.4	-	V
t_{rr}	Diode reverse recovery time	V_R=400V I_F=50A di_F/dt=-800A/μs	-	82	-	ns
I_{rrm}	Diode peak reverse recovery current		-	15	-	A
Q_{rr}	Diode reverse recovery charge		-	698	-	nC
t_{rr}	Diode reverse recovery time	V_R=400V I_F=50A di_F/dt=-800A/μs T_{vj}=175℃	-	132	-	ns
I_{rrm}	Diode peak reverse recovery current		-	26	-	A
Q_{rr}	Diode reverse recovery charge		-	2194	-	nC

Typical performance characteristics

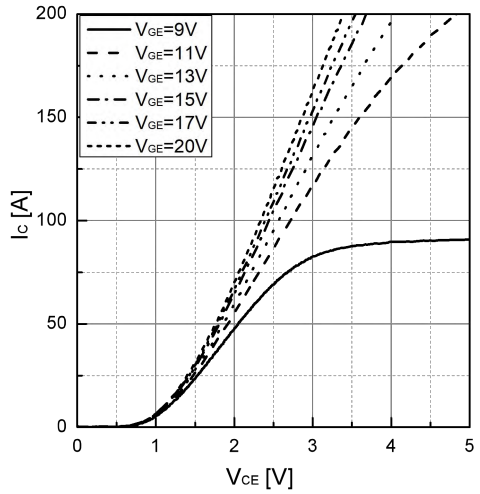


Fig 1. Typical output characteristic (T_{vj}=25℃)

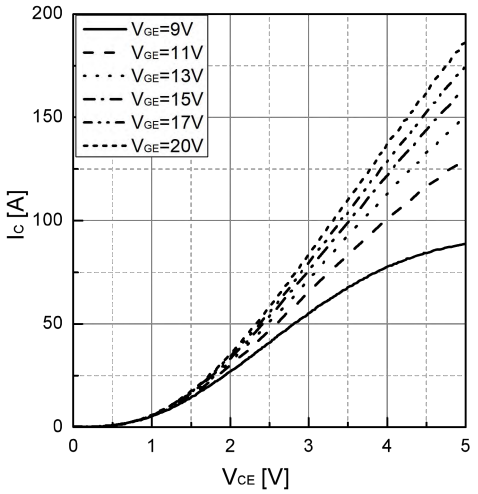


Fig 2. Typical output characteristic(T_{vj}=175℃)

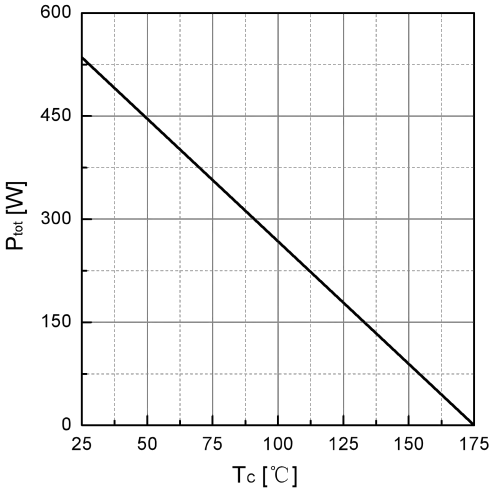


Fig 3. Power dissipation as a function of T_C

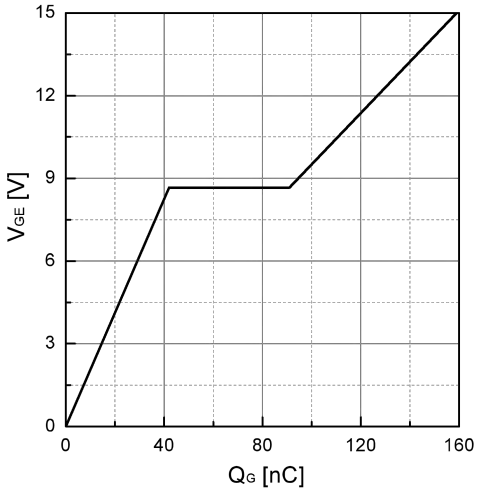


Fig 4. Typical Gate charge

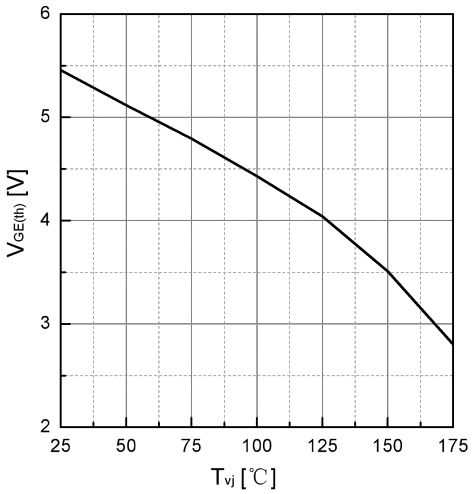


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

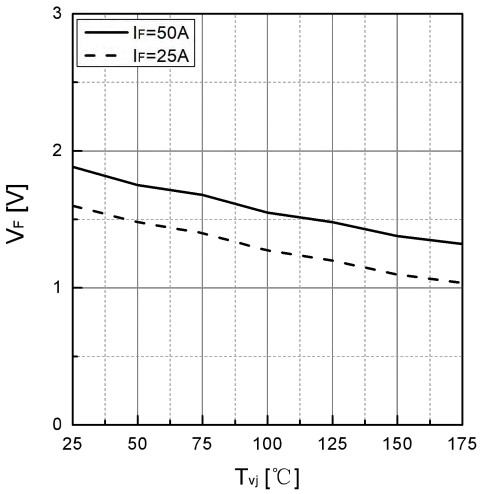


Fig 6. Typical V_F as a function of T_{vj}

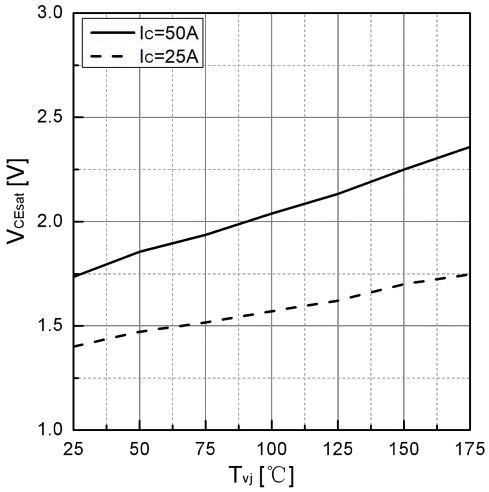


Fig 7. Typical V_{CEsat} as a function of T_{vj}

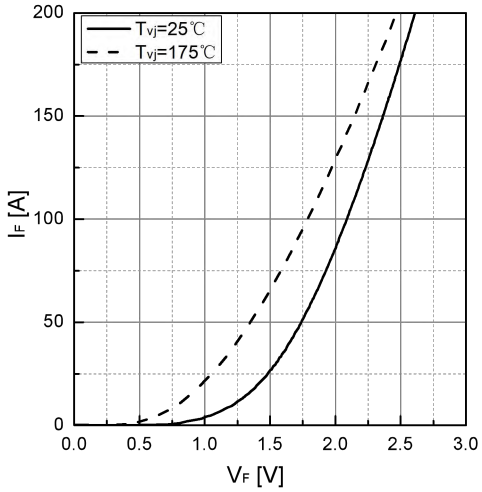


Fig 8. Typical I_F as a function of V_F

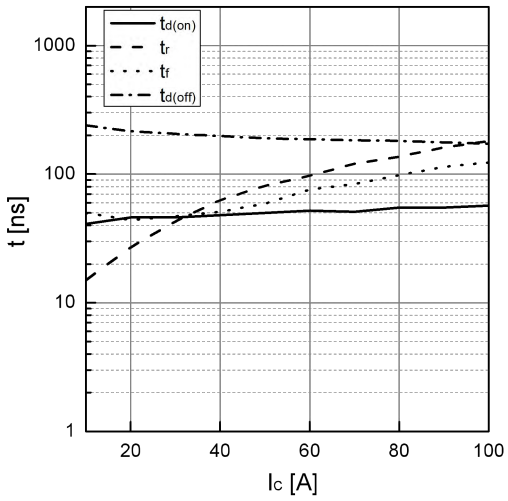


Fig 9. Typical switching time as a function of I_C

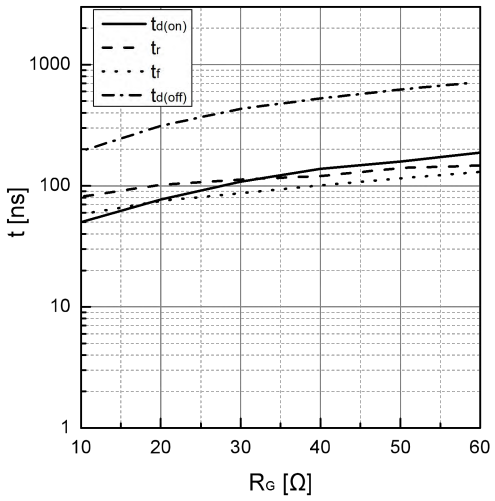


Fig 10. Typical switching times as a function of R_G

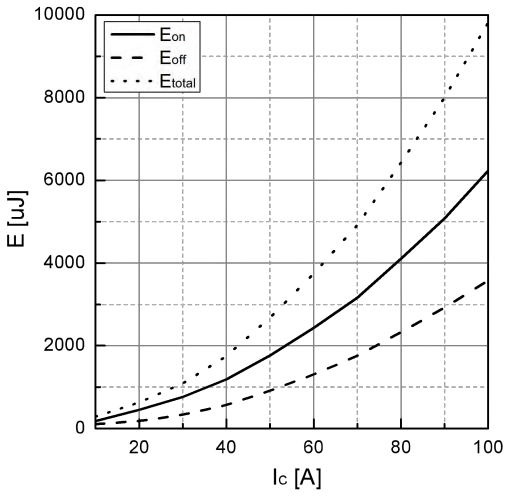


Fig 11. Typical switching energy losses as a function of I_C

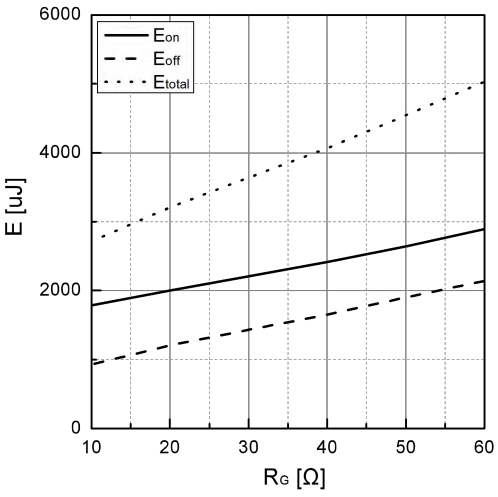


Fig 12. Typical switching energy losses as a function of R_G

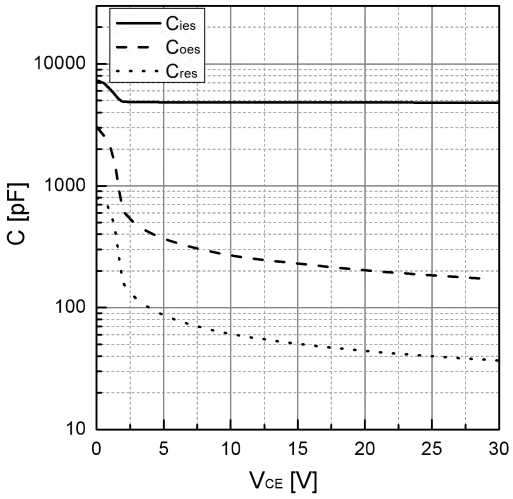


Fig 13. Typical capacitance as a function of V_{CE} (f=1Mhz, V_{GE}=0V)

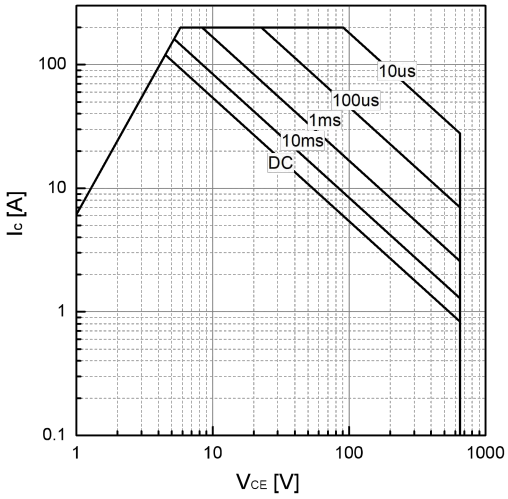


Fig 14. Safe operating area

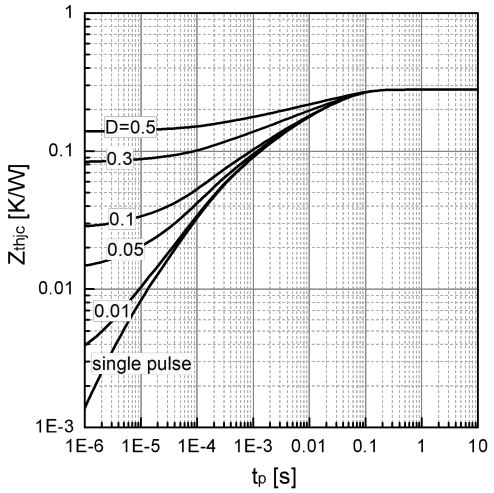
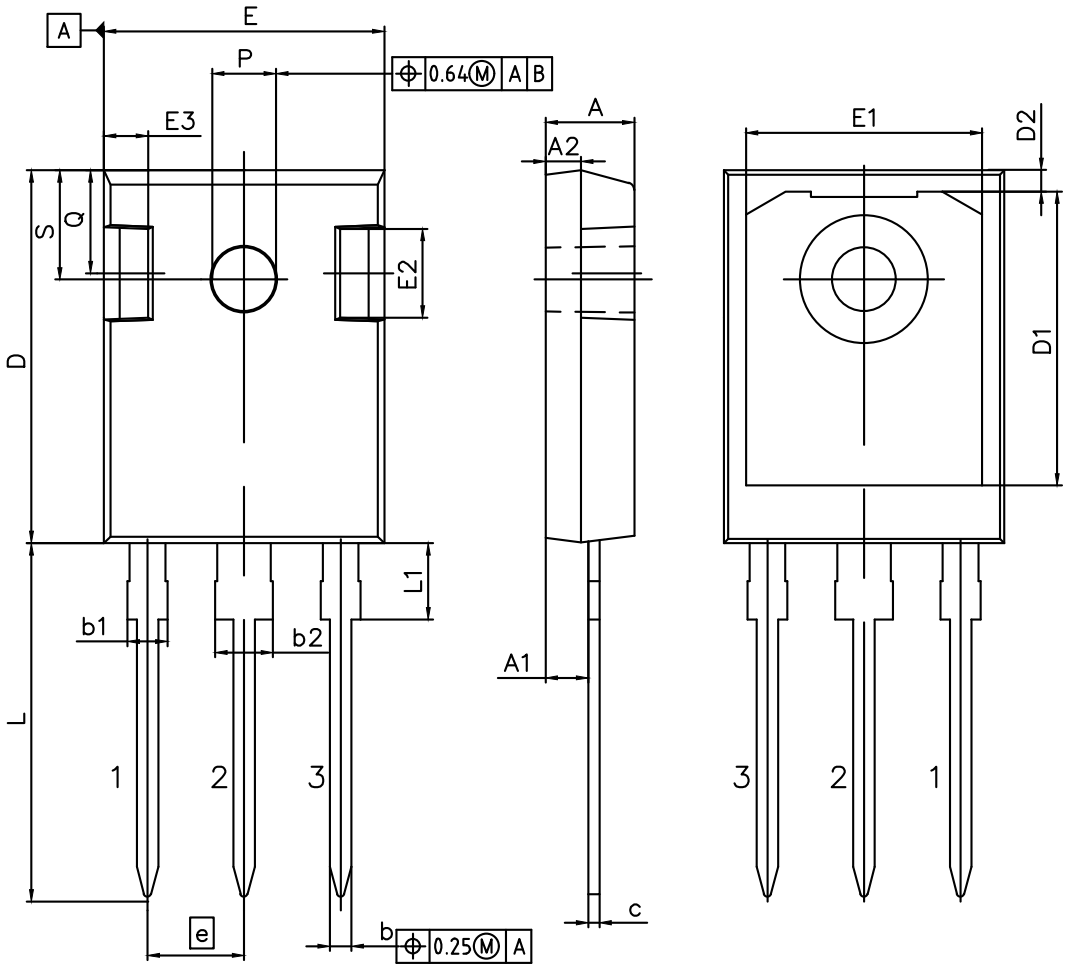


Fig 15. Transient thermal impedance of IGBT

Package Drawing TO-247



DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.70	5.30
A1	2.20	2.60
A2	1.50	2.50
b	1.00	1.40
b1	1.60	2.41
b2	2.57	3.43
c	0.38	0.89
D	20.70	21.50
D1	13.08	17.65
D2	0.51	1.35
E	15.50	16.30
E1	12.38	14.15
E2	3.40	5.10
E3	1.00	2.60
e	5.44	
L	19.80	20.40
L1	3.85	4.50
P	3.50	3.70
Q	5.35	6.25
S	6.04	6.30

Important Notice

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