

Product Summary

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

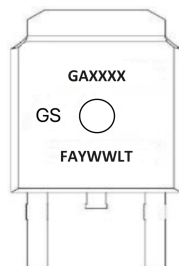
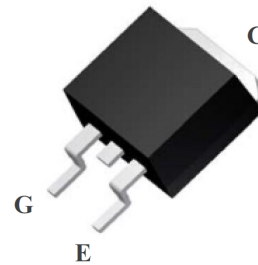
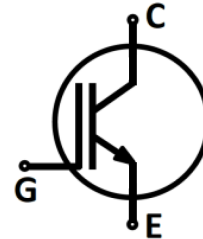
Features

- ✓ 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

Equivalent circuit



TO-220C

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

Absolute Maximum ratings $T_a = 25^{\circ}\text{C}$

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

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	$V_{GE}=0V, I_C=250\mu A$	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	$V_{GE}=15V, I_C=60A$	-	1.8	-	V
		$V_{GE}=15V, I_C=60A, T_{vj}=175^\circ C$	-	2.3	-	V

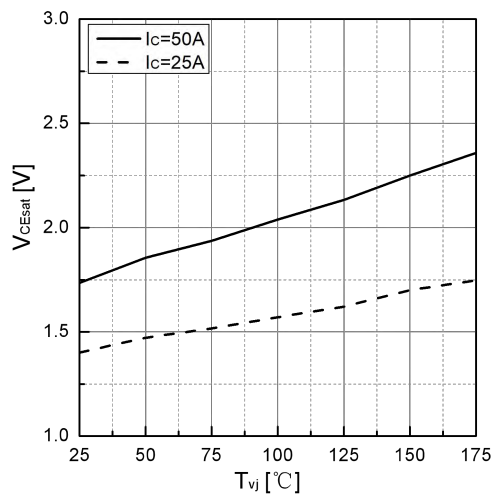
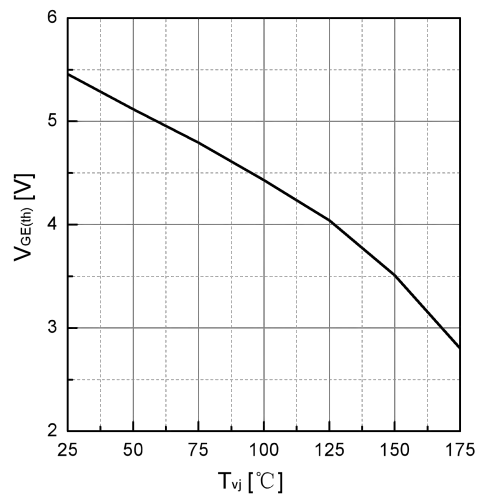
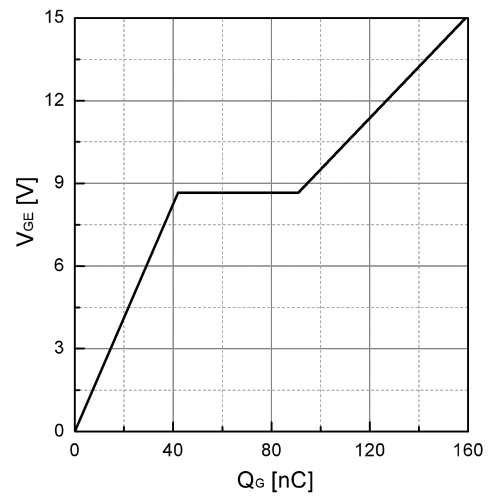
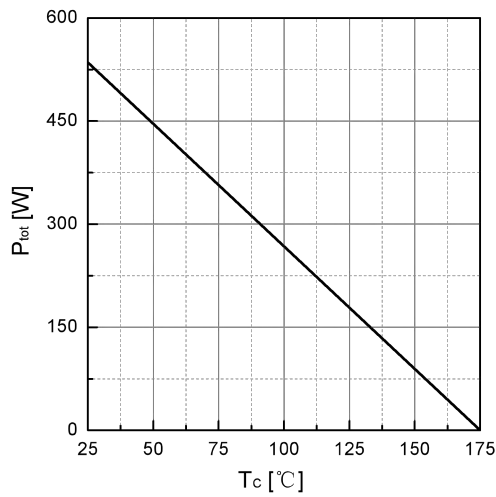
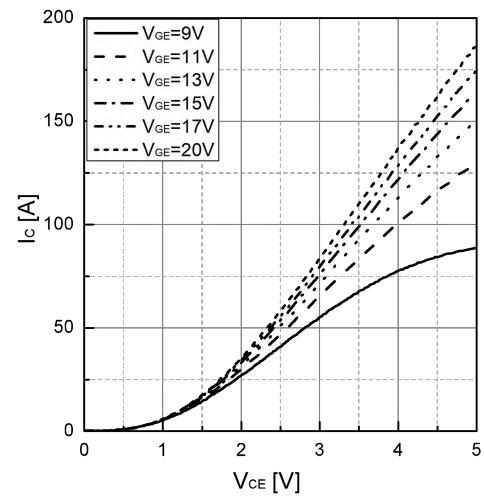
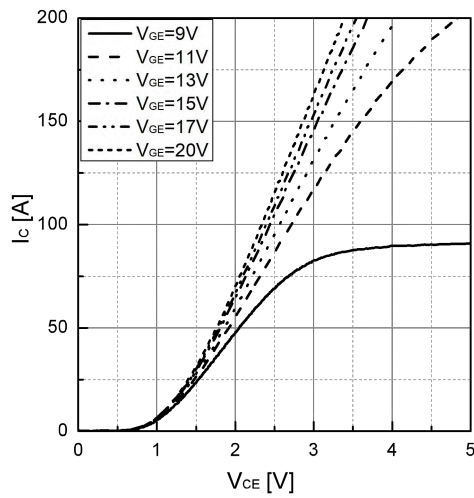
Dynamic characteristics

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 characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=50A$ $R_G=10\Omega$ 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	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=50A$ $R_G=10\Omega$ Inductive load $T_{vj}=175^{\circ}C$	-	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

Typical performance characteristics



Typical performance characteristics

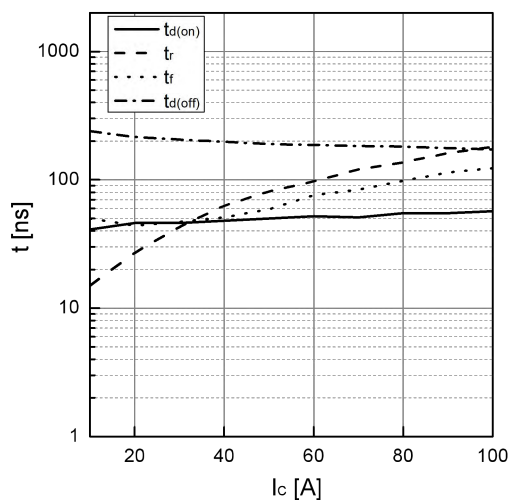


Fig 7. Typical switching time as a function of I_C

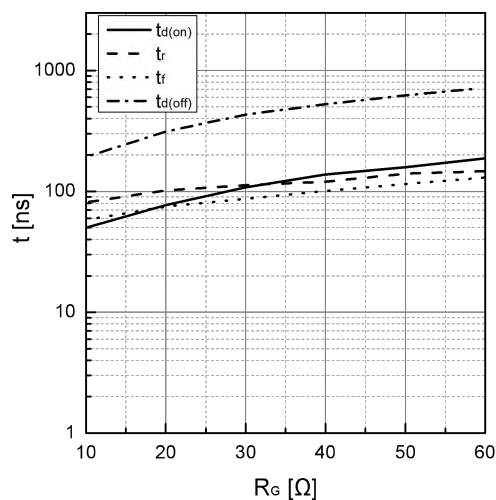


Fig 8. Typical switching times as a function of R_G

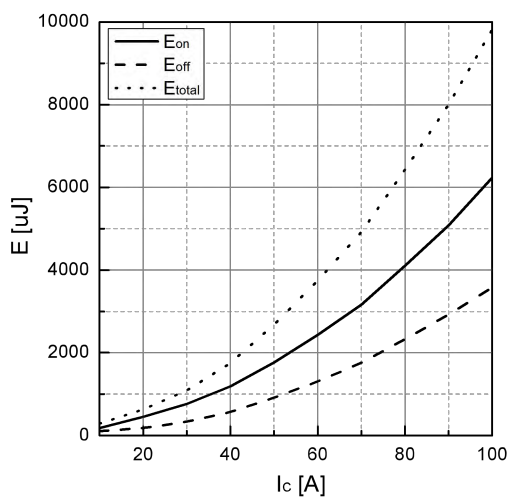


Fig 9. Typical switching energy losses as a function of I_C

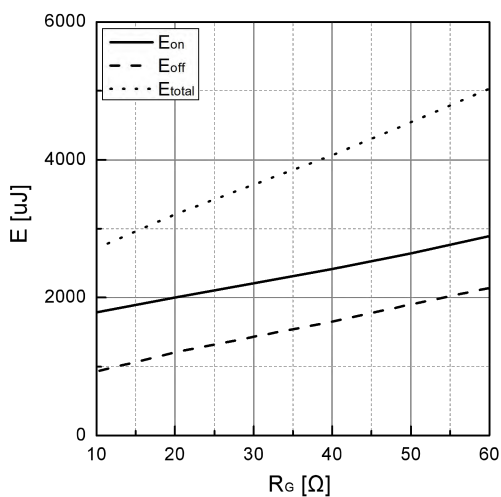


Fig 10. Typical switching energy losses as a function of R_G

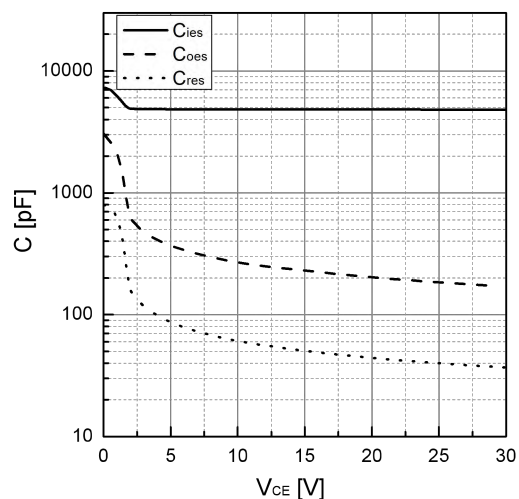


Fig 11. Typical capacitance as a function of V_{CE}
($f=1\text{MHz}$, $V_{GE}=0\text{V}$)

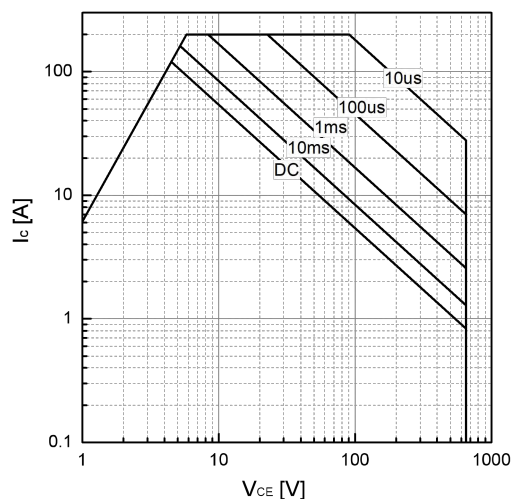


Fig 12. Safe operating area

Typical performance characteristics

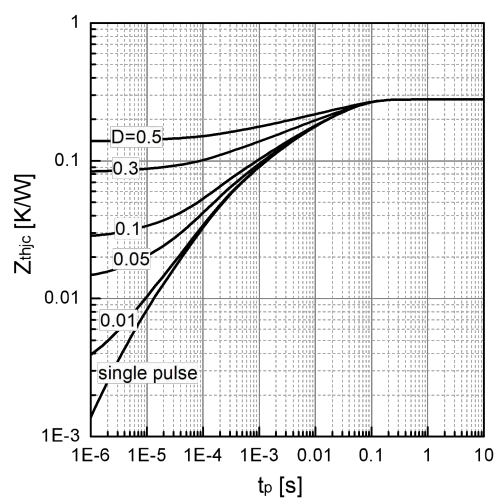
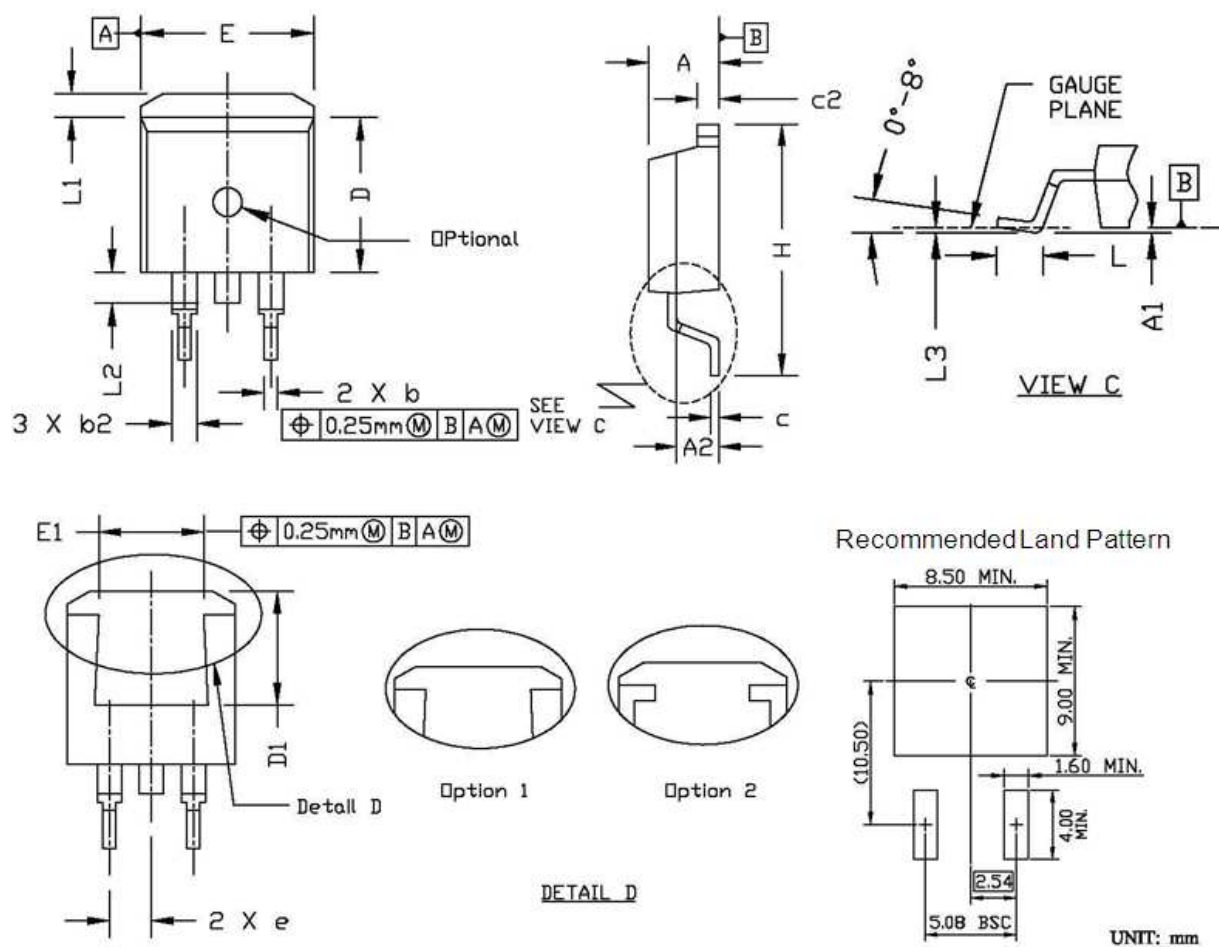


Fig 13. Transient thermal impedance of IGBT

Package Drawing TO-263


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.30	4.86	0.169	0.191
A1	0.00	0.25	0.000	0.010
A2	2.34	2.79	0.092	0.110
b	0.68	0.94	0.027	0.037
b2	1.15	1.35	0.045	0.053
c	0.33	0.65	0.013	0.026
c2	1.17	1.40	0.046	0.055
D	8.38	9.45	0.330	0.372
D1	6.90	8.17	0.272	0.322
e	2.54 BSC.		0.100 BSC.	
E	9.78	10.50	0.385	0.413
E1	6.50	8.60	0.256	0.339
H	14.61	15.88	0.575	0.625
L	2.24	3.00	0.088	0.118
L1	0.70	1.60	0.028	0.063
L2	1.00	1.78	0.039	0.070
L3	0.00	0.25	0.000	0.010

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