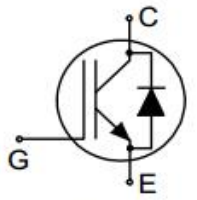
IGBT

Features

- 650V,15A
- $V_{CE(sat)(typ.)}$=1.6V@V_{GE}=15V,I_C=15A
- High ruggedness performance
- 10μs short circuit capability
- High efficiency for motor control
- Excellent current sharing in parallel operation



Applications

- Home appliances
- Motor drives
- General inverter

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Continuous Collector Current (T_C=25 ℃)	30	A
	Continuous Collector Current (T_C=100℃)	15	A
I_{CM}	Pulsed Collector Current (Note 1)	60	A
I_F	Diode Continuous Forward Current (T_C=100 ℃)	15	A
I_{FM}	Diode Maximum Forward Current (Note 1)	60	A
t_{sc}	Short Circuit Withstand Time	10	us
P_D	Maximum Power Dissipation (T_C=25 ℃)	39	W
	Maximum Power Dissipation (T_C=100℃)	19	W
T_J	Operating Junction Temperature Range	-40 to +175	℃
T_{STG}	Storage Temperature Range	-55 to +150	℃

Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th\ j\text{-}c}$	Thermal Resistance, Junction to case for IGBT	3.8	℃/ W
$R_{th\ j\text{-}c}$	Thermal Resistance, Junction to case for Diode	4.2	℃/ W
$R_{th\ j\text{-}a}$	Thermal Resistance, Junction to Ambient	50	℃/ W

Electrical Characteristics (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE}= 0V, I_C= 250uA	650	-	-	V
I_{CES}	Collector-Emitter Leakage Current	V_{CE}= 650V, V_{GE}= 0V	-	-	50	uA
I_{GES}	Gate Leakage Current, Forward	V_{GE}=±20V, V_{CE}= 0V	-	-	±100	nA
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE}= V_{CE}, I_C= 1mA	5.4	5.6	5.9	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE}=15V, I_C= 15A	-	1.6	-	V
Q_g	Total Gate Charge	V_{CC}=520V V_{GE}=15V I_C=15A	-	55	-	nC
$t_{d(on)}$	Turn-on Delay Time	V_{CC}=400V V_{GE}=15V I_C=15A R_G=10Ω Inductive Load T_C=25 ℃	-	17	-	ns
t_r	Turn-on Rise Time		-	14	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	104	-	ns
t_f	Turn-off Fall Time		-	46	-	ns
Eon	Turn-on Switching Loss		-	0.30	-	mJ
Eoff	Turn-off Switching Loss		-	0.27	-	mJ
Ets	Total Switching Loss		-	0.57	-	mJ
C_{ies}	Input Capacitance	V_{CE}=30V V_{GE}=0V f = 1MHz	-	1055	-	pF
C_{oes}	Output Capacitance		-	57	-	pF
C_{res}	Reverse Transfer Capacitance		-	15	-	pF

Electrical Characteristics of Diode (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=15A	-	1.4	-	V
t_{rr}	Diode Reverse Recovery Time	V_{CE} = 400V I_F = 15A dif/dt = 600A/us	-	55	-	ns
I_{rr}	Diode peak Reverse Recovery Current		-	9.5	-	A
Q_{rr}	Diode Reverse Recovery Charge		-	220	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature

Typical Performance Characteristics

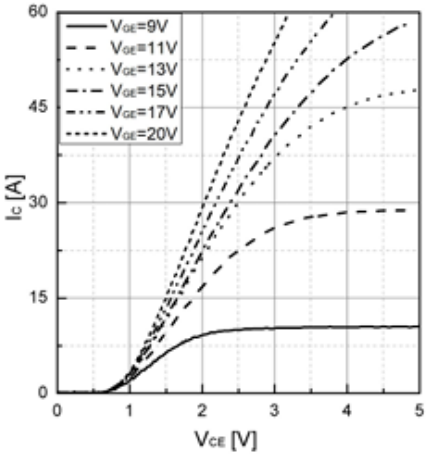


Fig 1. Typical output characteristic (T_{vj}=25℃)

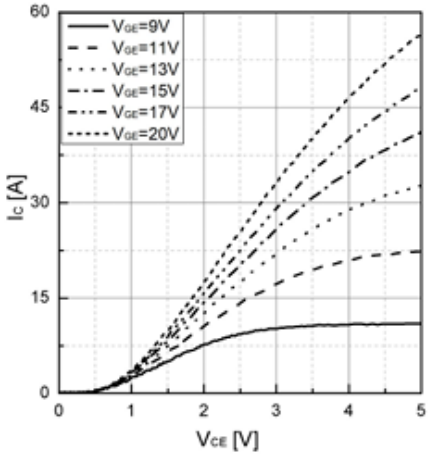


Fig 2. Typical output characteristic(T_{vj}=175℃)

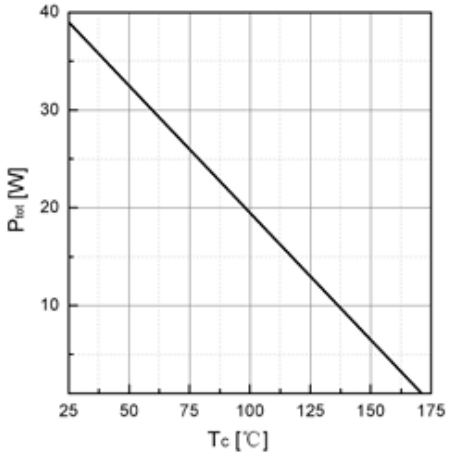


Fig 3. Power dissipation as a function of T_C

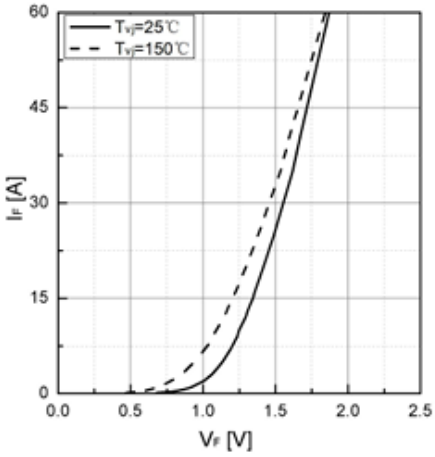


Fig 4. Typical I_F as a function of V_F

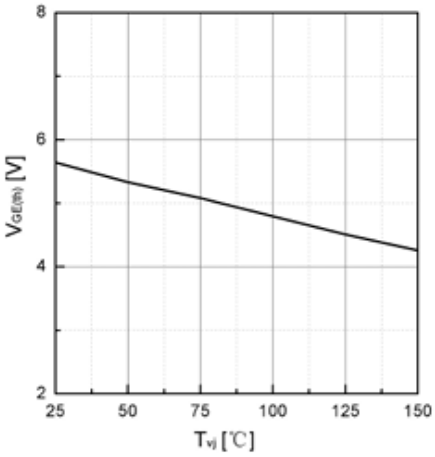


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

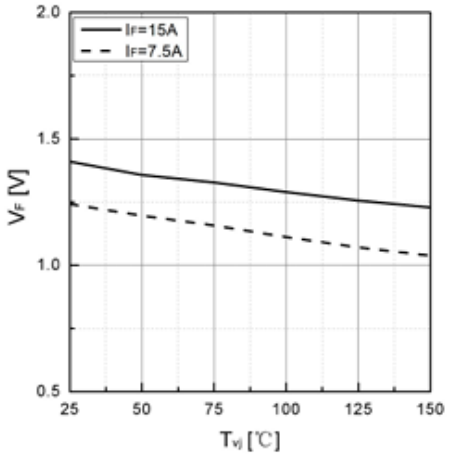


Fig 6. Typical V_F as a function of T_{vj}

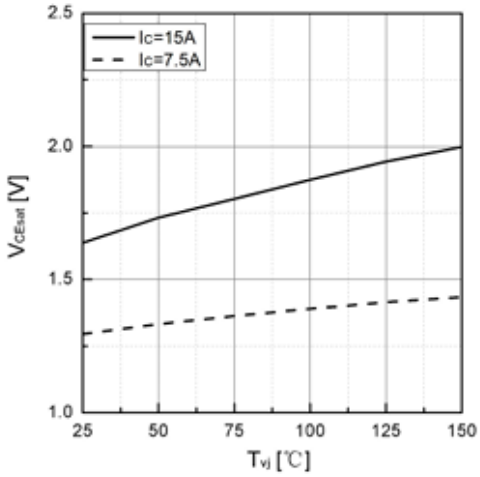


Fig 7. Typical V_{CEsat} as a function of T_{vj}

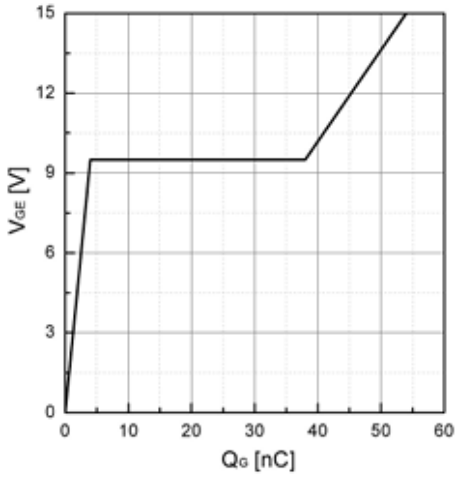


Fig 8. Typical Gate charge

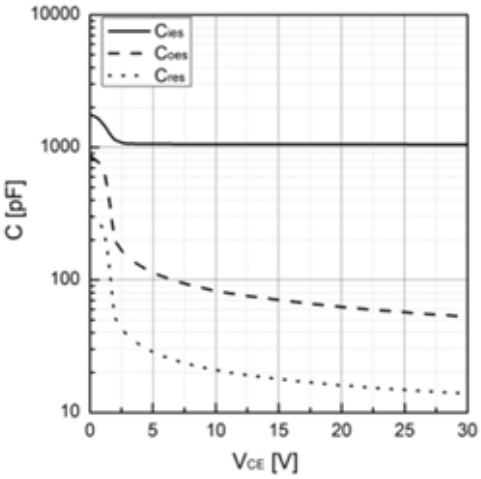


Fig 9. Typical capacitance as a function of V_{CE} (f=1Mhz, V_{GE}=0V)

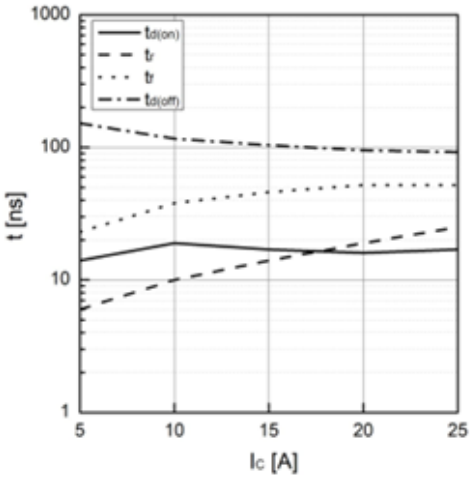


Fig 10. Typical switching times as a function of I_C

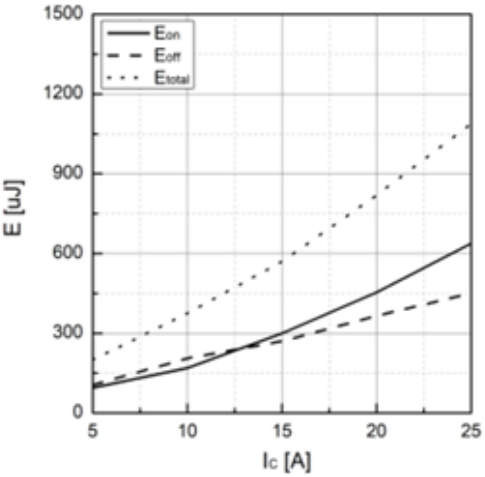


Fig 11. Typical switching energy losses as a function of I_C

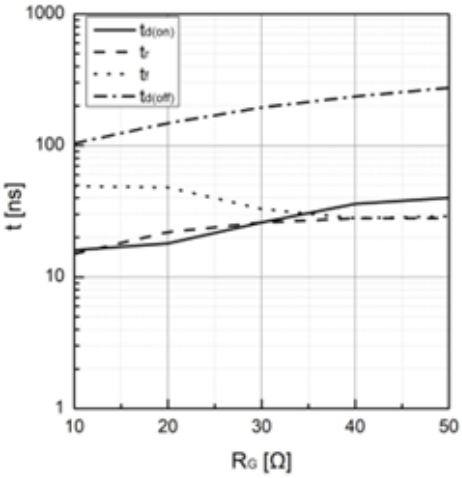


Fig 12. Typical switching times as a function of R_G

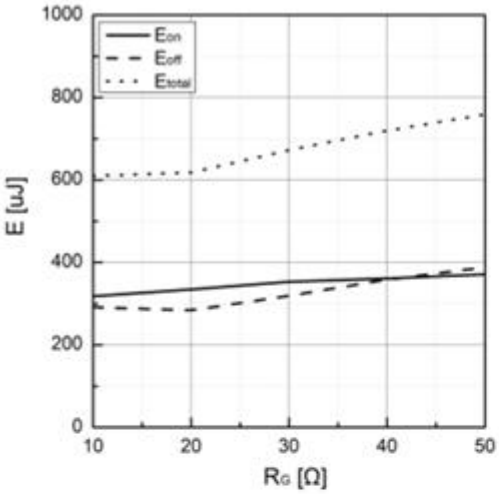


Fig 13. Typical switching energy losses as a function of R_G

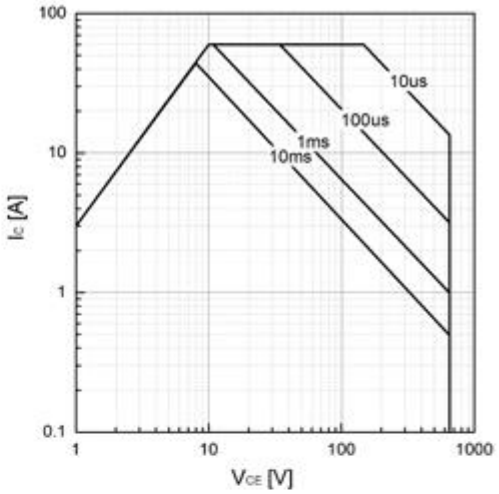


Fig 14. Safe operating area

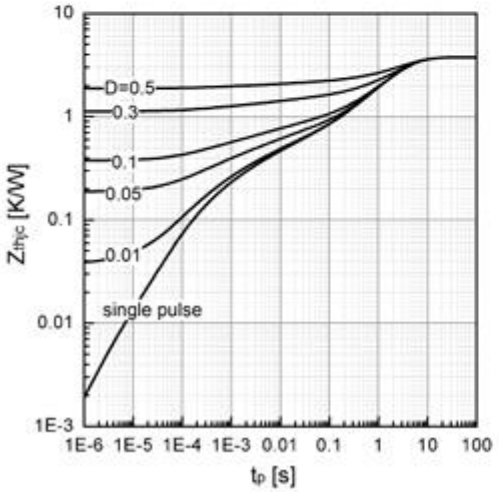
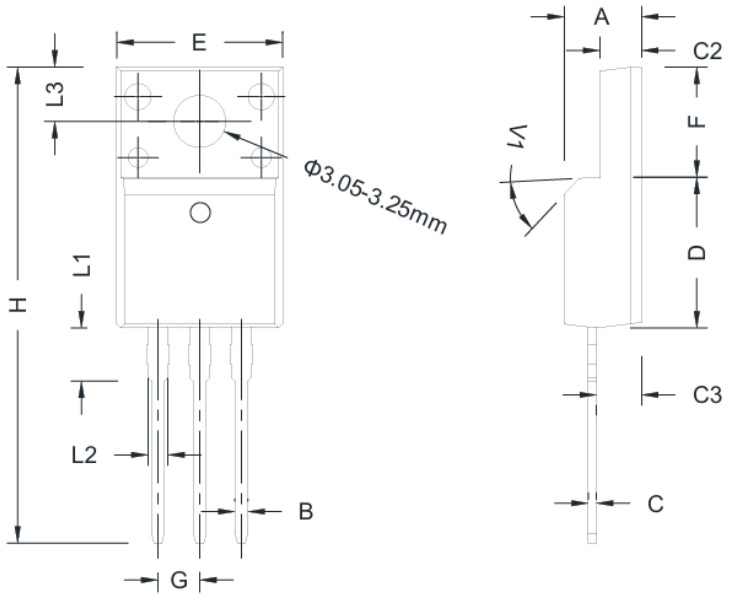


Fig 15. Transient thermal impedance, IGBT

TO-220F PACKAGE OUTLINE



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.50	-	4.90	0.177	-	0.193
B	0.74	0.80	0.83	0.029	0.031	0.033
C	0.47	-	0.66	0.019	-	0.026
C2	2.45	-	2.75	0.096	-	0.108
C3	2.60	-	3.00	0.102	-	0.118
D	8.80	-	9.30	0.346	-	0.366
E	9.80	-	10.40	0.386	-	0.410
F	6.40	-	6.80	0.252	-	0.268
G	2.40	-	2.70	0.094	-	0.106
H	28.0	-	29.80	1.102	-	1.173
L1	-	3.63	-	-	0.143	-
L2	1.14	-	1.70	0.045	-	0.067
L3	-	3.30	-	-	0.130	-
V1	-	45°	-	-	45°	-

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