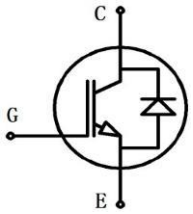
V_{CES} = 650V, I_C = 20A, $V_{CE\ (sat)}$ = 1.6V

Features:

- High ruggedness performance
- Very tight parameter distribution
- Positive VCE (sat) temperature coefficient
- High efficiency for motor control
- Excellent current sharing in parallel operation
- RoHS compliant

TO-220F



Applications:

- Home appliances
- Motor drives
- General Inverter

Absolute Maximum Ratings of IGBT (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Value	Unit
V_{CES}	Collector to Emitter Voltage		650	V
V_{GES}	Continuous Gate to Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C = 100°C	20	A
		T_C = 25°C	40	A
I_{CM}	Pulse Collector Current	t_p=1ms	80	A
P_D	Maximum Power Dissipation (IGBT)	T_C = 25°C, T_J = 175°C	150	W
t_{sc}	Short Circuit Withstand Time	V_{CC} = 400V, V_{GE}≤15V	10	μs

Absolute Maximum Ratings of Diode (T_J = 25°C unless otherwise noted)

V_{RRM}	Repetitive peak reverse voltage	T_C = 25°C	650	V
I_F	Diode Continuous Forward Current	T_C = 100°C	20	A
I_{FM}	Peak FWD Current Repetitive	t_p=1ms	80	A

Electrical Characteristics of IGBT (T_J = 25°C unless otherwise noted)

Static characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 1mA, V_{CE} = V_{GE} , T_J = 25°C		5.2	5.7	6.2	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 20A, V_{GE} = 15V	T_J = 25°C	-	1.6	-	V
			T_J= 175°C		1.9		
I_{CES}	Collector-Emitter Leakage Current	V_{GE} = 0V, V_{CE} = V_{CES}, T_J = 25°C		-	-	0.1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±20V V_{CE} = 0V, T_J = 25°C		-100	-	100	nA

C_{iss}	Input capacitance	V_{CE}=30V, V_{GE}=0V , f=1MHz	-	1700	-	pF
C_{oss}	Output capacitance		-	72	-	
C_{rss}	Reverse transfer capacitance		-	13	-	
Q_g	Total gate charge	V_{CC}=520V V_{GE}=15V I_C=20A	-	71	-	nC

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=400V, I_C=20A, V_{GE}=±15V, L=525uH, R_G=10Ω	T_J = 25°C		21		ns
			T_J = 175°C		21		
t_r	Rise Time		T_J = 25°C		23		ns
			T_J = 175°C		23		
$t_{d(off)}$	Turn-off Delay Time		T_J = 25°C		120		ns
			T_J = 175°C		141		
t_f	Fall Time		T_J = 25°C		63		ns
			T_J = 175°C		108		
E_{on}	Turn-on Switching Loss		T_J = 25°C		0.37		mJ
			T_J = 175°C		0.59		
E_{off}	Turn-off Switching Loss		T_J = 25°C		0.46		mJ
			T_J = 175°C		0.67		
$R_{\theta JC}$	Junction-To-Case (IGBT)					1	K/W

Electrical Characteristics of Diode (T_J = 25°C unless otherwise noted)

Static characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F=20A,V_{GE}=0V	T_J = 25°C		1.5		V
			T_J = 150°C		1.2		

Switching Characteristics

IRM	Peak Reverse Recovery Current	I_F=20A, V_{CC}=400V, V_{GE}=-15V, L=525uH, R_G=10Ω	T_J = 25°C		12		A
			T_J = 175°C		19		
Q_{rr}	Reverse Recovery Charge		T_J = 25°C		472		nC
			T_J = 175°C		1130		
t_{rr}	Reverse Recovery Energy		T_J = 25°C		62		ns
			T_J = 175°C		90		
$R_{\theta JC}$	Junction-To-Case (Diode)					1.8	K/W

Module Characteristics

T_J	Maximum Junction Temperature			175	°C
T_{JOP}	Maximum Operating Junction Temperature Range	-40		+175	°C
T_{stg}	Storage Temperature	-55		+150	°C

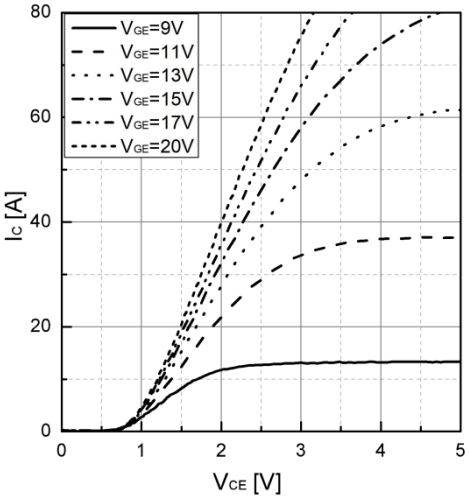


Fig 1. Typical output characteristic (T_{vj}=25℃)

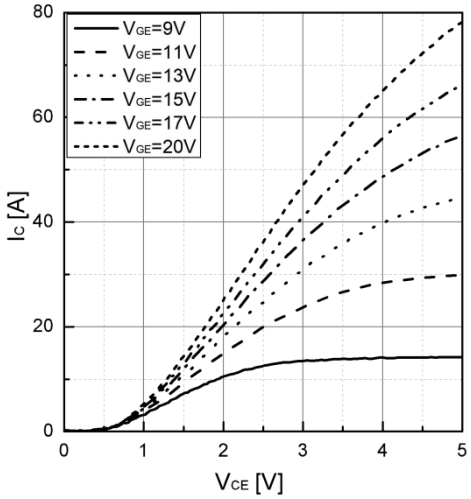


Fig 2. Typical output characteristic(T_{vj}=175℃)

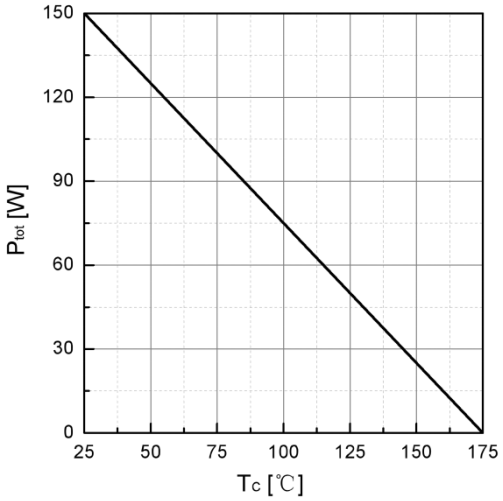


Fig 3. Power dissipation as a function of T_C

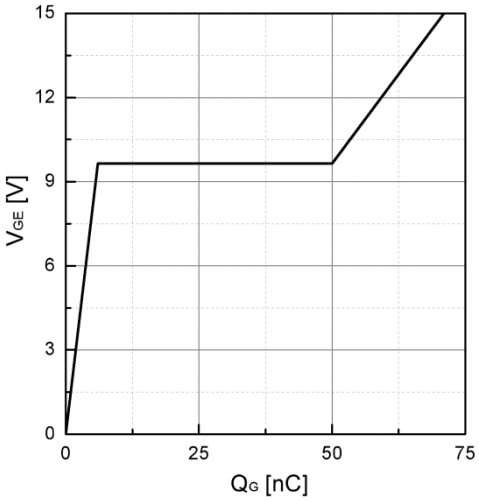


Fig 4. Typical Gate charge

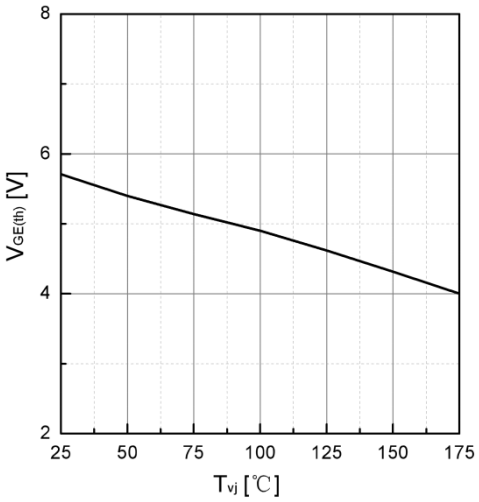


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

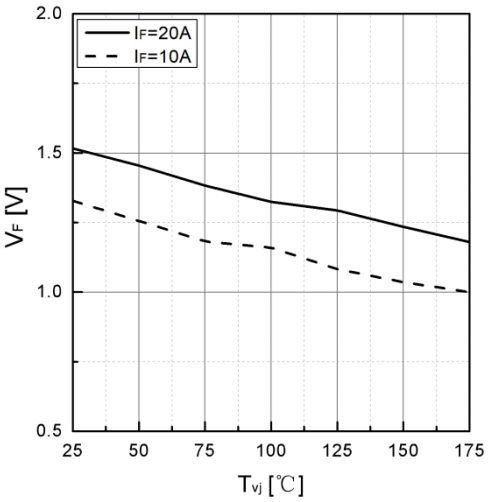


Fig 6. Typical V_F as a function of T_{vj}

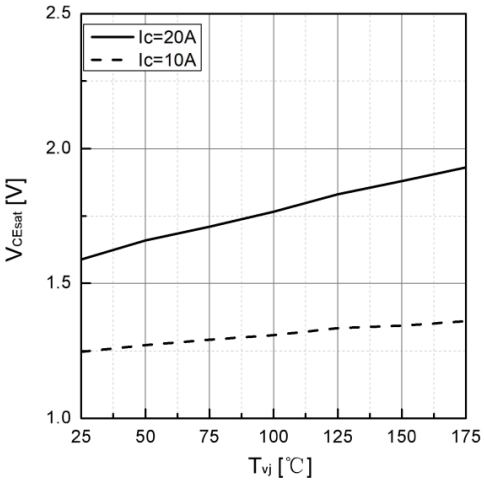


Fig 7. Typical V_{CEsat} as a function of T_{vj}

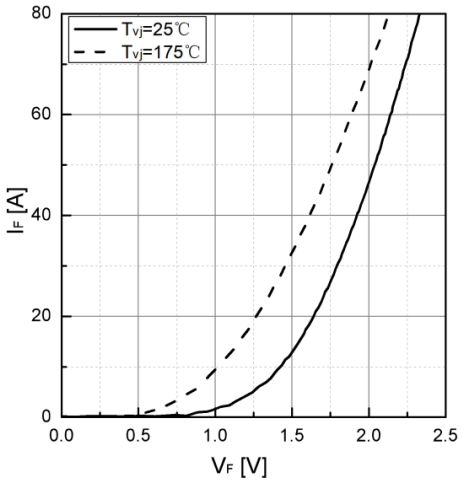


Fig 8. Typical I_F as a function of V_F

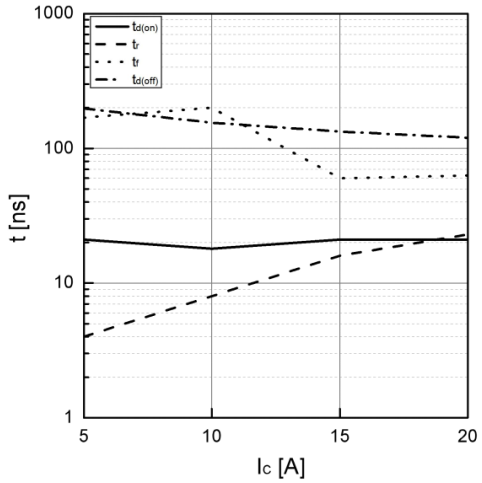


Fig 9. Typical switching time as a function of I_C

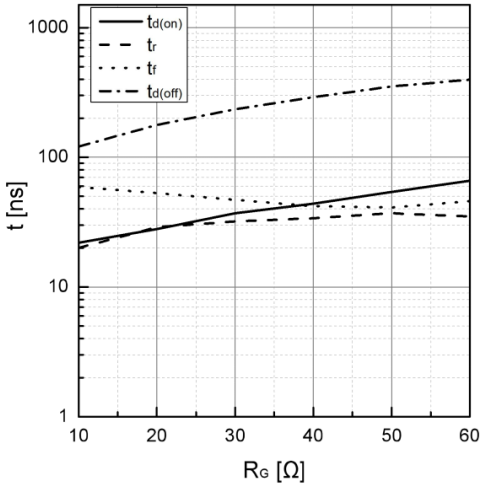


Fig 10. Typical switching times as a function of R_G

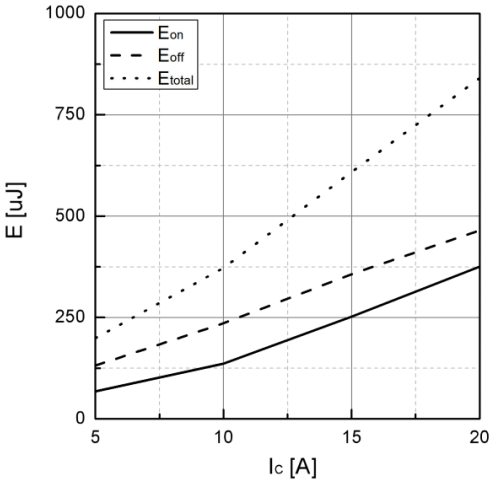


Fig 11. Typical switching energy losses as a function of I_C

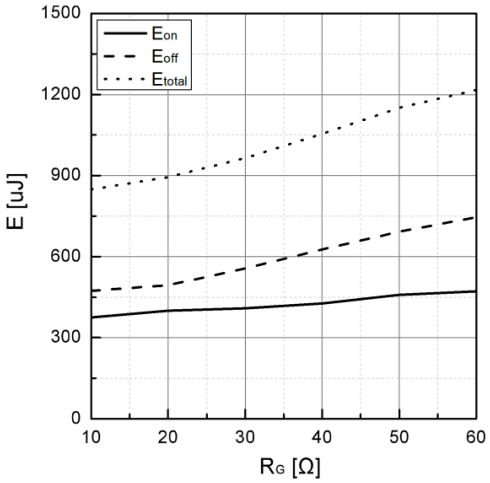
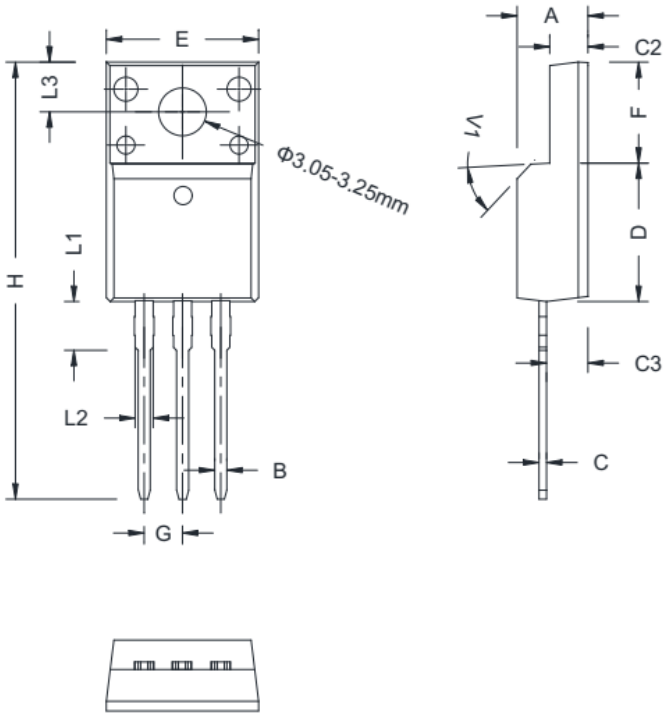


Fig 12. Typical switching energy losses as a function of R_G

Package Outline:

TO-220F



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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