650V 30A IGBT

■ Applications

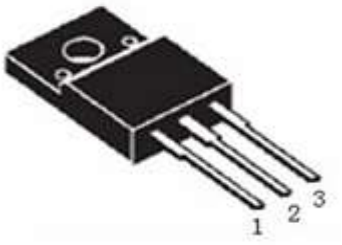
- Inverter
- Welding converters
- Power Factor Correction（PFC）
- Uninterruptible Power Supply（UPS）
- Converters with high switching frequency

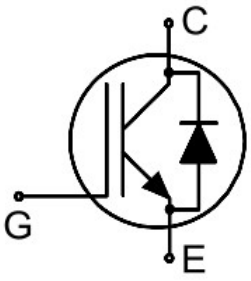
■ Features

- Low $V_{CE(sat)}$
- High speed switching
- Short circuit withstand time – 5uS
- High ruggedness, temperature stable
- Positive temperature coefficient in VCE(sat)
- Enhanced avalanche capability
- RoHS and Halogen-Free Compliant

■ Product Summary

V_{CES}	650	V
I_C	30	A
$V_{CE(sat),Typ}$@15V	1.65	V





Gate： 1

Collector： 2

Emitter： 3

TO-220F

Marking	Package	Packaging	Min. package quantity
MHFB30N065J2F	TO-220F	Tube	1000

■ Absolute Maximum Ratings（Tc=25℃ unless otherwise noted)

Parameter	Symbol	Ratings	Unit
Collector-emitter Voltage	V_{CES}	650	V
DC collector current，limited by T_{jmax} TC=25℃ TC=100℃	I_C	 60 30	A
Pulsed collector current，tp limited by T_{jmax}	$I_{C\ Pulse}$	90	A
Diode forward current，limited by T_{jmax} TC=25℃ TC=100℃	I_F	 60 30	A
Diode Pulsed current，tp limited by T_{jmax}	$I_{F\ Pulse}$	90	A
Continuous Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time V_{GE}=15V,V_{CC}≤400V，T_j≤150℃	t_{SC}	5	μs
Power Dissipation （TC=25℃）	P_D	50	W
Junction Temperature	T_j	175	℃
Storage Temperature	T_{STG}	-55-175	℃

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

■ Thermal Characteristics

Parameter	Symbol	Max	Unit
IGBT Maximum Junction-to-Case	$R_{\theta JC}$	3	℃/W
Diode Maximum Junction-to-Case	$R_{\theta JC}$	3	℃/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	80	℃/W

Note：This transistor is sensitive to electrostatic discharge and should be handled with care.

■ Electrical Characteristics（Tc=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{CES}	V_{GE}=0V,I_C=250uA	650	-	-	V
Zero gate voltage collector current	I_{CES}	V_{CE}=650V,V_{GE}=0V	-	-	20	uA
Gate-emitter leakage current	I_{GES}	V_{GE}=±20V,V_{CE}=0V	-	-	±100	nA
Gate-emitter threshold voltage	$V_{GE(TH)}$	V_{CE}=V_{GE},I_C=250uA	4	5	6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V,I_C=30A	-	1.65	2	V
		Tj=175°C	-	2	-	V
Diode forward voltage	V_F	I_F=30A	-	1.6	1.9	V
		Tj=175°C	-	1.3	-	V
Dynamic Characteristics						
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V, f=1.0MHz	-	1750	-	pF
Output Capacitance	C_{oes}		-	75	-	pF
Reverse Transfer Capacitance	C_{res}		-	28	-	pF
Integrated gate resistor	R_{Gint}		-	6	-	Ω
Total Gate Charge	Q_g	V_{CC}=400V,I_C=30A, V_{GE}=15V	-	63.5	-	nC
Gate−to−emitter charge	Q_{ge}		-	13.5	-	nC
Gate−to−collector charge	Q_{gc}		-	23	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	7	-	nH

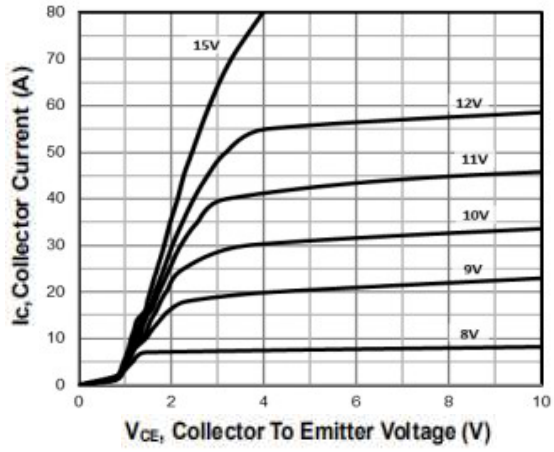
■ Switching Characteristic, Inductive Load, at T_j=25℃

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	V_{CC}=400V,I_C=30A, V_{GE}=0/15V,R_g=10Ω Inductive load	-	28	-	ns
Turn-On Rise Time	t_r		-	40	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	88	-	ns
Turn-Off Fall Time	t_f		-	149	-	ns
Turn-on energy	E_{on}		-	0.89	-	mJ
Turn-off energy	E_{off}		-	0.41	-	mJ
Body Diode Characteristics						
Reverse Recovery Time	t_{rr}	V_R=400V,I_F=30A, di/dt=100A/us	-	32	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.28	-	μC
Peak Reverse Recovery Current	I_{rrm}		-	18	-	A

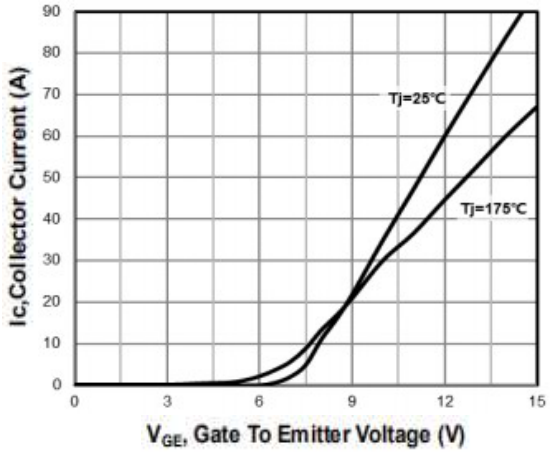
■ Switching Characteristic, Inductive Load, at T_j=150℃

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	V_{CC}=400V,I_C=30A, V_{GE}=0/15V,R_g=10Ω Inductive load	-	32	-	ns
Turn-On Rise Time	t_r		-	40	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	78	-	ns
Turn-Off Fall Time	t_f		-	184	-	ns
Turn-on energy	E_{on}		-	1.18	-	mJ
Turn-off energy	E_{off}		-	0.65	-	mJ
Body Diode Characteristics						
Reverse Recovery Time	t_{rr}	V_R=400V,I_F=30A, di/dt=100A/us	-	117	-	ns
Reverse Recovery Charge	Q_{rr}		-	1.37	-	μC
Peak Reverse Recovery Current	I_{rrm}		-	19	-	A

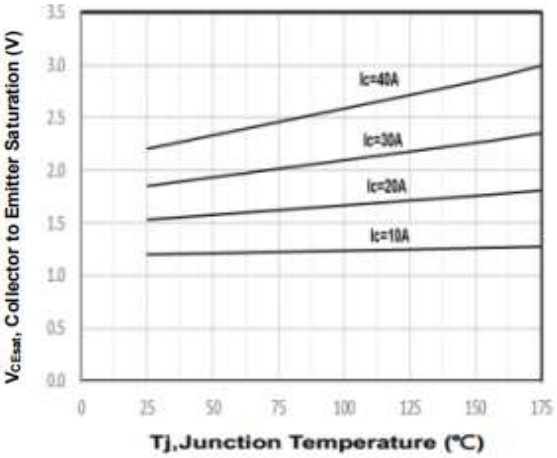
■ Characteristics Curves



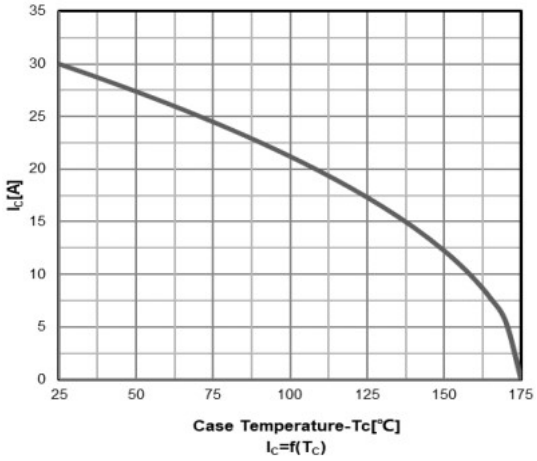
Output Characteritsics



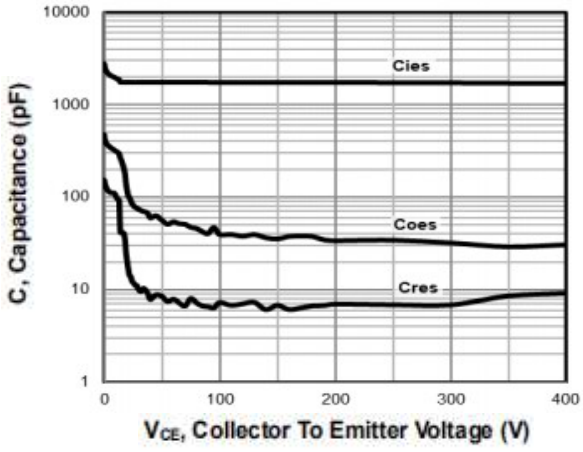
Transfer Characteritsics



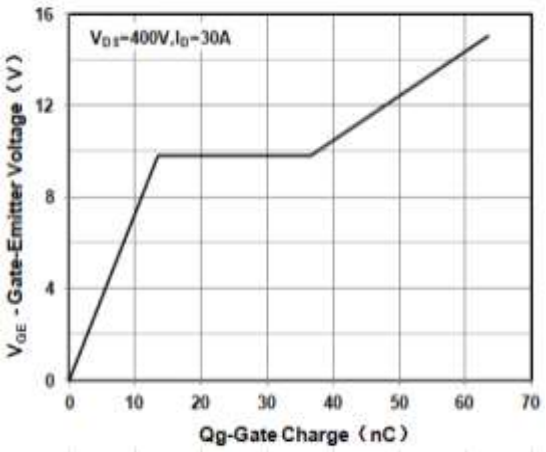
Typical collector-emitter saturation voltage as a function of junction temperature (VGE = 15V)



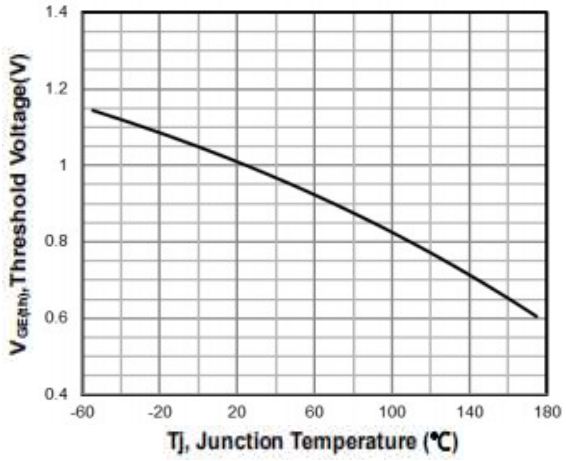
Collector current as a function of Case temperature



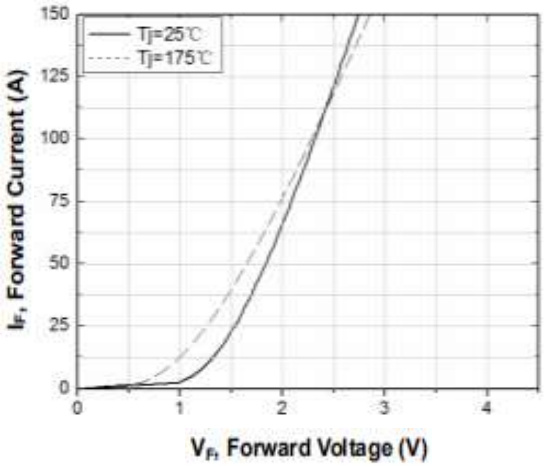
Capacitance



Typical gate charge



Gate-emitter threshold voltage as a function of junction temperature



Typ. diode forward current as a function of forward voltage

Note： The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

■ TO-220F Package Dimensions

Unit：mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.5		4.9	E1	6.5	7	7.5
A1	2.3		2.9	e	2.44	2.54	2.64
b	0.65		0.9	L	12.5		14.3
b1	1.1		1.7	L1	9.45		10.05
b2	1.2		1.4	L2	15		16
c	0.35		0.65	L3	3.2		4.4
D	14.5		16.5	ΦP	3		3.3
D1	6.1		6.9	Q	2.5		2.9
E	9.6		10.3