

■ Applications

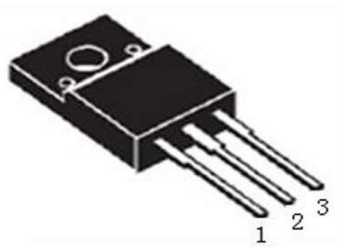
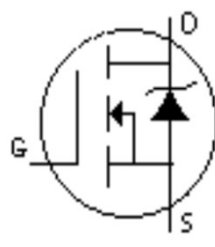
- Industrial UPS
- Welding machine
- Solar converters
- Energy Storage
- Mid to high range switching frequency converters

■ Features

- Low switching power loss
- Low switching surge and noise
- Advanced Fieldstop technology
- Low EMI
- Short circuit withstand time – 5 μ S
- Qualified according to JEDEC for target applications
- RoHS and Halogen-Free Compliant

■ Product Summary

V_{CES}	650	V
I_C	15	A
$V_{CE(sat)}, Typ@15V$	1.7	V

Gate: 1

Drain: 2

Source: 3

TO-220F

Marking	Package	Packaging	Min. package quantity
MHFB15N065T4F	TO-220F	Tube	1000





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

Parameter	Symbol	Ratings	Unit
Collector-emitter Voltage	V_{CES}	650	V
DC collector current, limited by T_{jmax} TC=25°C TC=100°C	I_C	30 15	A
Pulsed collector current, tp limited by T_{jmax}	$I_{C\ Pulse}$	45	A
Diode forward current, limited by T_{jmax} TC=25°C TC=100°C	I_F	30 15	A
Diode Pulsed current, tp limited by T_{jmax}	$I_{F\ Pulse}$	40	A
Continuous Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time $V_{GE}=15V, V_{CC} \leq 400V, T_j \leq 150^\circ C$	t_{SC}	5	µs
Power Dissipation (TC=25°C)	P_D	55	W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{STG}	-55-150	°C

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	$R_{\theta JC}$	2.75	°C/W
Diode Maximum Junction-to-Case	$R_{\theta JC}$	4	°C/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	80	°C/W

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



■ Electrical Characteristics (Tc=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Collector-emitter breakdown voltage	BV_{CES}	$V_{GE}=0V, I_C=250\mu A$	650	-	-	V
Zero gate voltage collector current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$	-	-	200	μA
Gate-emitter leakage current	I_{GES}	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	± 100	nA
Gate-emitter threshold voltage	$V_{GE(TH)}$	$V_{CE}=V_{GE}, I_C=250\mu A$	4.2	5.2	6.2	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=15A$	-	1.7	2.4	V
		$T_j=150^\circ C$	-	2.2	-	V
Diode forward voltage	V_F	$I_F=15A$	-	1.4	1.9	V
		$T_j=150^\circ C$	-	1.1	-	V
Dynamic Characteristics						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1.0MHz$	-	878	-	pF
Output Capacitance	C_{oes}		-	42	-	pF
Reverse Transfer Capacitance	C_{res}		-	14	-	pF
Integrated gate resistor	R_{Gint}		-	2.7	-	Ω
Total Gate Charge	Q_g	$V_{CC}=400V, I_C=15A,$ $V_{GE}=15V$	-	42	-	nC
Gate-to-emitter charge	Q_{ge}		-	8	-	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 $T_j=25^\circ\text{C}$

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=400\text{V}$ $I_C=15\text{A}$ $V_{GE}=15\text{V}$ $R_G=10\Omega$ Inductive load	-	15	-	ns
Turn-On Rise Time	t_r		-	45	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	ns
Turn-Off Rise Time	t_f		-	135	-	ns
Turn-on energy	E_{on}		-	0.7	-	mJ
Turn-off energy	E_{off}		-	0.2	-	mJ
Diode Characteristics						
Reverse Recovery Time	t_{rr}	$V_R=400\text{V}, I_F=15\text{A},$ $di/dt=200\text{A}/\mu\text{s}$	-	62	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.22	-	μC
Peak Reverse Recovery Current	I_{rrm}		-	7	-	A

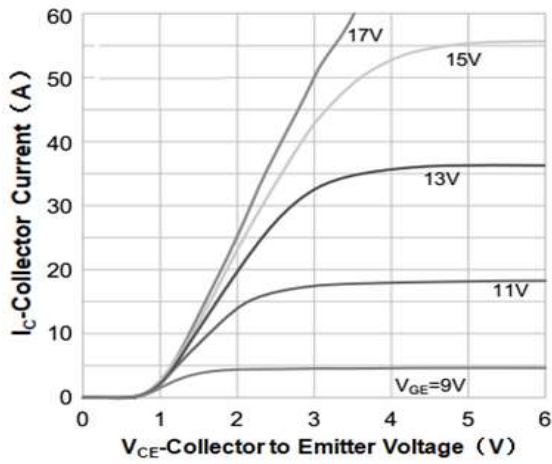
■ Switching Characteristic, Inductive Load, at $T_j=150^\circ\text{C}$

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=400\text{V}$ $I_C=15\text{A}$ $V_{GE}=15\text{V}$ $R_G=10\Omega$ Inductive load	-	17	-	ns
Turn-On Rise Time	t_r		-	43	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	27	-	ns
Turn-Off Rise Time	t_f		-	137	-	ns
Turn-on energy	E_{on}		-	1	-	mJ
Turn-off energy	E_{off}		-	0.37	-	mJ
Diode Characteristics						
Reverse Recovery Time	t_{rr}	$V_R=400\text{V}, I_F=15\text{A},$ $di/dt=200\text{A}/\mu\text{s}$	-	100	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.55	-	μC
Peak Reverse Recovery Current	I_{rrm}		-	11	-	A

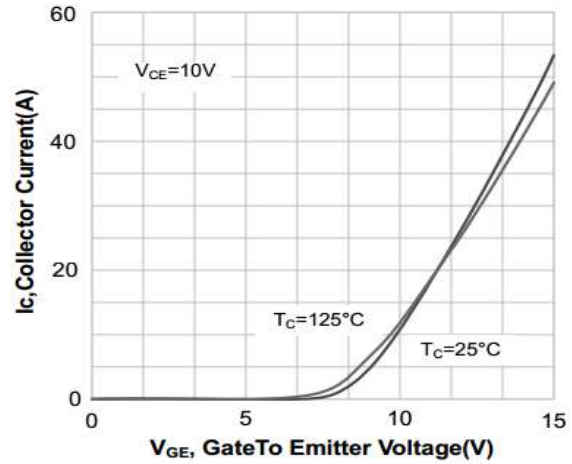




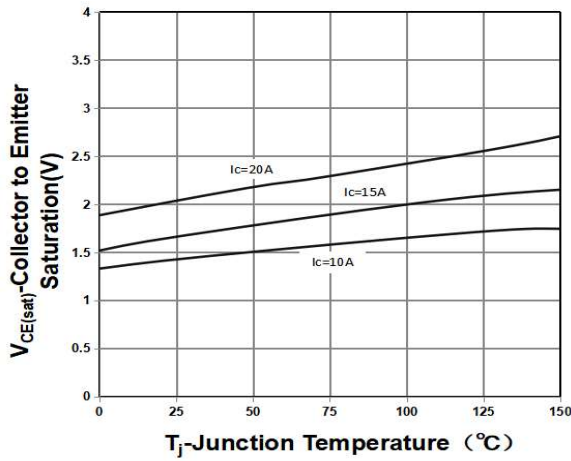
■ Characteristics Curves



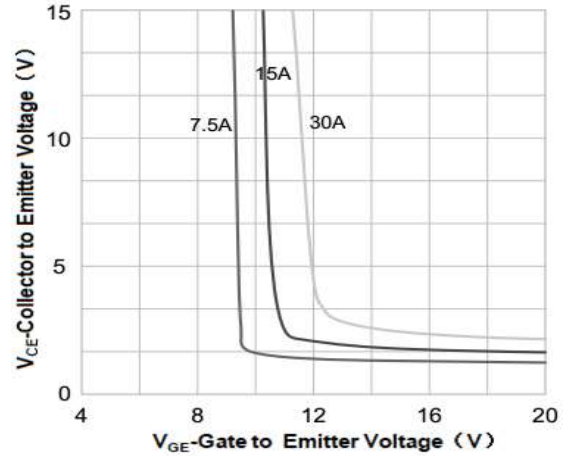
Output Characterisics



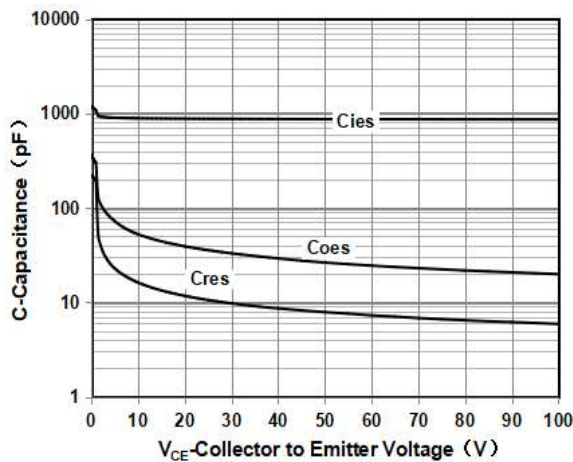
Transfer Characterisics



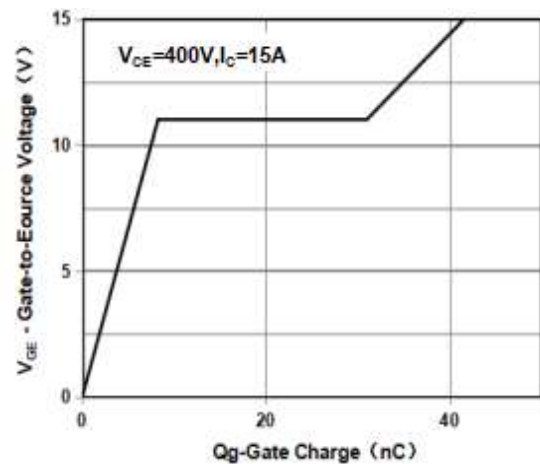
Typical collector-emitter saturation voltage as a function of junction temperature



Saturation Voltage vs. V_{GE}

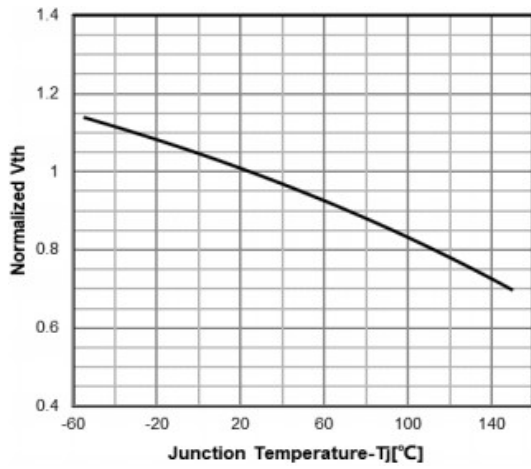


Capacitance

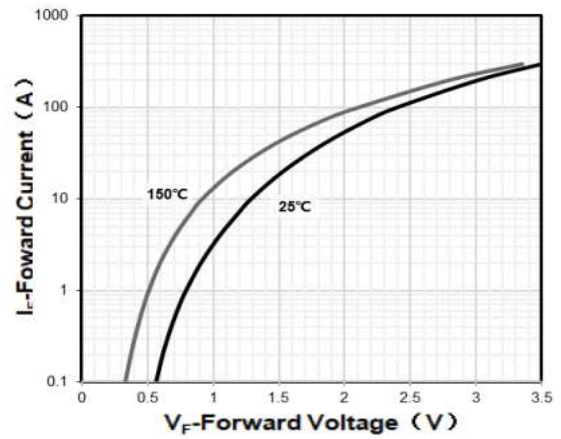


Typical gate charge





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				

