

## ■ Applications

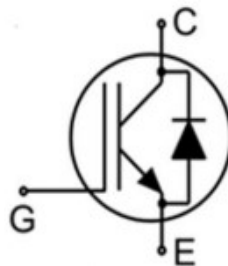
- Inverter
- Welding converters
- Power Factor Correction (PFC)
- Uninterruptible Power Supply (UPS)
- Converters with high switching frequency

## ■ Features

- Low  $V_{CE(sat)}$
- High speed switching
- Short circuit withstand time – 5 $\mu$ S
- High ruggedness, temperature stable
- Positive temperature coefficient in  $V_{CE(sat)}$
- 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



**TO-220C**

Gate: 1  
 Collector: 2  
 Emitter: 3

Marking	Package	Packaging	Min. package quantity
MXB30N065J2F	TO-220C	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	$I_C$	60 30	A
Pulsed collector current, $t_p$ limited by $T_{jmax}$	$I_{C\ Pulse}$	90	A
Diode forward current, limited by $T_{jmax}$ TC=25°C TC=100°C	$I_F$	60 30	A
Diode Pulsed current, $t_p$ limited by $T_{jmax}$	$I_{F\ Pulse}$	90	A
Continuous Gate-emitter voltage	$V_{GE}$	±20	V
Short circuit withstand time $V_{GE}=15V, V_{CC} \leq 400V, T_j \leq 150^\circ C$	$t_{SC}$	5	μs
Power Dissipation (TC=25°C)	$P_D$	170	W
Junction Temperature	$T_j$	175	°C
Storage Temperature	$T_{STG}$	-55-175	°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	$R_{\theta JC}$	0.88	°C/W
Diode Maximum Junction-to-Case	$R_{\theta JC}$	2	°C/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	60	°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
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{CES}$	$V_{GE}=0V, I_C=250\mu A$	650	-	-	V
Zero gate voltage collector current	$I_{CES}$	$V_{CE}=650V, V_{GE}=0V$	-	-	20	$\mu A$
Gate-emitter leakage current	$I_{GES}$	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	$\pm 100$	nA
Gate-emitter threshold voltage	$V_{GE(TH)}$	$V_{CE}=V_{GE}, I_C=250\mu A$	4	5	6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=30A$	-	1.65	2	V
		$T_j=175^\circ C$	-	2	-	V
Diode forward voltage	$V_F$	$I_F=30A$	-	1.6	1.9	V
		$T_j=175^\circ C$	-	1.3	-	V
<b>Dynamic Characteristics</b>						
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	-	$\Omega$
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 $T_j=25^\circ\text{C}$

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>IGBT Switching Characteristics</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=400V, I_C=30A,$ $V_{GE}=0/15V, R_g=10\Omega$ 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
<b>Body Diode Characteristics</b>						
Reverse Recovery Time	$t_{rr}$	$V_R=400V, I_F=30A,$ $di/dt=100A/us$	-	32	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	0.28	-	$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rrm}$		-	18	-	A

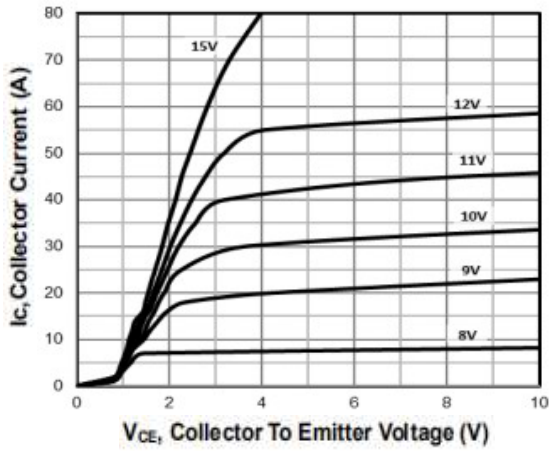
### ■ Switching Characteristic, Inductive Load, at $T_j=150^\circ\text{C}$

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>IGBT Switching Characteristics</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=400V, I_C=30A,$ $V_{GE}=0/15V, R_g=10\Omega$ 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
<b>Body Diode Characteristics</b>						
Reverse Recovery Time	$t_{rr}$	$V_R=400V, I_F=30A,$ $di/dt=100A/us$	-	117	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	1.37	-	$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rrm}$		-	19	-	A

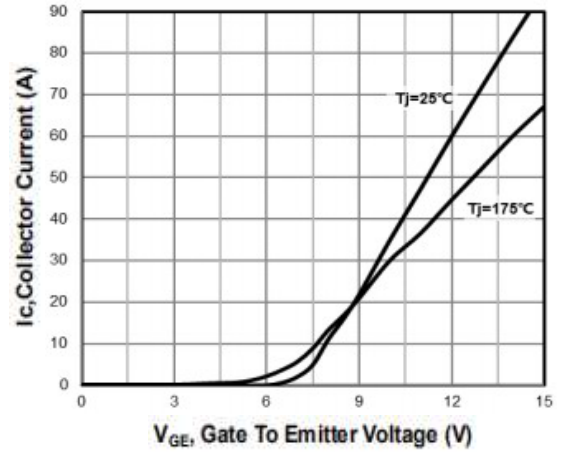




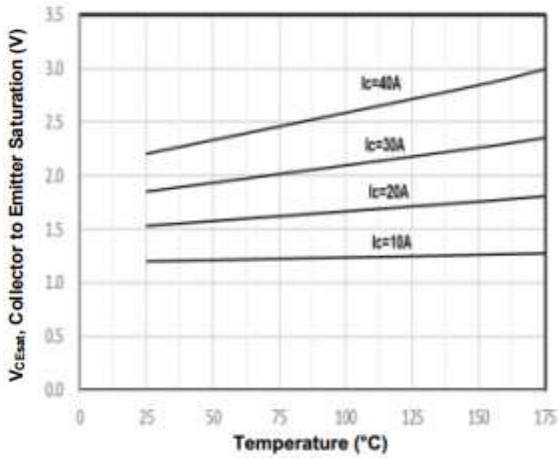
■ Characteristics Curves



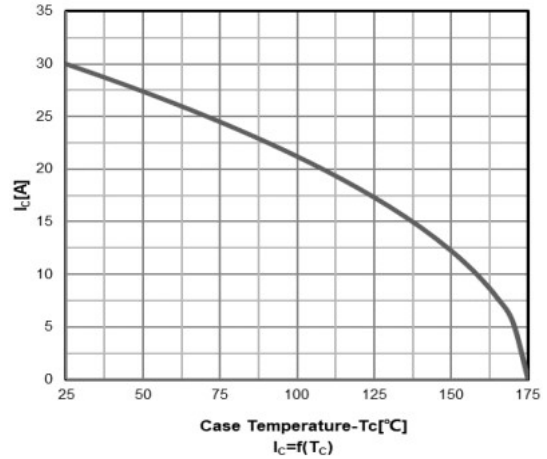
Output Characteristics



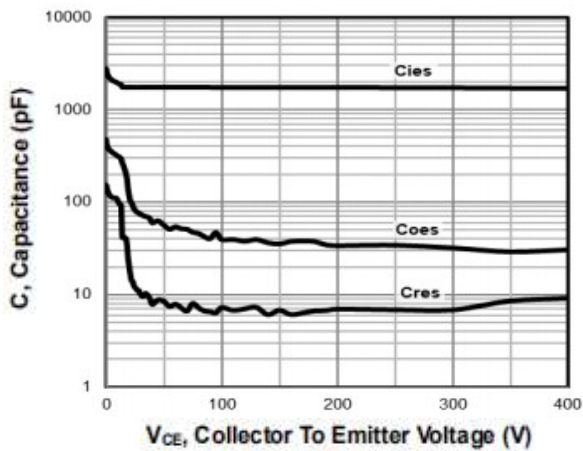
Transfer Characteristics



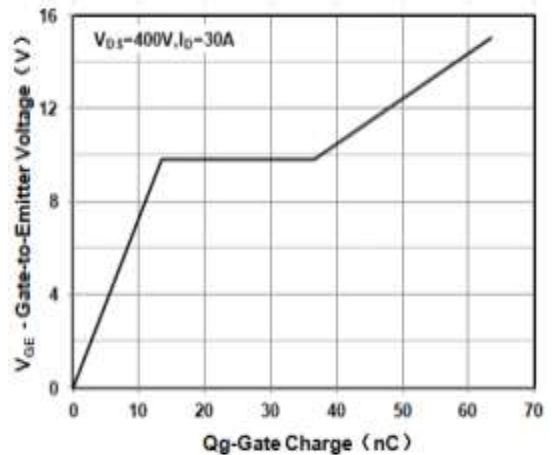
Typical collector-emitter saturation voltage as a function of junction temperature ( $V_{GE} = 15\text{V}$ )



Collector current as a function of Case temperature

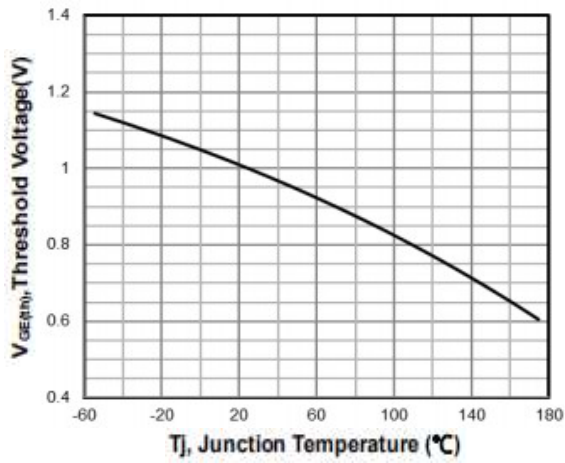


Capacitance

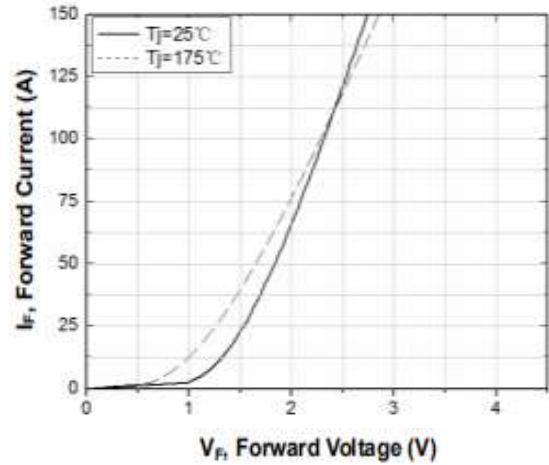


Typical gate charge





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-220C Package Dimensions

Unit: mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.3		4.8	e	2.44	2.54	2.64
B	1.2		1.4	F	1.2		1.45
B1	1		1.4	L	12.75		13.9
b1	0.7		0.95	L1	2.85		3.4
c	0.4		0.65	ΦP	3.5		3.8
D	15.2		16	Q	2.6		3
D1	6.2		6.8	Q1	2.2		2.7
E	9.7		10.3				

