

## Applications

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

## Features

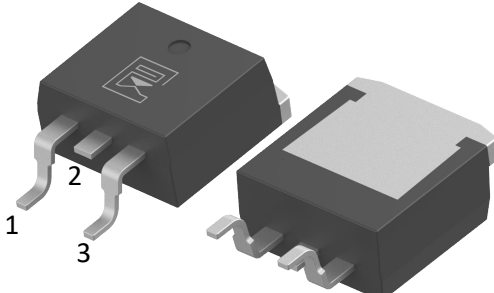
- Low  $V_{CE(sat)}$
- High speed switching
- Short circuit withstand time – 3 $\mu$ S
- High ruggedness, temperature stable
- Positive temperature coefficient in  $V_{CE(sat)}$
- Enhanced avalanche capability

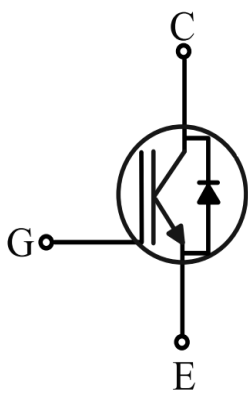
## Product Summary

$V_{CES}$	650	V
$I_C$	50	A
$V_{CE(sat), Typ@15V}$	1.8	V



### TO-263





Gate: 1  
Collector: 2  
Emitter: 3

## Package Marking and Ordering Information

Ordering code	Marking	Package	Packaging	Min. package quantity
MLB50N065J2S	MLB50N065J2S	TO-263	Tape & Reel	800

**» 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	$I_C$	80 50	A
Pulsed collector current, $t_p$ limited by $T_{jmax}$	$I_{C\ Pulse}$	150	A
Diode forward current, limited by $T_{jmax}$ TC=25°C TC=100°C	$I_F$	60 40	A
Diode Pulsed current, $t_p$ limited by $T_{jmax}$	$I_{F\ Pulse}$	140	A
Continuous Gate-emitter voltage	$V_{GE}$	±20	V
Short circuit withstand time $V_{GE}=15V, V_{CC} \leq 400V, T_j \leq 150^\circ C$	$t_{SC}$	3	μs
Power Dissipation (TC=25°C)	$P_D$	166	W
Junction Temperature	$T_j$	175	°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	$R_{\theta JC}$	1.1	°C/W
Diode Maximum Junction-to-Case	$R_{\theta JC}$	0.85	°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>						
Collector-emitter Breakdown Voltage	$BV_{CES}$	$V_{GE}=0V, I_C=200\mu A$	650	-	-	V
Zero gate voltage collector current	$I_{CES}$	$V_{CE}=650V, V_{GE}=0V$	-	-	5	$\mu A$
Gate-emitter leakage current	$I_{GES}$	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	$\pm 100$	nA
Gate-emitter threshold voltage	$V_{GE(TH)}$	$V_{CE}=V_{GE}, I_C=250\mu A$	4.0	4.7	6.0	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=50A$	-	1.8	2.1	V
		$T_j=150^\circ C$	-	2.4	-	V
Diode forward voltage	$V_F$	$I_F=50A$	-	1.9	2.2	V
		$T_j=175^\circ C$	-	2.5	-	V
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V, f=1.0MHz$	-	2750	-	pF
Output Capacitance	$C_{oes}$		-	300	-	pF
Reverse Transfer Capacitance	$C_{res}$		-	60	-	pF
Integrated gate resistor	$R_{Gint}$		-	3.7	-	$\Omega$
Total Gate Charge	$Q_g$	$V_{CC}=400V, I_C=50A, V_{GE}=15V$	-	105	-	nC
Gate-to-emitter charge	$Q_{ge}$		-	15	-	nC
Gate-to-collector charge	$Q_{gc}$		-	45	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	$L_E$		-	7	-	nH

**Switching Characteristic, Inductive Load, at  $T_j=25^{\circ}\text{C}$** 

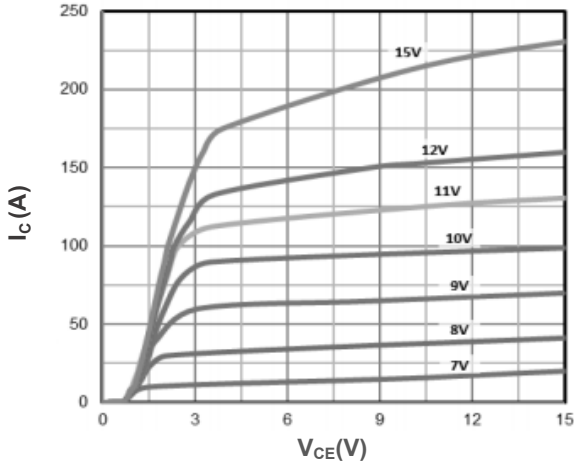
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>IGBT Switching Characteristics</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}= 400\text{V}$ $I_C= 50\text{A}$ $V_{GE}= 15\text{V}$ $R_G= 8.2\Omega$ Inductive load	-	24	-	ns
Turn-On Rise Time	$t_r$		-	28	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	117	-	ns
Turn-Off Fall Time	$t_f$		-	32	-	ns
Turn-on energy	$E_{on}$		-	1.05	-	mJ
Turn-off energy	$E_{off}$		-	0.45	-	mJ
<b>Diode Characteristics</b>						
Reverse Recovery Time	$t_{rr}$	$V_R=400\text{V}, I_F=30\text{A},$ $di/dt=200\text{A}/\mu\text{s}$	-	34	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	0.06	-	$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rrm}$		-	3.3	-	A

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

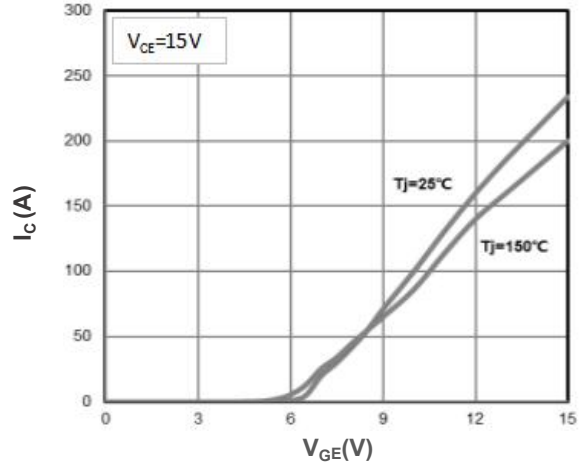
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>IGBT Switching Characteristics</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}= 400\text{V}$ $I_C= 50\text{A}$ $V_{GE}= 15\text{V}$ $R_G= 8.2\Omega$ Inductive load	-	24	-	ns
Turn-On Rise Time	$t_r$		-	30	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	125	-	ns
Turn-Off Fall Time	$t_f$		-	37	-	ns
Turn-on energy	$E_{on}$		-	1.21	-	mJ
Turn-off energy	$E_{off}$		-	0.55	-	mJ
<b>Diode Characteristics</b>						
Reverse Recovery Time	$t_{rr}$	$V_R=400\text{V}, I_F=30\text{A},$ $di/dt=200\text{A}/\mu\text{s}$	-	47	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	0.12	-	$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rrm}$		-	5	-	A



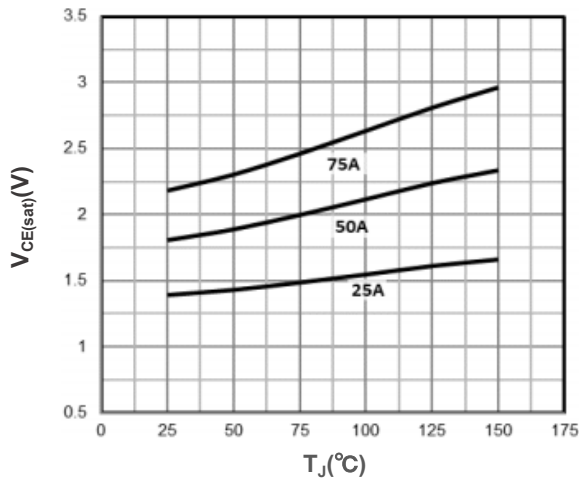
Characteristics Curves



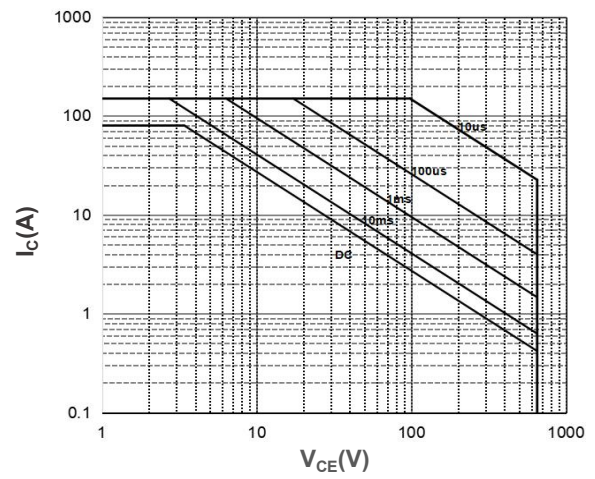
Output Characteristics



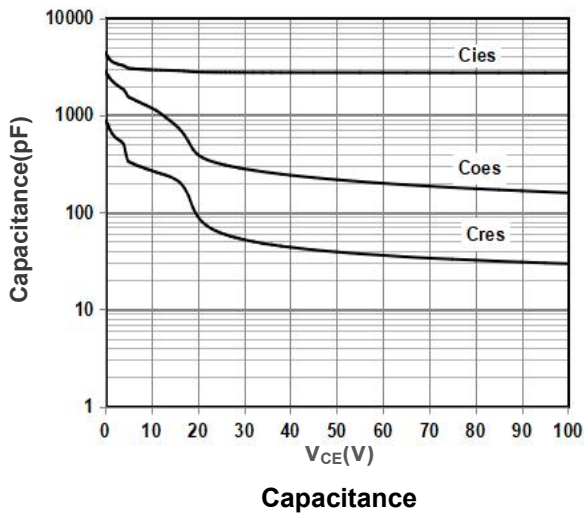
Transfer Characteristics



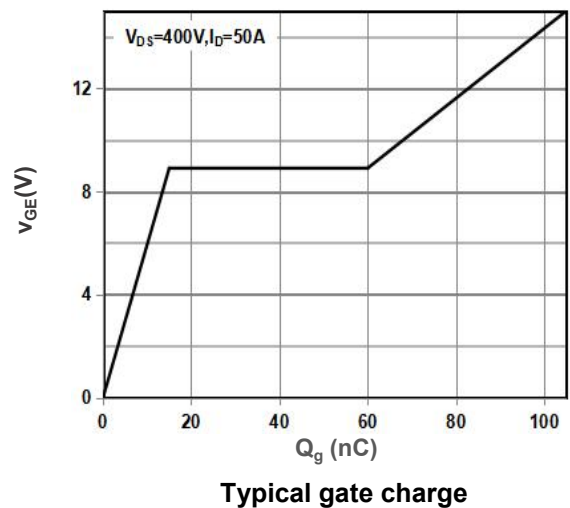
"Typical collector-emitter saturation voltage as a function of junction temperature " ( $V_{GE}=15\text{V}$ )



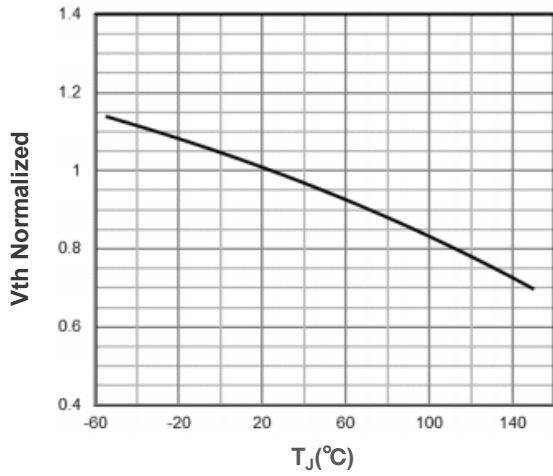
Maximum Safe Operating Area( $T_a=25^\circ\text{C}$ )



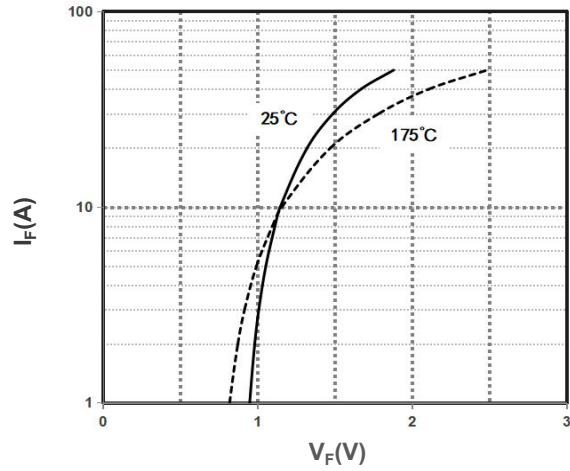
Capacitance



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-263 Package Dimensions

Unit: mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.42		4.72	E	8.99		9.29
B	1.22		1.4	e1	2.44	2.54	2.64
b	0.76		0.86	e2	4.98		5.18
b1	1.22		1.4	L1	14.7	15.1	15.5
b2	0.33		0.43	L2	2	2.3	2.6
C	1.22		1.35	L3	1.5		2
D	9.95		10.25	K	-0.1		0.1

