

■ Applications


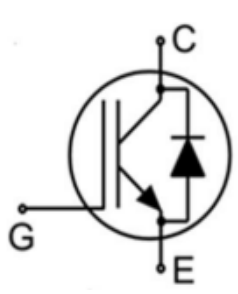
- Industrial UPS
- Welding machine
- Solar converters
- Energy Storage
- Mid to high range switching frequency converters

■ Features

- Low switching power loss
- Low switching surge and noise
- Advanced Fieldstop technology
- Short circuit withstand time – 5 μ S
- Maximum junction temperature 175°C
- Qualified according to JEDEC for target applications
- RoHS and Halogen-Free Compliant

■ Product Summary

V_{CES}	650	V
I_C	40	A
$V_{CE(sat), Typ@15V}$	1.45	V

Gate: 1

Collector: 2

Emitter: 3

TO-247L

Marking	Package	Packaging	Min. package quantity
MSLB40N065T7EF	TO-247L	Tube	450



■ 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 40	A
Pulsed collector current, tp limited by T_{jmax}	$I_{C\ Pulse}$	160	A
Diode forward current, limited by T_{jmax} TC=25°C TC=100°C	I_F	80 40	A
Diode Pulsed current, tp limited by T_{jmax}	$I_{F\ Pulse}$	160	A
Continuous Gate-emitter voltage	V_{GE}	±20	V
Short Circuit Withstand Time, $V_{GE}=15V, V_{CE} \leq 300V$	T_{SC}	5	us
Power Dissipation (TC=25°C)	P_D	300	W
Junction Temperature	T_J	175	°C
Storage Temperature	T_{STG}	-40-175	°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	$R_{\theta JC}$	0.5	°C/W
Diode Maximum Junction-to-Case	$R_{\theta JC}$	0.6	°C/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	40	°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						
Drain-Source Breakdown Voltage	BV_{CES}	$V_{GE}=0V, I_C=0.5mA$	650	-	-	V
Zero gate voltage collector current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$	-	-	250	uA
Gate-emitter leakage current	I_{GES}	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	± 200	nA
Gate-emitter threshold voltage	$V_{GE(TH)}$	$V_{CE}=V_{GE}, I_C=250uA$	5	5.8	6.6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A$	-	1.45	1.8	V
		$T_j=175^\circ C$	-	2	-	V
Diode forward voltage	V_F	$I_F=40A$	-	1.42	1.8	V
		$T_j=175^\circ C$	-	1.15	-	V
Dynamic Characteristics						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1.0MHz$	-	6000	-	pF
Output Capacitance	C_{oes}		-	165	-	pF
Reverse Transfer Capacitance	C_{res}		-	60	-	pF
Integrated gate resistor	R_{Gint}		-	1.2	-	Ω
Total Gate Charge	Q_g	$V_{CC}=520V, I_C=25A,$ $V_{GE}=15V$	-	180	-	nC
Gate-to-emitter charge	Q_{ge}		-	45	-	nC
Gate-to-collector charge	Q_{gc}		-	80	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13	-	nH



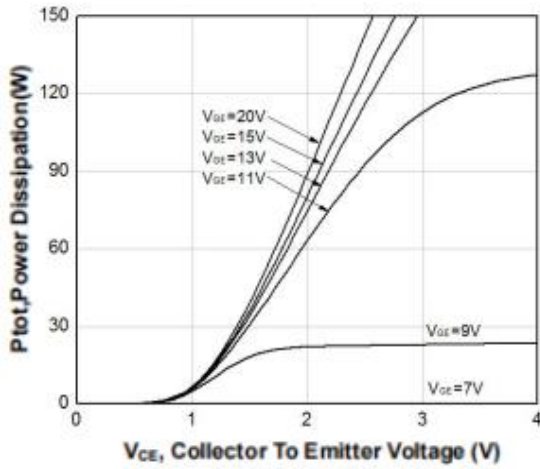
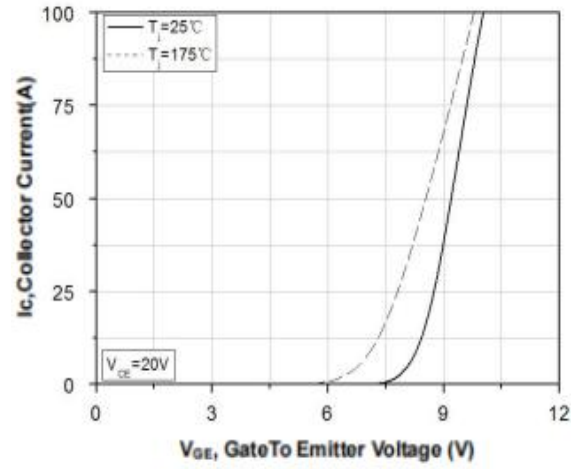
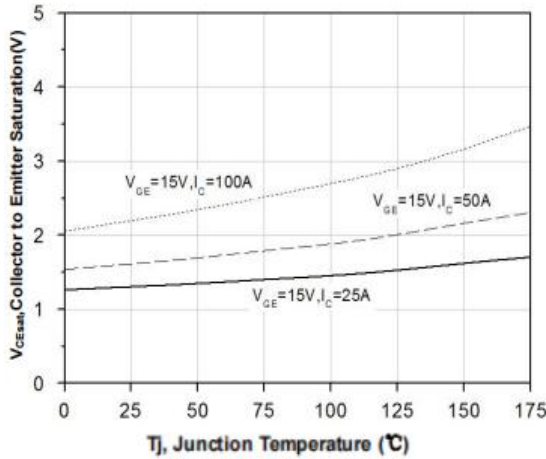
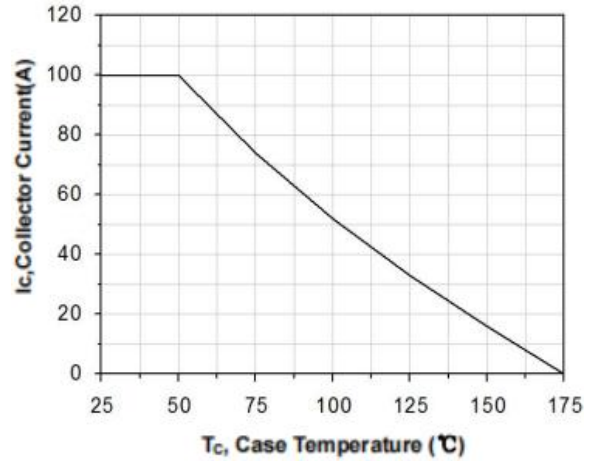
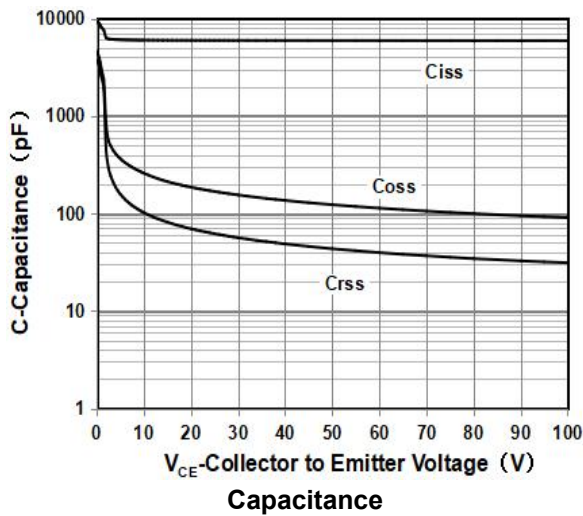
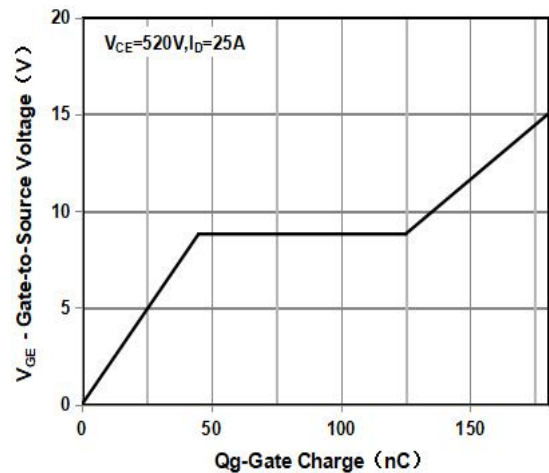
■ Switching Characteristic, Inductive Load, at $T_j=25^\circ\text{C}$

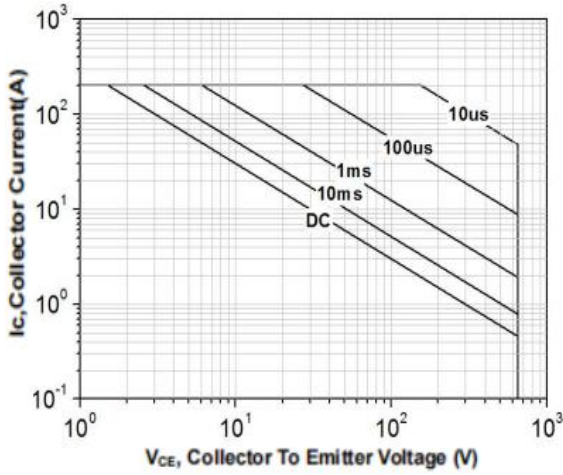
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=400\text{V}$ $I_C=40\text{A}$ $V_{GE}=15\text{V}$ $R_G=10\Omega$ Inductive load	-	79	-	ns
Turn-On Rise Time	t_r		-	45	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	170	-	ns
Turn-Off Fall Time	t_f		-	95	-	ns
Turn-on energy	E_{on}		-	0.95	-	mJ
Turn-off energy	E_{off}		-	0.66	-	mJ
Diode Characteristics						
Reverse Recovery Time	t_{rr}	$V_R=400\text{V}, I_F=30\text{A},$ $di/dt=200\text{A/us}$	-	90	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.3	-	μC
Peak Reverse Recovery Current	I_{rrm}		-	6	-	A

■ Switching Characteristic, Inductive Load, at $T_j=175^\circ\text{C}$

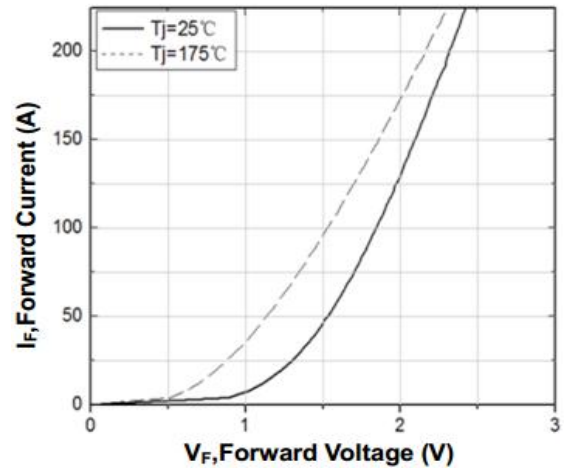
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=400\text{V}$ $I_C=40\text{A}$ $V_{GE}=15\text{V}$ $R_G=10\Omega$ Inductive load	-	78	-	ns
Turn-On Rise Time	t_r		-	47	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	190	-	ns
Turn-Off Fall Time	t_f		-	115	-	ns
Turn-on energy	E_{on}		-	1	-	mJ
Turn-off energy	E_{off}		-	0.75	-	mJ
Diode Characteristics						
Reverse Recovery Time	t_{rr}	$V_R=400\text{V}, I_F=30\text{A},$ $di/dt=500\text{A/us}$	-	115	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.6	-	μC
Peak Reverse Recovery Current	I_{rrm}		-	10	-	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 ($V_{GE} \geq 15\text{V}$, $T_j \leq 175^\circ\text{C}$)

Capacitance

Typical gate charge

Maximum Safe Operating Area



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-247L Package Dimensions

Unit: mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.80		5.20	E1	13.00		13.60
A1	2.20	2.40	2.60	E2	5.00		5.50
A2	1.85		2.15	E3	1.90		2.60
b	1.07		1.33	e		5.44	
b2	1.90		2.16	L	19.30		19.90
b4	2.90		3.20	L1	3.75	3.95	4.15
c	0.52		0.68	ΦP	3.40		3.80
D	20.70		21.30	ΦP1	7.00		7.40
D1	16.15		16.95	S	6.04	6.15	6.30
E	15.50		16.10				

