

## ■ Applications

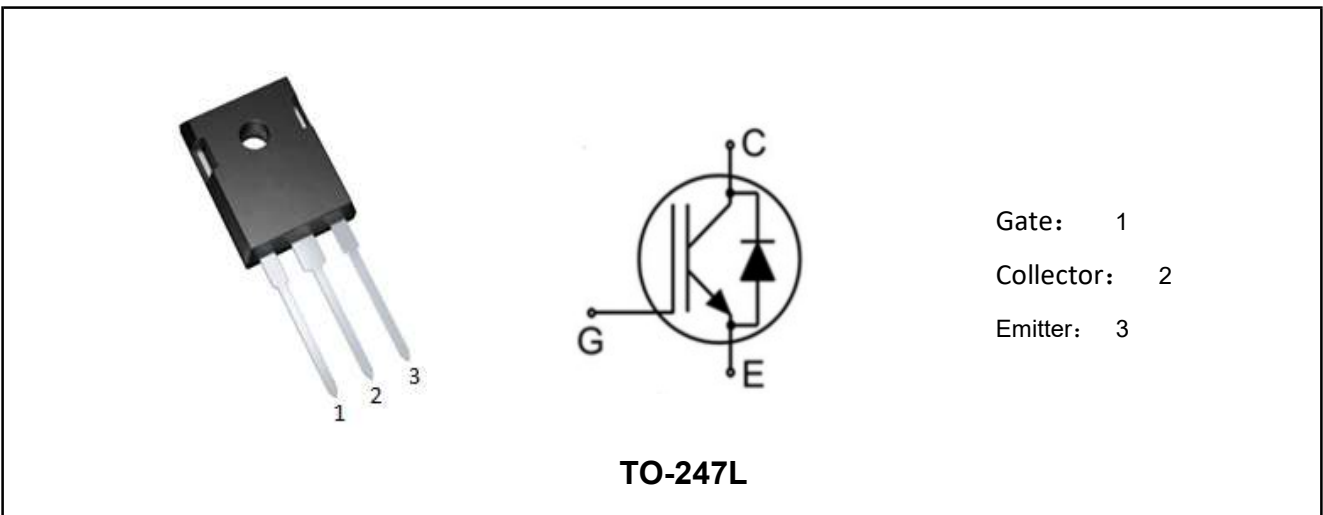
- Industrial UPS
- Welding machine
- Solar converters
- Energy Storage
- Mid to high range switching frequency converters

## ■ Features

- Low switching power loss
- Low switching surge and noise
- Advanced Fieldstop technology
- Short circuit withstand time – 5 $\mu$ 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



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
<b>Static Characteristics</b>						
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	$\mu A$
Gate-emitter leakage current	$I_{GES}$	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	$\pm 200$	nA
Gate-emitter threshold voltage	$V_{GE(TH)}$	$V_{CE}=V_{GE}, I_C=250\mu A$	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
<b>Dynamic Characteristics</b>						
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	-	$\Omega$
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
<b>IGBT Switching Characteristics</b>						
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
<b>Diode Characteristics</b>						
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	-	$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rrm}$		-	6	-	A

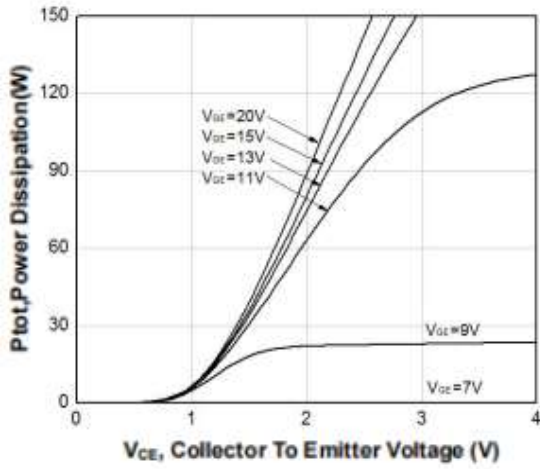
### ■ Switching Characteristic, Inductive Load, at $T_j=175^\circ\text{C}$

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>IGBT Switching Characteristics</b>						
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
<b>Diode Characteristics</b>						
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	-	$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rrm}$		-	10	-	A

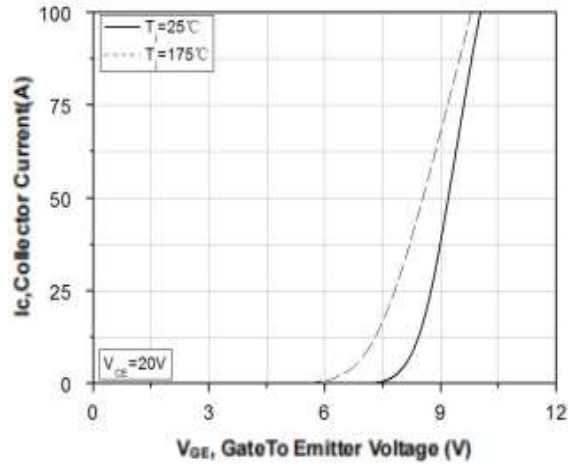




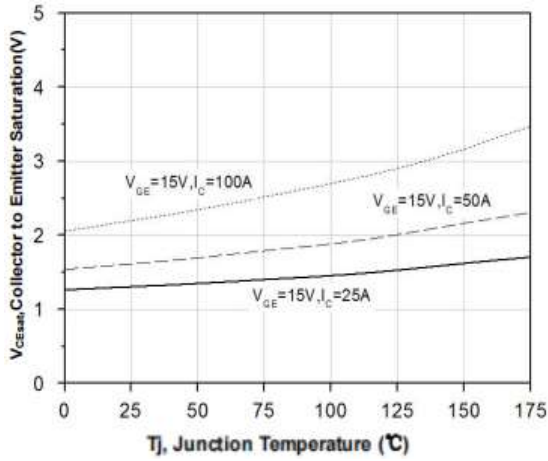
■ Characteristics Curves



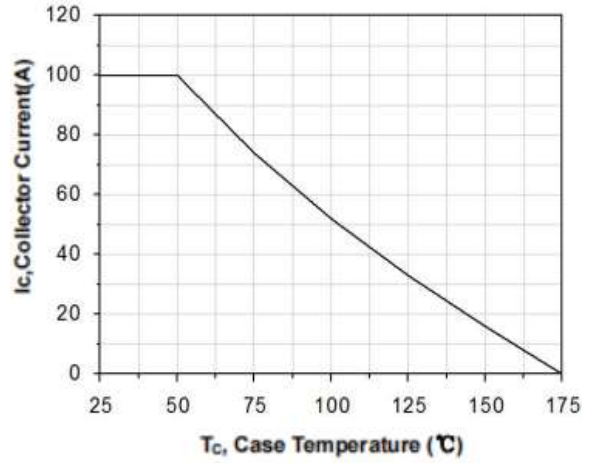
Output Characteristics



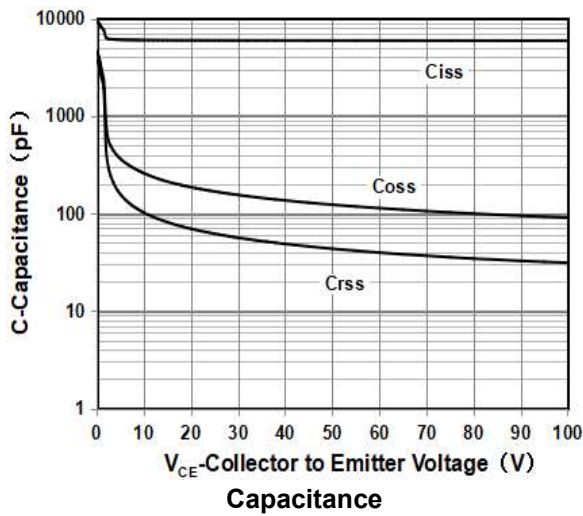
Transfer Characteristics



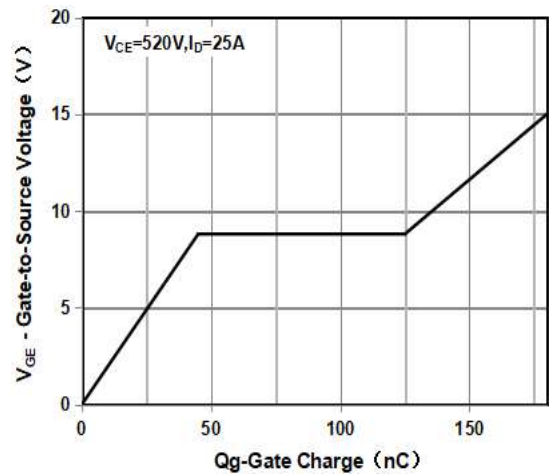
Typical collector-emitter saturation voltage as a function of junction temperature ( $V_{GE} = 15V$ )



Collector current as a function of case temperature ( $V_{GE} \geq 15V, T_{vj} \leq 175^\circ C$ )

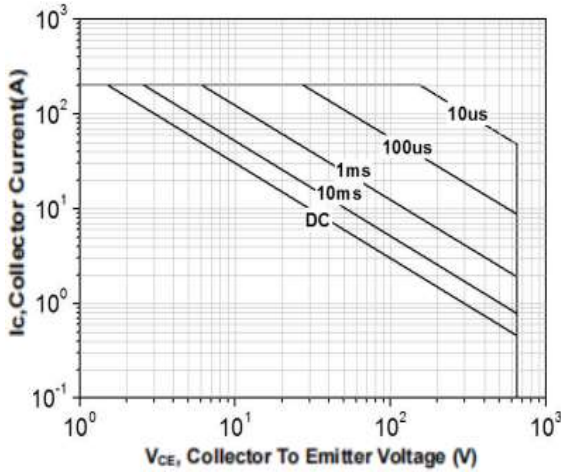


Capacitance

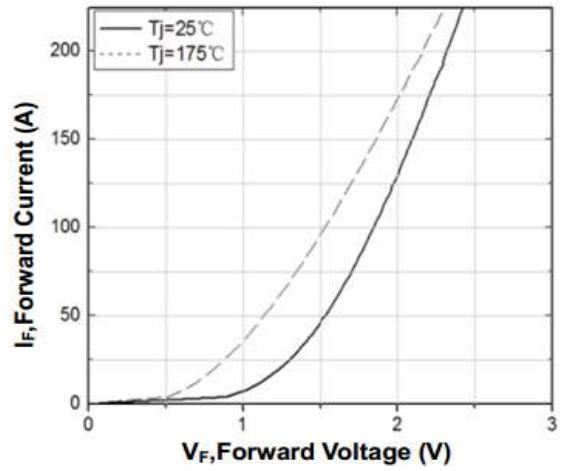


Typical gate charge





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				

