

■ Applications

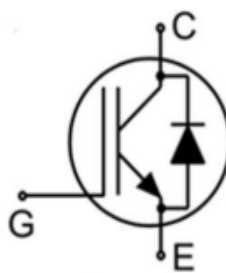
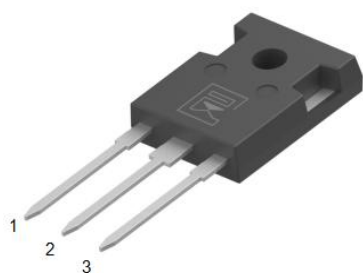
- Industrial UPS
- Welding machine
- Solar converters
- Energy Storage
- Mid to high range switching frequency converters

■ Features

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

■ Product Summary

V_{CES}	1200	V
I_C	40	A
$V_{CE(sat)}, Typ @ 15V$	2	V



Gate: 1
Collector: 2
Emitter: 3

TO-247L

Marking	Package	Packaging	Min. package quantity
MSLB40N120T4F	TO-247L	Tube	450





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

Parameter	Symbol	Ratings	Unit
Collector-emitter Voltage	V_{CES}	1200	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 $V_{GE}=15V, V_{CC} \leq 600V, T_j \leq 150^\circ C$	t_{SC}	5	μs
Power Dissipation (TC=25°C)	P_D	312	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	$R_{\theta JC}$	0.4	°C/W
Diode Maximum Junction-to-Case	$R_{\theta JC}$	0.8	°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}	$V_{GE}=0V, I_C=250\mu A$		1200	-	-	V
Zero gate voltage collector current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$		-	-	100	μA
Gate-emitter leakage current	I_{GES}	$V_{GE}=\pm 20V, V_{CE}=0V$		-	-	± 500	nA
Gate-emitter threshold voltage	$V_{GE(TH)}$	$V_{CE}=V_{GE}, I_C=250\mu A$		5.5	6.4	7.5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A$		-	2	2.4	V
			$T_j=125^{\circ}C$	-	2.4	-	V
Diode forward voltage	V_F	$I_F=40A$		-	1.9	2.4	V
			$T_j=150^{\circ}C$	-	1.7	-	V
Dynamic Characteristics							
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1.0MHz$		-	4340	-	pF
Output Capacitance	C_{oes}			-	153	-	pF
Reverse Transfer Capacitance	C_{res}			-	28	-	pF
Integrated gate resistor	R_{Gint}			-	0.7	-	Ω
Total Gate Charge	Q_g	$V_{CC}=600V, I_C=40A, V_{GE}=15V$		-	134	-	nC
Gate-to-emitter charge	Q_{ge}			-	43	-	nC
Gate-to-collector charge	Q_{gc}			-	47	-	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	$t_{d(on)}$	$V_{CC}= 600V$ $I_C= 40A$ $V_{GE}= 15V$ $R_G= 10\Omega$ Inductive load	-	45	-	ns
Turn-On Rise Time	t_r		-	120	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	98	-	ns
Turn-Off Fall Time	t_f		-	82	-	ns
Turn-on energy	E_{on}		-	3.9	-	mJ
Turn-off energy	E_{off}		-	0.6	-	mJ
Diode Characteristics						
Reverse Recovery Time	t_{rr}	$V_R=800V, I_F=30A,$ $di/dt=200A/us$	-	75	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.37	-	uC
Peak Reverse Recovery Current	I_{rrm}		-	10	-	A

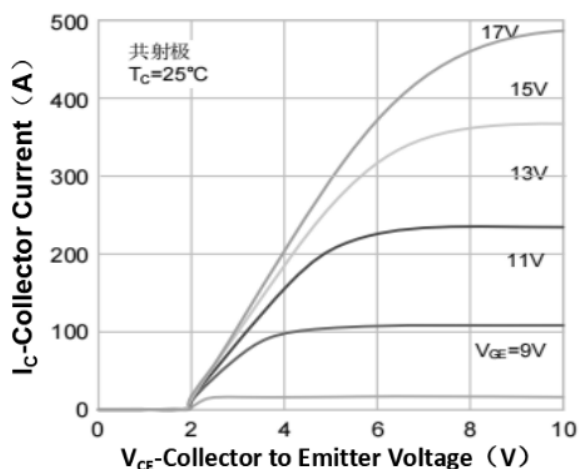
■ Switching Characteristic, Inductive Load, at $T_j=150^\circ\text{C}$

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}= 600V$ $I_C= 40A$ $V_{GE}= 15V$ $R_G= 10\Omega$ Inductive load	-	47	-	ns
Turn-On Rise Time	t_r		-	116	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	104	-	ns
Turn-Off Fall Time	t_f		-	85	-	ns
Turn-on energy	E_{on}		-	4.2	-	mJ
Turn-off energy	E_{off}		-	0.8	-	mJ
Diode Characteristics						
Reverse Recovery Time	t_{rr}	$V_R=800V, I_F=30A,$ $di/dt=200A/us$	-	100	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.75	-	uC
Peak Reverse Recovery Current	I_{rrm}		-	15	-	A

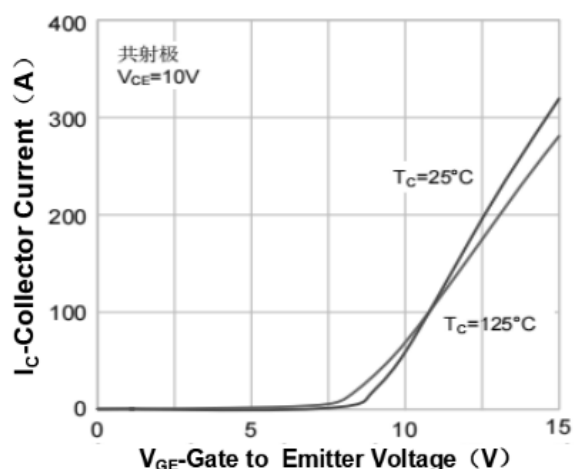




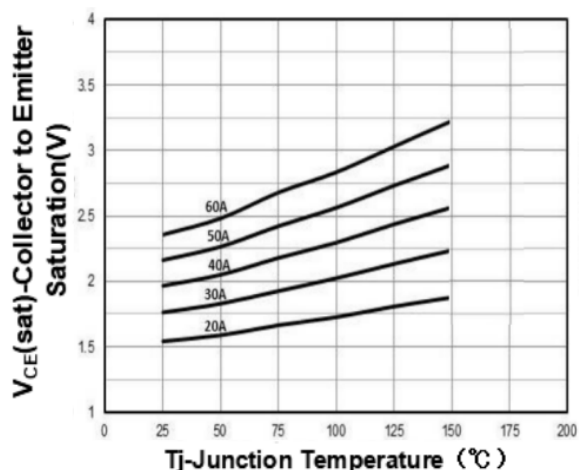
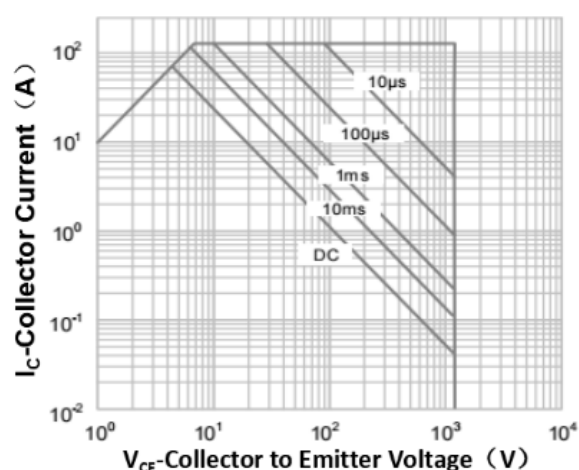
■ Characteristics Curves



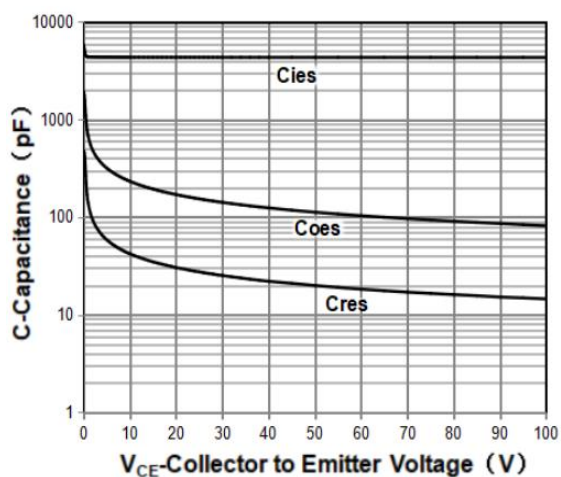
Output Characteristics



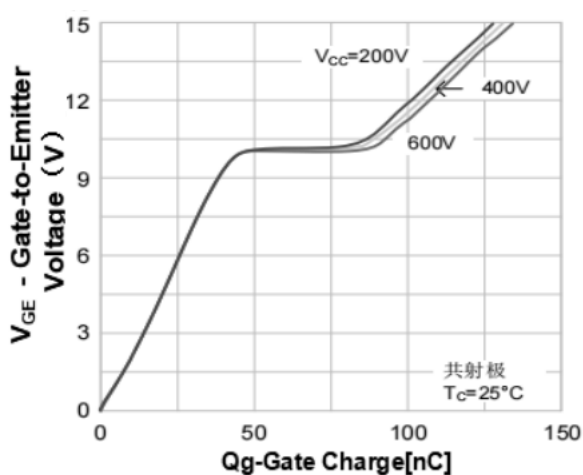
Transfer Characteristics

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

Maximum Forward Biased Safe Operating Area

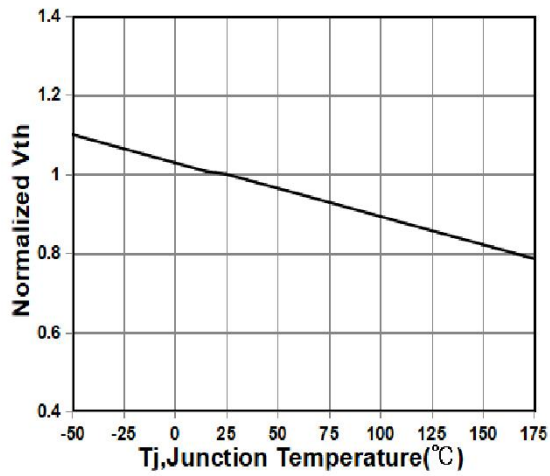


Capacitance

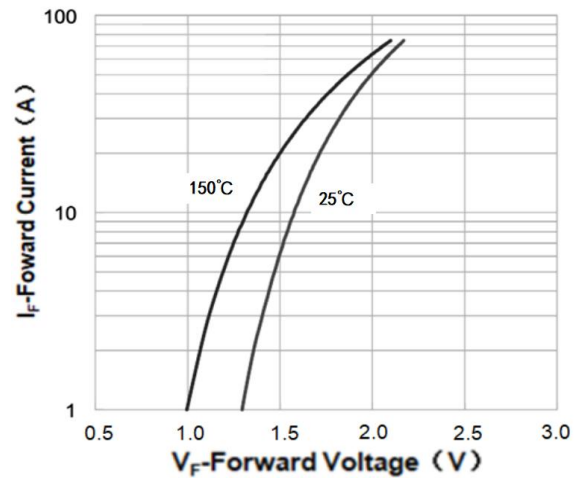


Typical gate charge





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-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				

