

Lonten 1200V, 40A, Field Stop Trench IGBT

Description

LKB40N120TM1 IGBT is obtained by novel field stop IGBT technology, which provides the best compromise between switching and conduction losses.

Features

- ◆ maximum junction temperature: $T_{vj}=150^{\circ}\text{C}$
- ◆ low V_{CEsat}
- ◆ small oscillation of V_{ge} during turn-on
- ◆ with fast recovery anti-parallel diode
- ◆ RoHS compliant

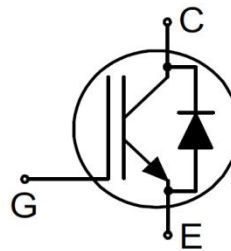
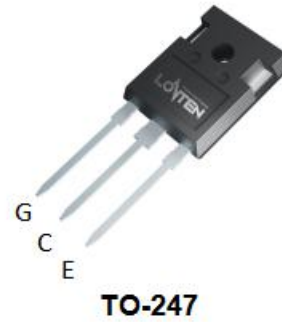
Applications

- ◆ uninterruptible power supplies
- ◆ welding machines
- ◆ converters

Product Summary

V_{CES}	1200V
I_C	40A
$V_{CEsat} @ T_{vj}=25^{\circ}\text{C}$	1.8V

Pin Configuration



lead-free

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter Voltage	V_{CES}	1200	V
DC collector current, limited by T_{vjmax} $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_C	80 40	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	160	A
Diode forward current, limited by T_{vjmax} $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_F	80 40	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	160	A
Gate-emitter voltage	V_{GES}	± 20	V
Short circuit withstand time $V_{GE} = 15.0\text{V}$, $V_{CC} \leq 600\text{V}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{s}$ $T_{vj} = 150^\circ\text{C}$	t_{SC}	10	μs
Power dissipation ($T_C = 25^\circ\text{C}$) Power dissipation ($T_C = 100^\circ\text{C}$)	P_{tot}	416 166	W
Operating junction temperature	T_{vj}	-55 to +150	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
IGBT thermal resistance, junction-to-case	$R_{\theta JC}$	0.3	K/W
Diode thermal resistance, junction-to-case	$R_{\theta JC}$	0.8	K/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	40	K/W

Package Marking and Ordering Information

Device	Device Package	Marking
LKB40N120TM1	TO-247	LKB40N120TM1

Electrical Characteristics $T_{vj} = 25^{\circ}\text{C}$ unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Static characteristics							
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}=0\text{ V}, I_C=250\mu\text{A}$	1200	-	-	V	
Collector-emitter saturation voltage	V_{CEsat}	$V_{GE} = 15.0\text{V}, I_C = 40.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- - -	1.8 2.16 2.3	2.4 - -	V	
Diode forward voltage	V_F	$V_{GE} = 0\text{V}, I_F = 20.0\text{A}$	--	1.5	2.7	V	
Diode forward voltage	V_F	$V_{GE} = 0\text{V}, I_F = 40.0\text{A}$	-	2.5	3.2	V	
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=250\mu\text{A}$	4.0	5.8	7.0	V	
Collector cut-off current	I_{CES}	$V_{CE}=1200\text{V}, V_{GE}=0\text{V},$ $T_{vj} = 25^{\circ}\text{C}$	-	-	5	μA	
Gate-emitter leakage current, Forward	I_{GESF}	$V_{GE}=20\text{ V}, V_{CE}=0\text{ V}$	-	-	100	nA	
Gate-emitter leakage current, Reverse	I_{GESR}	$V_{GE}=-20\text{ V}, V_{CE}=0\text{ V}$	-	-	-100	nA	
Dynamic characteristics							
Input capacitance	C_{ies}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V},$ $f = 1\text{MHz}$	-	4116	-	pF	
Output capacitance	C_{oes}		-	229	-		
Reverse transfer capacitance	C_{res}		-	113	-		
Turn-on delay time	$t_{d(on)}$	$T_{vj} = 25^{\circ}\text{C},$ $V_{CC} = 600\text{V}, I_C = 40.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$ $R_G = 10\Omega$	-	52.2	-	ns	
Rise time	t_r		-	17.3	-		
Turn-off delay time	$t_{d(off)}$		-	240.3	-		
Fall time	t_f		-	117.5	-		
Turn-on energy	E_{on}		-	2.8	-		mJ
Turn-off energy	E_{off}		-	2	-		
Total switching energy	E_{ts}	-	4.8	-			
Gate charge	Q_G	$V_{CC} = 960\text{V}, I_C = 40.0\text{A},$ $V_{GE} = 15\text{V}$	-	198	-	nC	
Gate to emitter charge	Q_{GE}		-	31.4	-		
Gate to collector charge	Q_{GC}		-	101.6	-		
Reverse diode characteristics							
Diode reverse recovery time	t_{rr}	$T_{vj} = 25^{\circ}\text{C},$ $V_R = 600\text{V},$	-	40.6	-	ns	
Diode reverse recovery charge	Q_{rr}	$I_F = 40.0\text{A},$	-	0.72	-	μC	
Diode peak reverse recovery current	I_{rrm}	$di_F/dt = 1000\text{A}/\mu\text{s}$	-	28	-	A	

Electrical Characteristics Diagrams

Fig1. Output Characteristic($T_J=25^\circ\text{C}$)

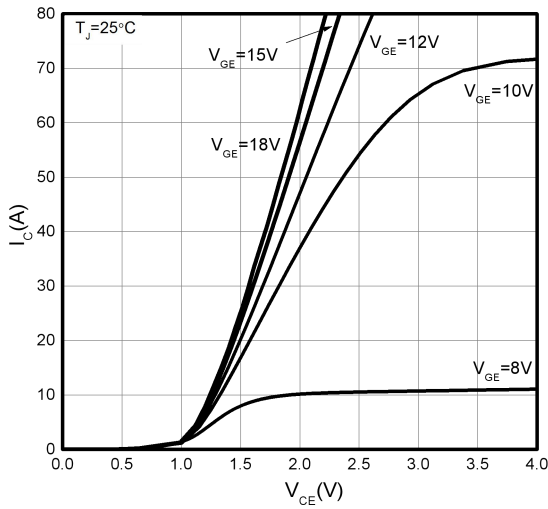


Fig2. Output Characteristic($T_J=125^\circ\text{C}$)

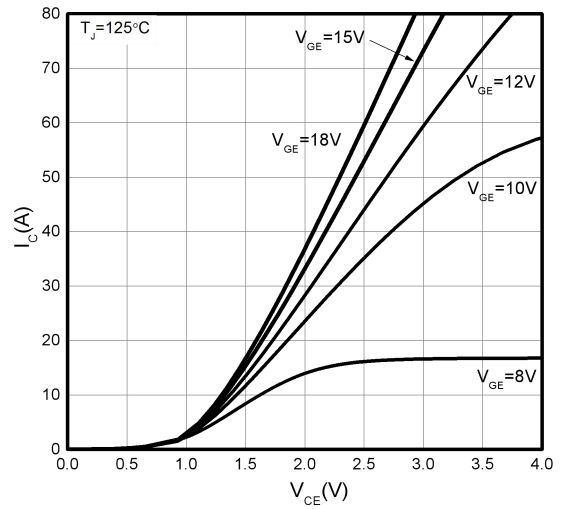


Fig3. Typical Transfer Characteristic

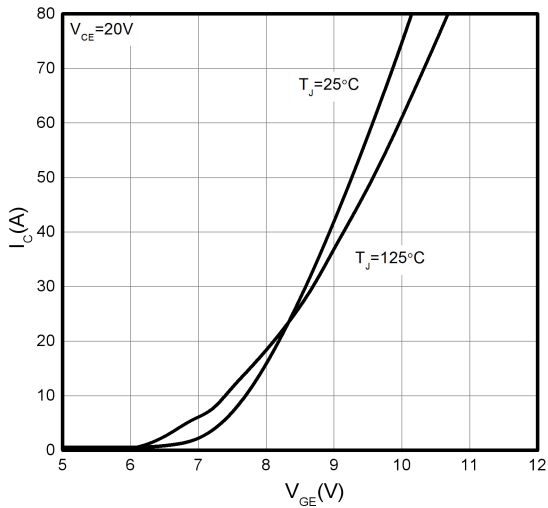


Fig4. $V_{CE(sat)}$ & T_J

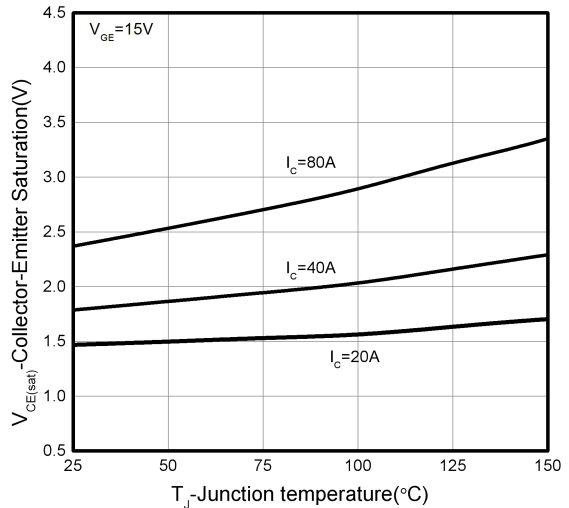


Fig5. Switching Times & Gate Resistance

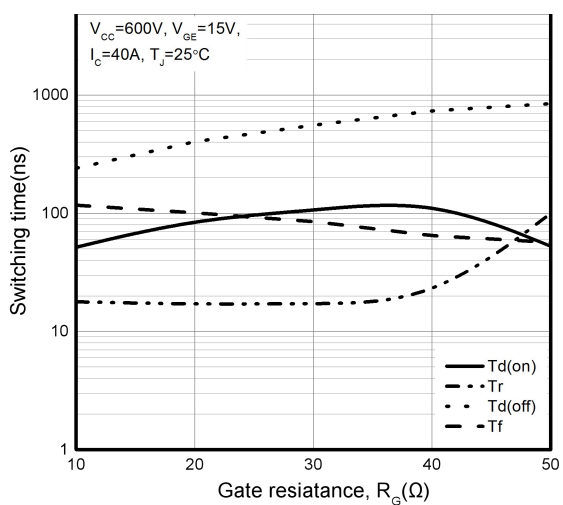


Fig6. Switching Times & Collector Current

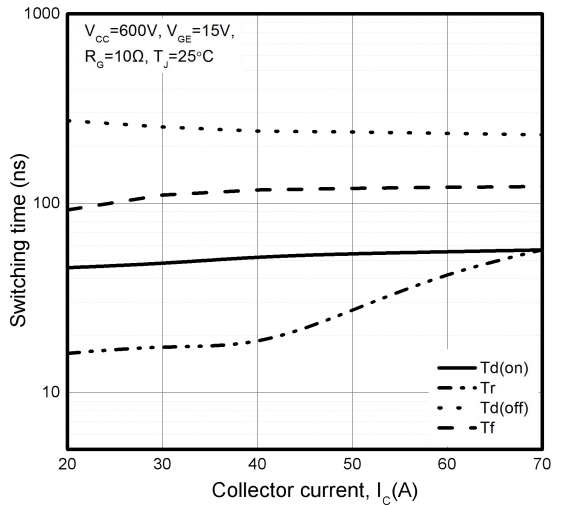


Fig7. Switching Loss & Gate Resistance

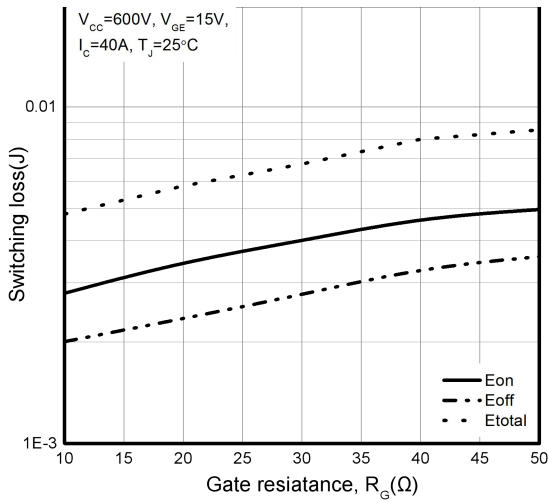


Fig8. Switching Loss & Collector Current

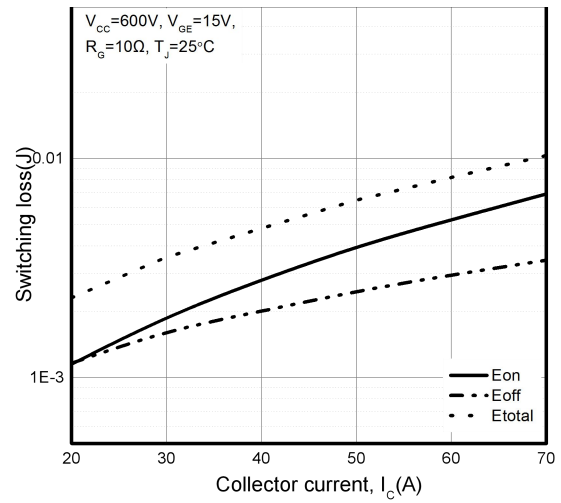


Fig9. Capacitance Characteristic

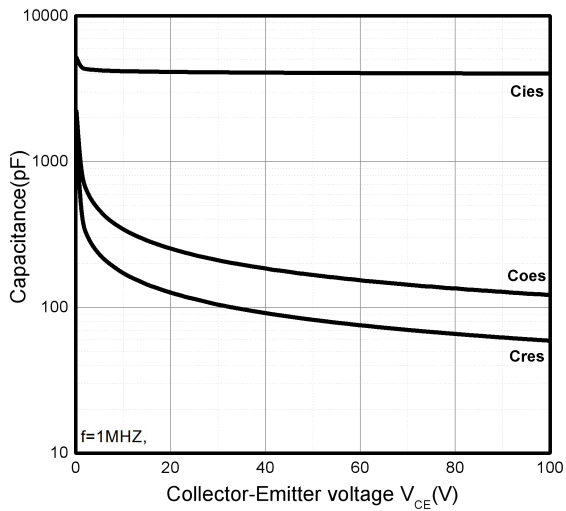


Fig10. Typical Gate Charge

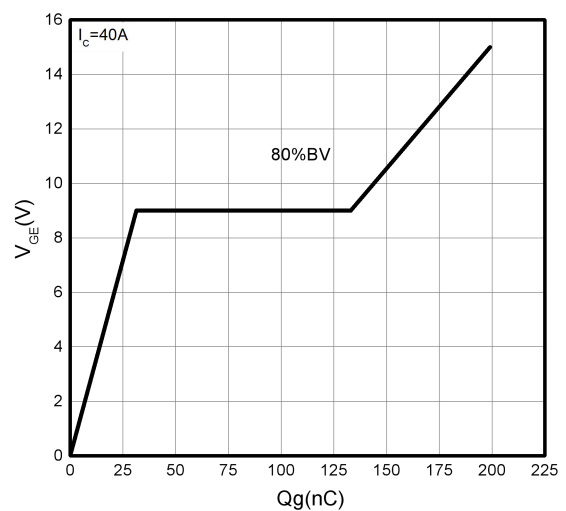


Fig11. Diode Characteristic

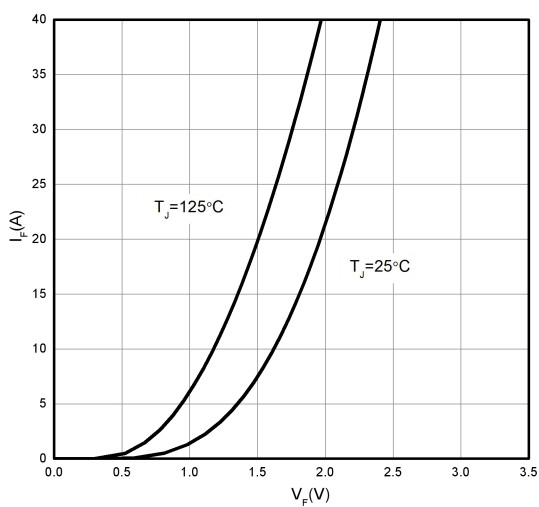


Fig12. Power Dissipation Characteristic

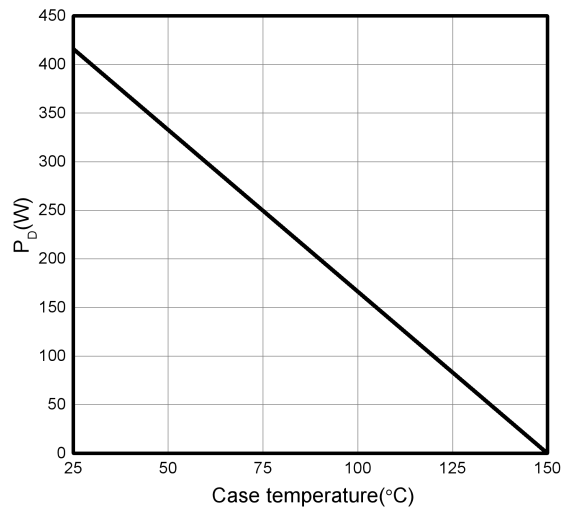


Fig13. I_c & T_c

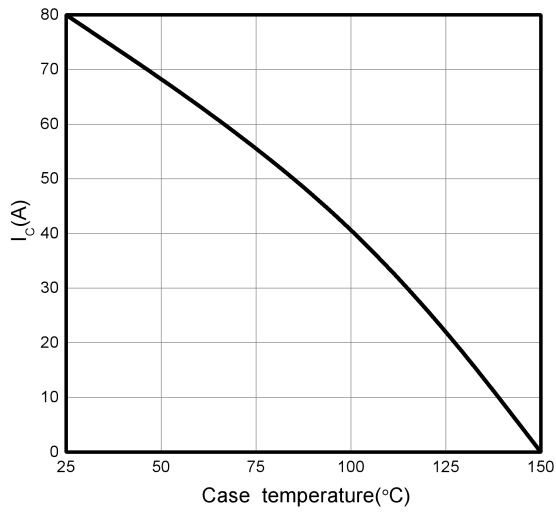


Figure 14: Safe Operating Area

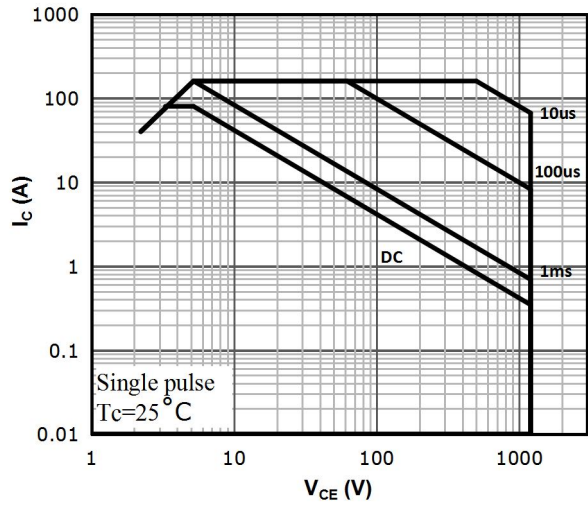
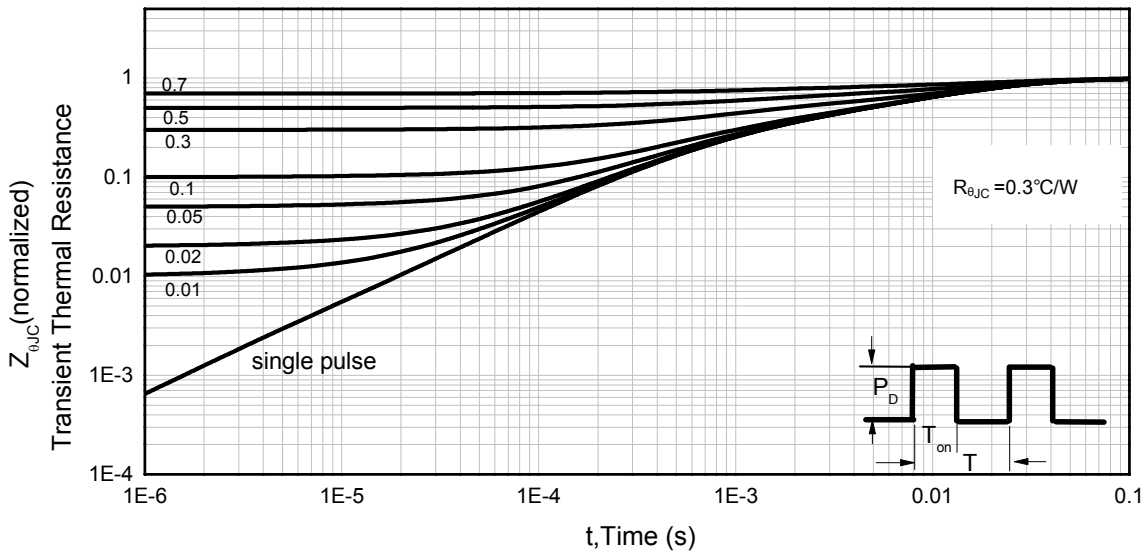
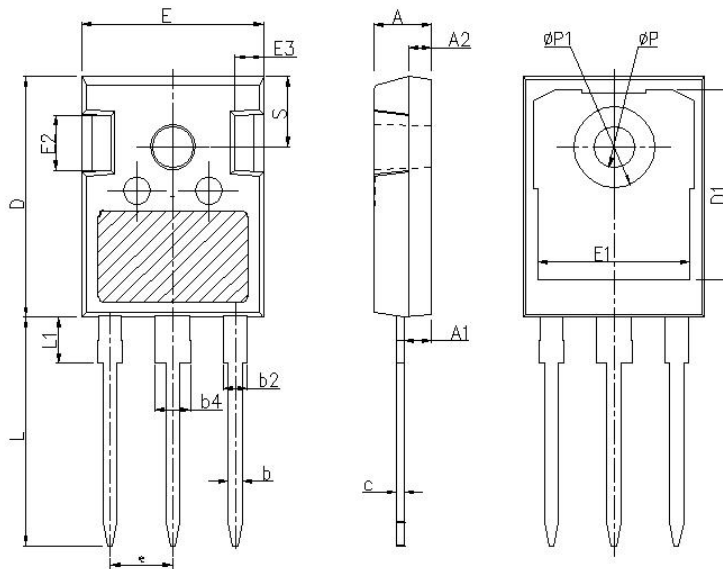


Figure 15. Normalized Maximum Transient Thermal Impedance (R_{thJC})



Mechanical Dimensions for TO-247



DIMENSIONS IN MILLIMETERS		
SYMBOL	MIN	MAX
A	4.8	5.21
A1	2.21	2.61
A2	1.85	2.16
b	1.07	1.36
b2	1.91	2.41
b4	2.87	3.38
c	0.51	0.75
D	20.7	21.3
D1	16.25	17.65
E	15.5	16.13
E1	13	13.6
E2	3.68	5.2
E3	1	2.7
e	5.44BSC	
L	19.62	20.32
L1	-	4.4
ΦP	3.4	3.8
ΦP1	-	7.4
S	6.04	6.3

Version Information

LKB40N120TM1

Revision:2022-03-10,Rev 0.3

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