

1200V 40A Insulated Gate Bipolar Transistors

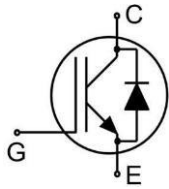
FEATURES

- $V_{CES}=1200V, I_C=40A(T_C=100^{\circ}C)$
- Saturation pressure is reduced and the switching speed is fast
- Saturation pressure drops to a positive temperature coefficient
- High reliability and thermal stability, good parameter consistency

APPLICATIONS

- UPS
- Inverter welder

SYMBOL



ASSEMBLY MESSAGE

Product Name	Package	Packaging
BXE40T1K2HFSD	TO-247	Tube

ABSOLUTE MAXIMUM RATINGS ($T_C=25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate- Emitter Voltage	± 20	V
I_C	Collector Current	80	A
	Collector Current @ $T_C = 100^{\circ}C$	40	A
I_{Cplus}	Pulsed Collector Current, t_p limited by T_{jmax}	160	A
I_F	Diode Continuous Forward Current @ $T_C = 25^{\circ}C$	80	A
	Diode Continuous Forward Current @ $T_C = 100^{\circ}C$	40	A
I_{FM}	Diode Maximum Forward Current	160	A
P_D	Power Dissipation @ $T_C = 25^{\circ}C$	278	W
T_J, T_{stg}	Operating Junction and Storage Temperature Range	-55 to +150	$^{\circ}C$
T_L	Maximum Temperature for Soldering	270	$^{\circ}C$

THERMAL CHARACTERISTICS

Parameter	Symbol	Max.	Units
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	0.45	$^{\circ}C/W$
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	0.7	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	40	$^{\circ}C/W$

ELECTRICAL CHARACTERISTICS ($T_C=25^{\circ}\text{C}$, unless otherwise Noted)

Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
Static Characteristics						
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_{CE}=250\mu A$	1200	--	--	V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0V, V_{CE}=1200V$	--	--	1	mA
$I_{GES(F)}$	Gate to Emitter Forward Leakage	$V_{GE}=+20V, V_{CE}=0V$	--	--	+250	nA
$I_{GES(R)}$	Gate to Source Reverse Leakage	$V_{GE}=-20V, V_{CE}=0V$	--	--	-250	nA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=40A, V_{GE}=15V$	--	1.9	2.4	V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=250\mu A, V_{CE}=V_{GE}$	4.5	5.8	7	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE}=25V, V_{GE}=0V,$ $f=1\text{MHz}$	--	3823	--	pF
C_{oes}	Output Capacitance		--	170	--	
C_{res}	Reverse Transfer Capacitance		--	94	--	
Q_g	Total Gate Charge	$V_{CE}=600V, I_C=40A,$ $V_{GE}=15V$	--	239	--	nC
Q_{ge}	Gate to Emitter Charge		--	30	--	
Q_{gc}	Gate to Collector Charge		--	147	--	
Switching Characteristics						
$t_{d(ON)}$	Turn-on Delay Time	$V_{CE}=600V, I_C=40A,$ $V_{GE}=15V, R_g=10\Omega,$ Inductive Load, $T_a=25^{\circ}\text{C}$	--	62	--	ns
t_r	Rise Time		--	54	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	265	--	
t_f	Fall Time		--	30	--	
E_{on}	Turn-On Switching Loss		--	3.3	--	
E_{off}	Turn-Off Switching Loss	$V_{CE}=600V, I_C=40A,$ $V_{GE}=15V, R_g=10\Omega,$ Inductive Load, $T_a=150^{\circ}\text{C}$	--	1.4	--	mJ
E_{ts}	Total Switching Loss		--	4.7	--	
$t_{d(ON)}$	Turn-on Delay Time		--	55	--	
t_r	Rise Time		--	55	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	306	--	
t_f	Fall Time		--	38	--	
E_{on}	Turn-On Switching Loss		--	3.49	--	
E_{off}	Turn-Off Switching Loss	--	1.85	--		
E_{ts}	Total Switching Loss	--	5.34	--	mJ	

ELECTRICAL CHARACTERISTICS OF THE DIODE ($T_C=25^{\circ}\text{C}$, unless otherwise Noted)

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{FM}	Diode Forward Voltage	$I_F=40A$	--	2.1	--	V
T_{rr}	Reverse Recovery Time	$I_F=40A,$ $di/dt=200A/\mu s$	--	88	--	ns
I_{RRM}	Diode Peak Reverse Recovery Current		--	7.6	--	A
Q_{rr}	Reverse Recovery Charge		--	326	--	nC

 Note: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

TYPICAL CHARACTERISTICS

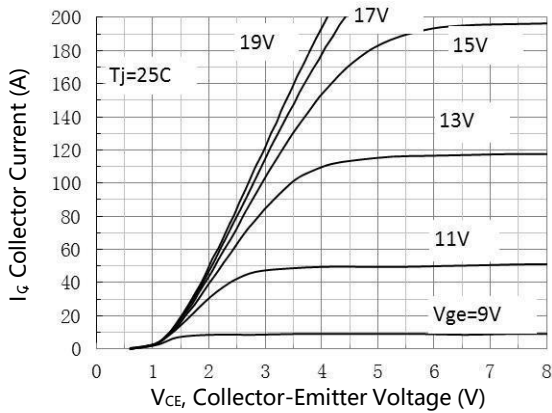


Figure1. Output Characteristics

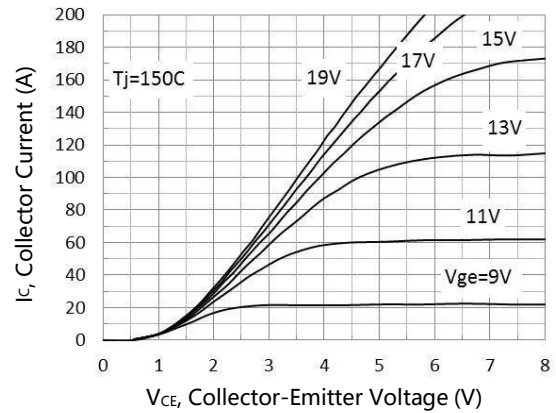


Figure2. Output Characteristics

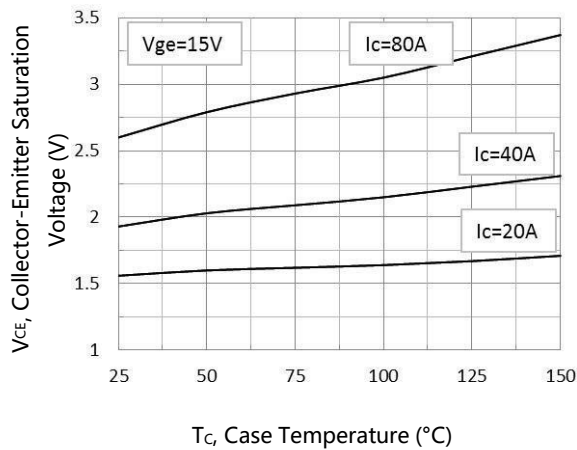


Figure3. $V_{CE(sat)}$ vs. Case Temperature

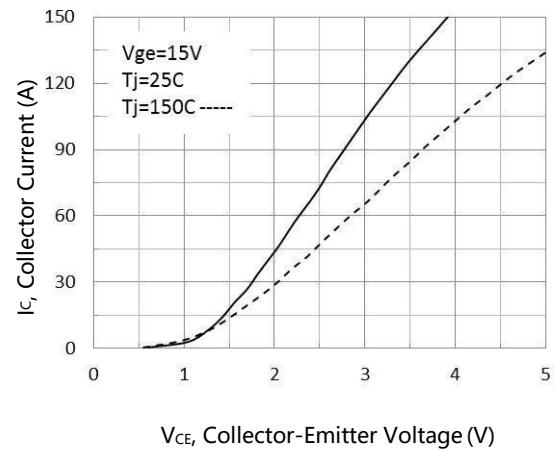


Figure4. Saturating pressure drop characteristics

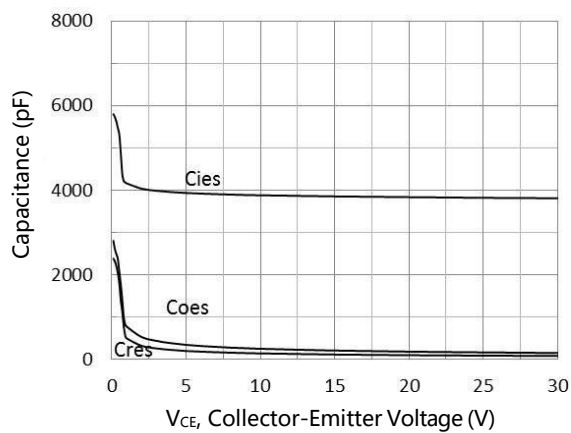


Figure5. Capacitance Characteristics

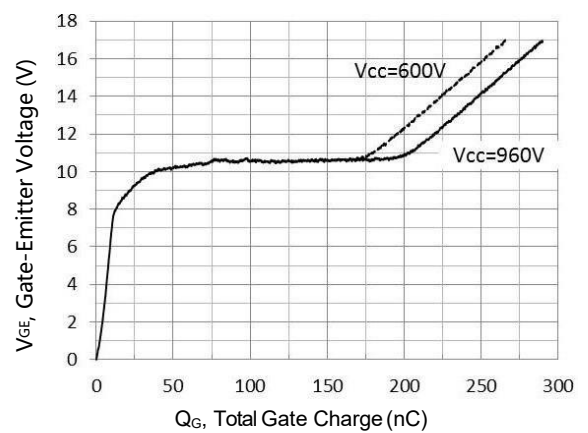
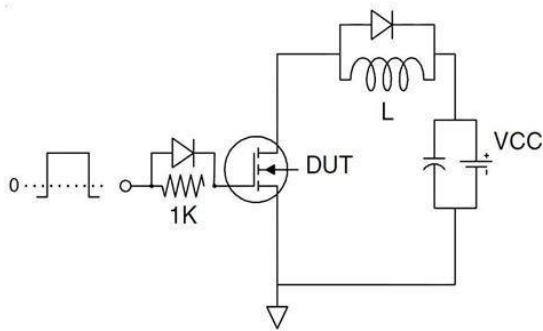
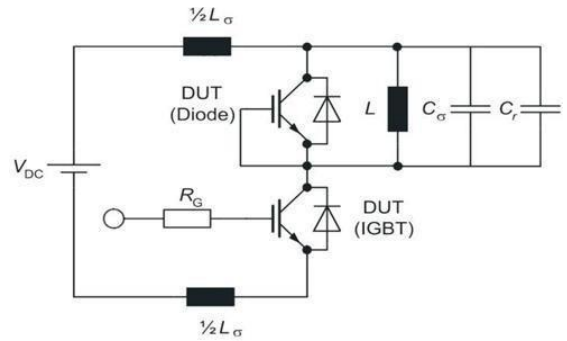


Figure6. Gate Charge Wave Form

TEST CIRCUIT

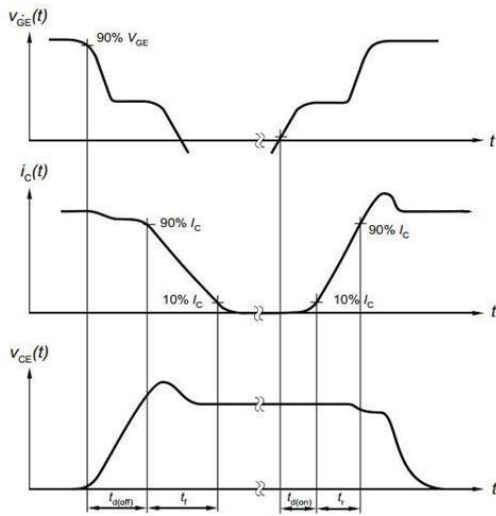


Gate Charge Test Circuit

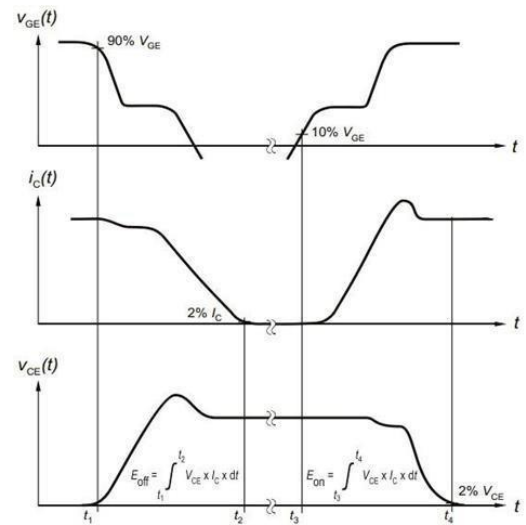


Switch Time Test Circuit

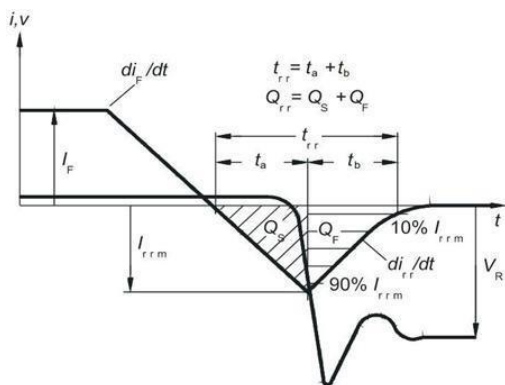
SWITCHING CHARACTERISTICS



Definition of switching times

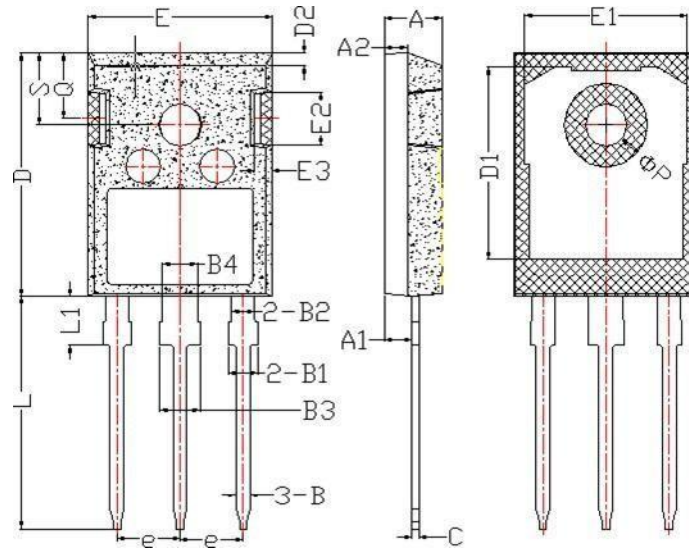


Definition of switching losses



Definition of diode switching characteristics

TO-247 Package



SYMBOL	T0-247(mm)	
	MIN	MAX
A	4.6	5.2
A1	2,2	2.6
B	0.9	1.4
B1	1.75	2.35
B2	1.75	2.15
B3	2.8	3.35
B4	2.8	3.15
C	0.5	0.7
D	20.60	21.30
D1	16	18
E	15.5	16.10
E1	13	14.7
E2	3.80	5.3
E3	0.8	2.60
e	5.2	5.7
L	19	20.5
L1	3.9	4.6
ΦP	3.3	3.70
Q	5.2	6.00
S	5.8	6.6

Revision history

Document revision history

Date	Revision	Changes
10-Aug-2021	1.0	First release

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