AK40TD120BT

Fast IGBT

Primary characteristics

Parameter	Value	Unit
Collector emitter voltage	1200	V
Collector current	80	A

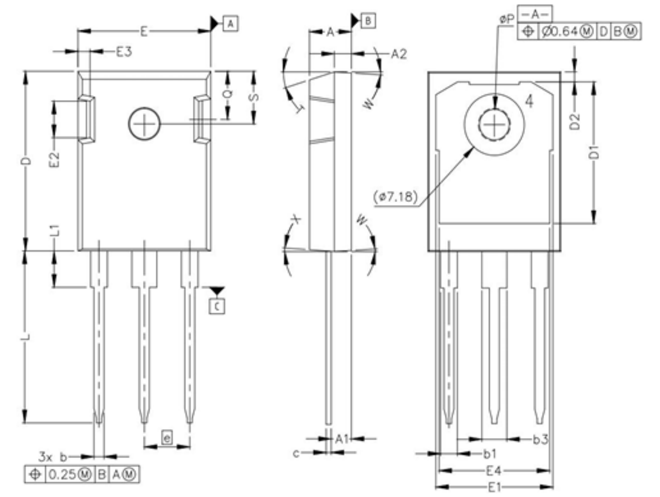
Features

- Very low $V_{CE(sat)}$
- High speed switching
- Positive temperature coefficient in $V_{CE(sat)}$
- Very tight parameter distribution
- High ruggedness, temperature stable behavior

Applications

- Inverters
- Motor drivers
- Converters

Case dimensions



TO-247

Unit mm	A	A1	A2	b	b1	b3	c	D	D1	D2	E	E1
MIN	4.83	2.29	1.91	1.07	1.91	2.87	0.55	20.80	16.25	0.95	15.75	13.10
MAX	5.21	2.54	2.16	1.33	2.41	3.38	0.68	21.10	17.65	1.25	16.13	14.15

Unit mm	E2	E3	E4	e	L	L1	ØP	Q	S	T	W	X
MIN	3.68	1.00	12.38	5.44	19.81	4.10	3.51	5.49	6.04	17.5°	3.5°	4°
MAX	5.10	1.90	13.43	BSC	20.32	4.40	3.65	6.00	6.30	REF	REF	REF

Absolute maximum ratings and thermal characteristics (T_c = 25°C unless otherwise noted)

Parameter		Symbol	Value	Unit
Collector emitter voltage		V_{CES}	1200	V
Gate emitter voltage		V_{GES}	±30	
Collector current	T_C=25°C	I_C	80	A
	T_C=100°C		40	
Pulsed collector current (t_p limited by T_{Jmax})		I_{Cpuls}	120	
Turn off safe operating area ($V_{CE(sat)}$ = 1200V, T_J = 175°C)		-	120	
Power dissipation	T_C=25°C	P_D	468	W
	T_C=100°C		234	
Diode continuous forward current (T_C=100°C)		I_F	40	A
Diode maximum forward current		I_{FM}	120	A
Operating junction and storage temperature range		T_J,T_{stg}	-55 ~ +175	°C
Maximum temperature for soldering		T_L	260	°C
Short circuit withstand time V_{GE}=15.0V, V_{CC}≤600V, Allowed number of short circuits<1000 Time between short circuits ≥1.0s, T_J≤150°C		t_{sc}	10	µs
Thermal resistance junction to case for IGBT		$R_{\theta JC}$	0.32	°C/W
Thermal resistance junction to case for diode		$R_{\theta JC}$	0.61	°C/W
Thermal resistance junction to ambient		$R_{\theta JA}$	40	°C/W

Electrical characteristics (T_c = 25°C unless otherwise noted)

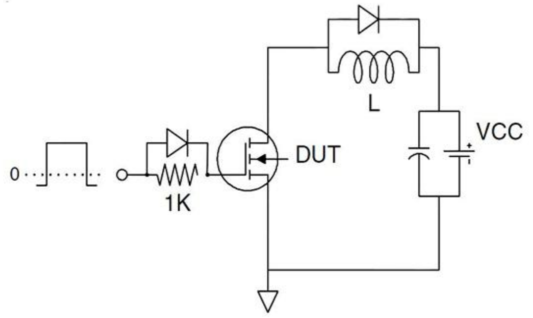
Parameter	Test condition	Symbol	Value			Unit
			Min.	Typ.	Max.	
Static characteristics						
Collector emiter breakdown voltage	V_{GE}=0V, I_{CE}=1mA	$V_{(BR)CES}$	1200	-	-	V
Gate threshold voltage	V_{CE}=V_{GE}, I_C=1mA	$V_{GE(th)}$	5.0	-	6.5	
Collector emitter saturation voltage	I_C=40A, V_{GE}=15V, T_J=25℃	$V_{CE(sat)}$	-	1.55	1.80	
	I_C=40A, V_{GE}=15V, T_J=175℃		-	1.80	-	
Collector emitter leakage current	V_{CE}=1200V, V_{GE}=0V	I_{CES}	-	-	200	µA
Gate emitter forward leakage	V_{CE}=0V, V_{GE}=+30V	$I_{GES(F)}$	-	-	200	nA
Gate source reverse leakage	V_{CE}=0V, V_{GE}=+30V	I_{GESI}	-	-	200	nA
Dynamic characteristics						
Input capacitance	V_{CE}=30V, V_{GE}=0V, f =1MHz	C_{ies}	-	5590	-	pF
Output capacitance		C_{oes}	-	177	-	
Reverse transfer capacitance		C_{res}	-	134	-	
Total gate charge	V_{CC}=960V, I_C=40A V_{GE}=15V	Q_g	-	298	-	nC
Gate emitter charge		Q_{ge}	-	52	-	
Gate collector charge		Q_{gc}	-	169	-	
Short circuit collector current Max.1000 short circuits Time between short circuits: ≥1.0s	V_{GE}=15V, V_{CC}=600V, t_{sc}≤10µs, T_j≤150°C	$I_{C(SC)}$	-	240	-	A
Switching characteristics						
Turn-on delay time	V_{CC}=600V I_C=40A R_G=80Ω V_{GE}=0/15V, Inductive Load	$t_{d(on)}$	-	19	-	ns
Rise time		t_r	-	17	-	
Turn-off delay time		$t_{d(off)}$	-	170	-	
Fall time		t_f	-	18	-	
Turn-on switching loss		E_{on}	-	2.3	-	mJ
Turn-off switching loss		E_{off}	-	1.6	-	
Total switching loss		E_{ts}	-	3.9	-	

Electrical Characteristics of the Diode (T_c = 25°C unless otherwise noted)

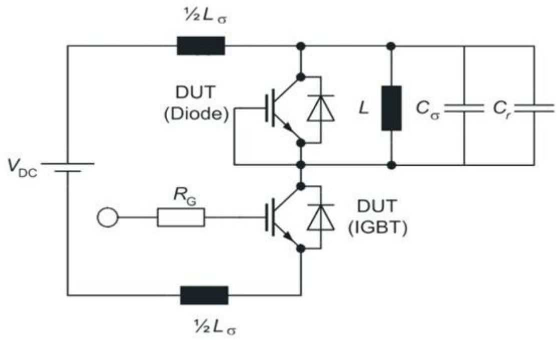
Parameter	Test condition	Symbol	Min.	Typ.	Max.	Unit
Diode forward voltage	I_F=40A	V_{FM}	-	2.2	2.8	V
Reverse recovery time	I_F=40A di/dt=500A/µs	T_{rr}	-	180	-	ns
Diode peak reverse recovery current		I_{RRM}	-	10	-	A
Reverse recovery charge		Q_{rr}	-	0.9	-	µC
Pulse width t_{tp}≤380µs, δ≤2%						

Switching characteristics

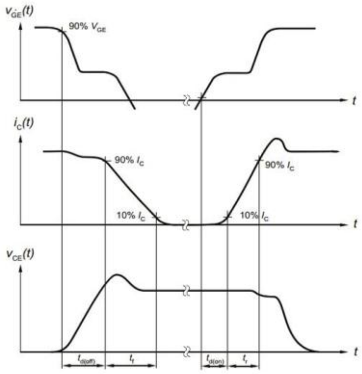
Gate charge test circuit



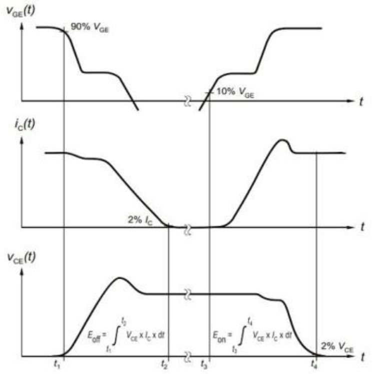
Switch time test circuit



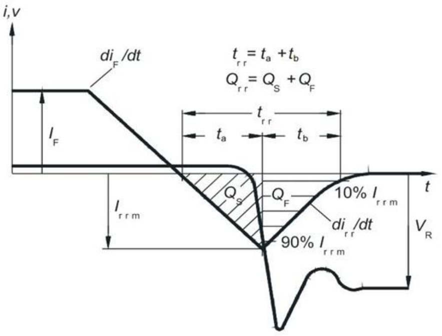
Definition of switching times



Definition of switching losses

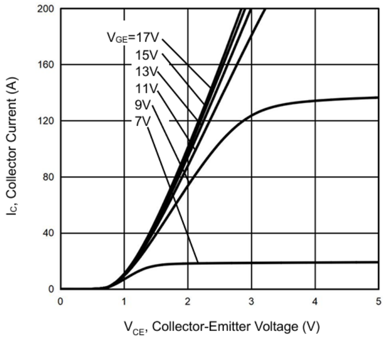


Definition of diode switching characteristics

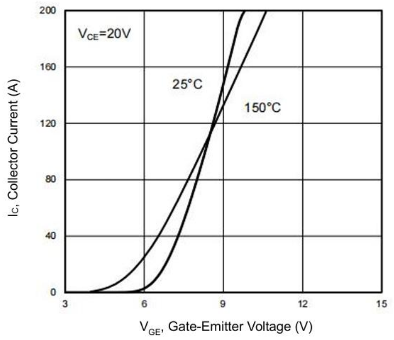


Typical Electrical and Thermal Characteristics

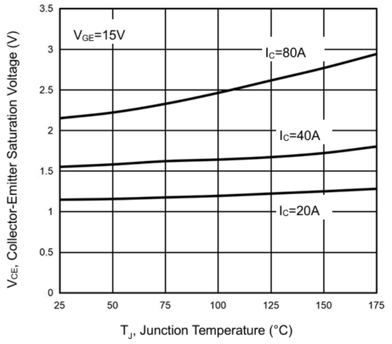
Output characteristics



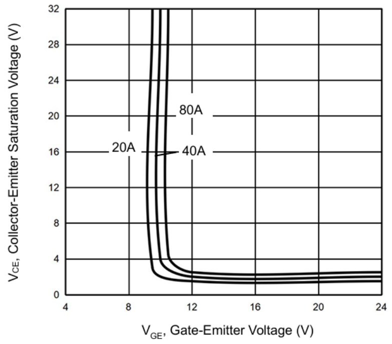
Transfer characteristics



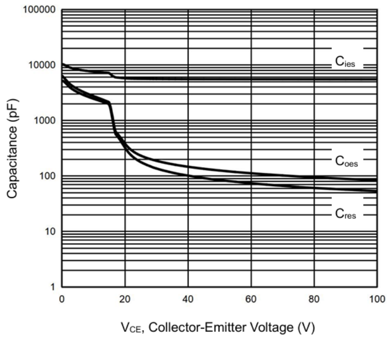
Saturation voltage vs. Case temperature



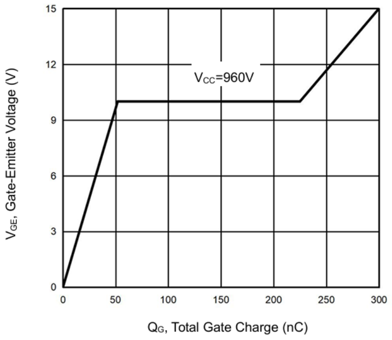
Saturation voltage vs. Gate emitter voltage



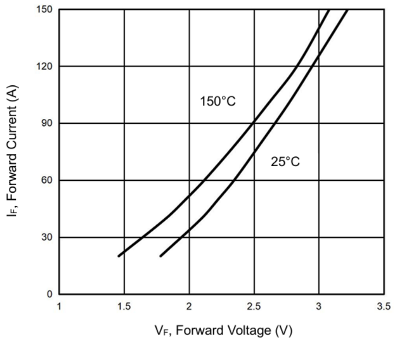
Capacitance characteristics



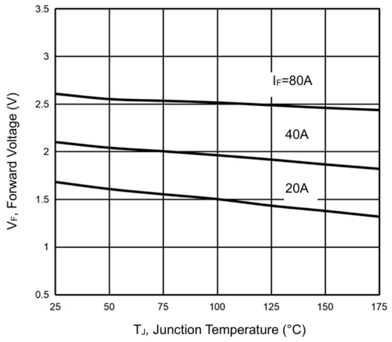
Gate charge wave form



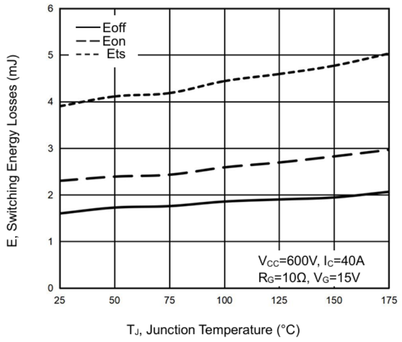
Forward characteristics



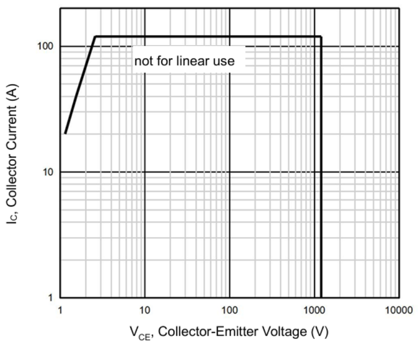
Forward voltage vs. Junction temperature



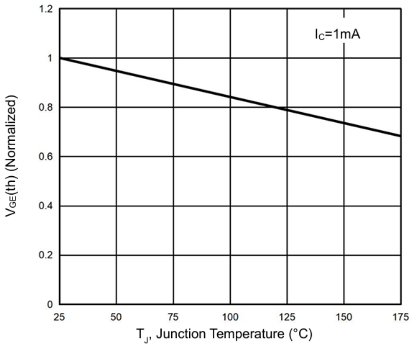
Switching energy vs. Temperature



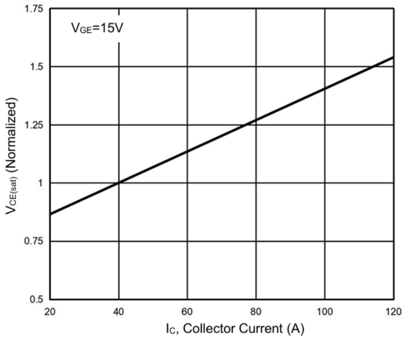
Forward bias safe operating area



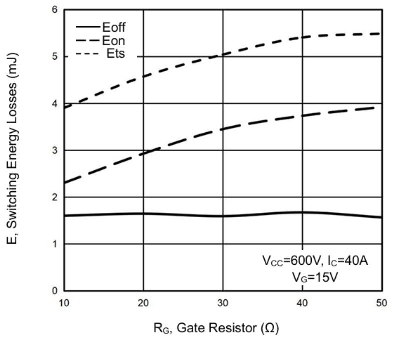
Gate emitter threshold voltage as a function of junction temperature



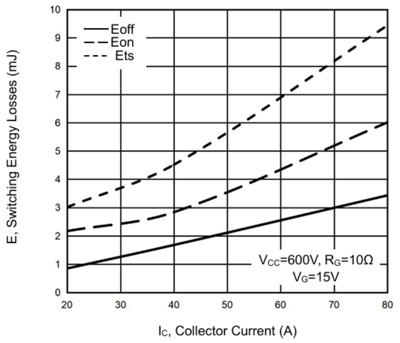
Typical collector emitter saturation voltage as function of collector current



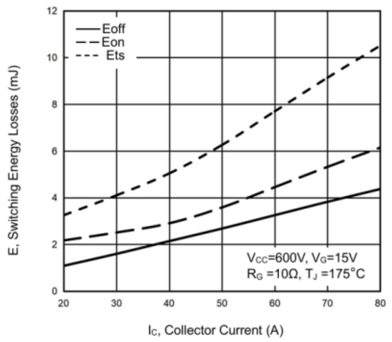
Switching loss vs. Gate resistance



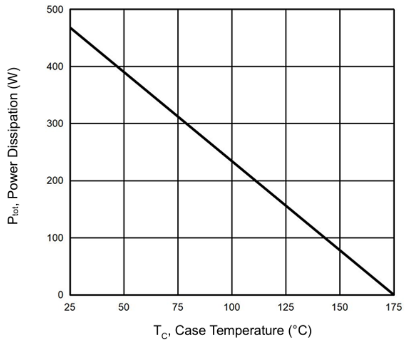
Switching loss vs. Collector current



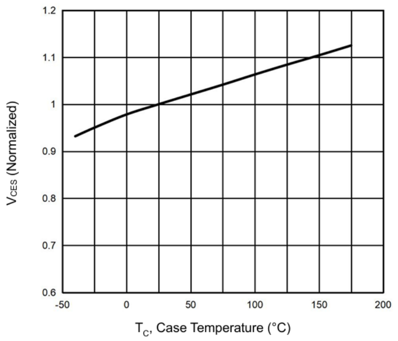
Switching loss vs. Collector current



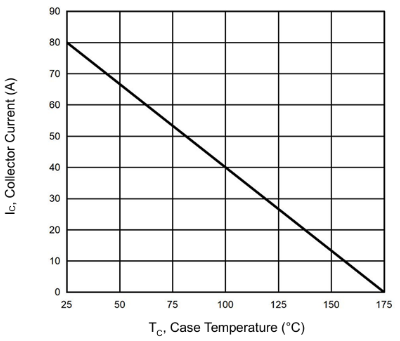
Power dissipation vs. Case temperature



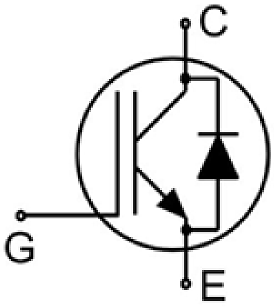
Collector emitter voltage vs. Case temperature



Collector current vs. Case temperature



Circuit schematic



Ordering information

Part Number	Package	Shipping Quantity	Dimensions
AK40TD120BT	TO-247	30pcs / tube	---

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