600V Trench and Fieldstop IGBT

PRODUCT SUMMARY		
V_{CE} (V)	600	
I_C (A)	50 (TC=25°C)	25 (TC=100°C)
$V_{CE\ (sat)}$ (V)	1.9	
Q_g(nC)	65	
I_{CM} (A)	75	

FEATURES

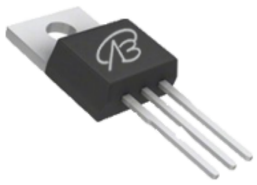
- Very Low VCEsat
- Low turn-off losses
- High speed switching
- Maximum junction temperature 175°C
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)

RoHS COMPLIANT
HALOGEN FREE

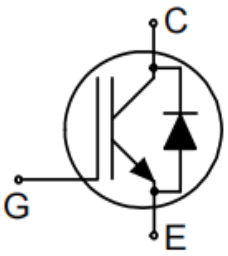
APPLICATIONS

- Telecommunications
  - Server and telecom power supplies
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting
- Consumer and computing
  - ATX power supplies
- Industrial
  - Welding
  - Battery chargers
- Renewable energy
  - Solar (PV inverters)
- Switch mode power supplies (SMPS)

TO-220



Top View



Package pin definition

- Pin1 G - Gate
- Pin2 C & backside - Collector
- Pin3 E - Emitter

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)					
PARAMETER			**SYMBOL**	**LIMIT**	**UNIT**
Collector-Emitter Voltage			V_{CE}	600	V
Gate-Emitter Voltage			V_{GE}	±30	
Continuous Collector Current (T_J = 150 °C)	V_{GE} at 15 V	T_C = 25 °C	I_C	50	A
		T_C = 100 °C		25	
Pulsed Collector Current [a]			I_{CM}	75	
Diode Forward Current [b]			I_F	60	A
Maximum Power Dissipation		T_C = 25 °C	P_D	170	W
		T_C = 100 °C		31	W
Operating Junction and Storage Temperature Range			T_J, T_{stg}	-55 to +175	°C
Short Circuit Withstand Time TC=150°C	VGE= 15V, VCE≤ 400V		tSC	3	µs
Short Circuit Withstand Time TC=100°C	VGE= 15V, VCE≤330V			5	
Soldering Recommendations (Peak Temperature) [c]	for 10 s			260	°C

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature.

b. Current limited by maximum junction temperature.

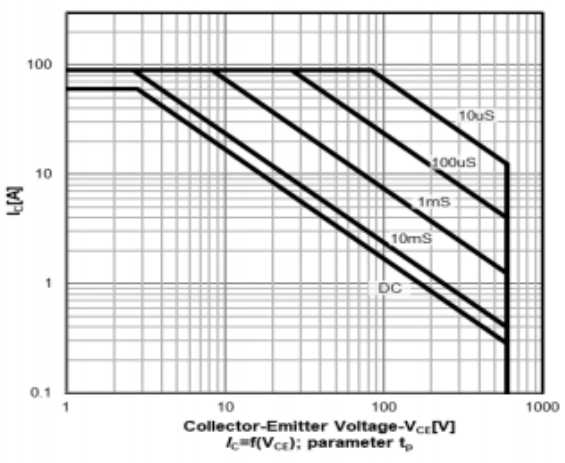
c. 1.6 mm from case.

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum Junction-to-Ambient	R_{thJA}	40	80	°C/W
Maximum Junction-to-Case	R_{thJC}	0.88	4.8	

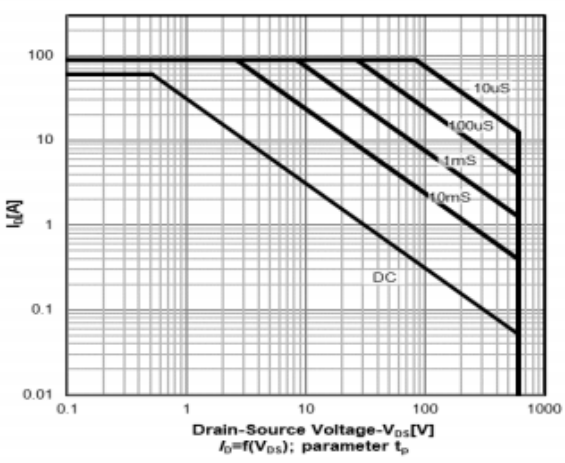
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Collector-Emitter Breakdown Voltage	BV_{CE}	V_{GE} = 0 V, I_C = 250 µA V_{GE} = 0 V, I_C = 1 mA	600 600	- -	- -	V
Gate-Source Threshold Voltage (N)	$V_{GE(th)}$	V_{CE} = V_{GE}, I_D = 250 µA	4	5	6	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 480V,V_{GE} = 0 V,T_J = 25 °C	-	1	20	µA
		V_{CE} = 480 V,V_{GE} = 0 V,T_J = 150 °C	-	1000	-	µA
Gate-Emitter Leakage Current	I_{GES}	V_{CE} = 0 V, V_{GS} = ± 2 0 V	-	-	100	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15 V, I_C = 30 A	-	1.9	2.1	V
Forward Transconductance	g_{fs}	V_{CE} = 20 V, I_C = 30 A	-	16	-	S
Dynamic						
Input Capacitance	C_{ies}	V_{GE} = 0 V, V_{CE} = 25 V, f = 500 KHz	-	2400	-	pF
Output Capacitance	C_{oes}		-	82	-	
Reverse Transfer Capacitance	C_{res}		-	12	-	
Turn-on Energy	E_{on}	V_{CS} = 480 V , V_{GE} = 0 /15V, I_C = 30 A, R_g = 10Ω	-	0.62	-	ns
Turn-off Energy	E_{off}		-	0.31	-	
Total Gate Charge	Q_g	V_{GE} = 15 V, I_C = 30 A, V_{CE} = 400 V	-	65	-	nC
Gate-Emitter Charge	Q_{ge}		-	14	-	
Gate to Collector Charge	Q_{gc}		-	13	-	
Turn-On Delay Time	$t_{d(on)}$	V_{CS} = 480 V , V_{GE} = 0 /15V, I_C = 30 A, R_g = 10Ω	-	60	-	ns
Rise Time	t_r		-	43	-	
Turn-Off Delay Time	$t_{d(off)}$		-	184	-	
Fall Time	t_f		-	30	-	
Internal emitter inductance measured 5 mm	L_E		-	13	-	nH
Diode Characteristics						
Diode Forward Current	I_F	IGBT symbol showing the integral reverse junction diode	-	-	25	A
Pulsed Diode Forward Current	I_{FM}		-	-	75	
Diode Forward Voltage	V_F	I_F = 30 A	-	1.35	2.0	V
Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 30 A, dIF/dt = 200 A/µs, V_R = 480 V	-	73	-	ns
Reverse Recovery Charge	Q_{rr}		-	80	-	µC
Reverse Recovery Current	I_{RRM}		-	13	-	A

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

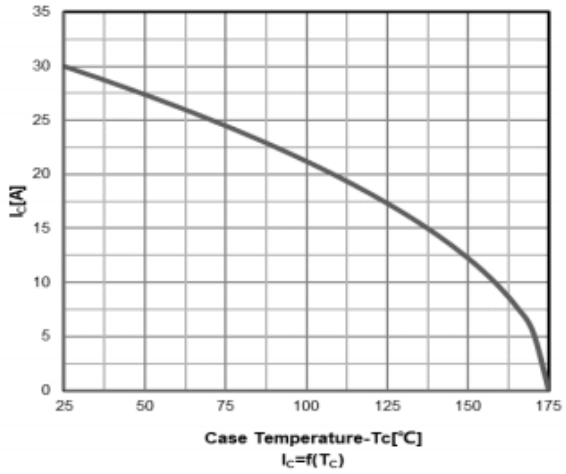
Safe operating area Ta=25 ℃
Non-Full PAK



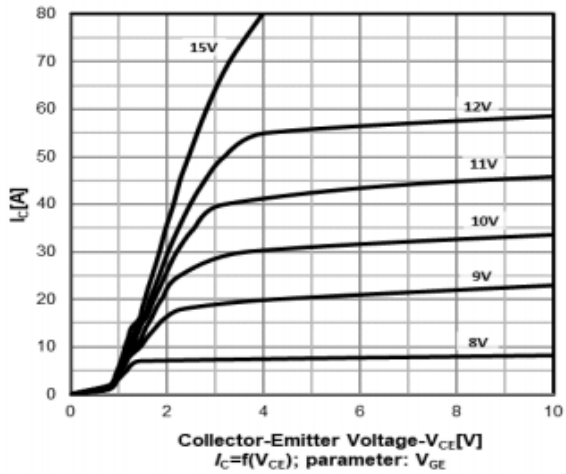
Safe operating area Ta=25 ℃
Full PAK



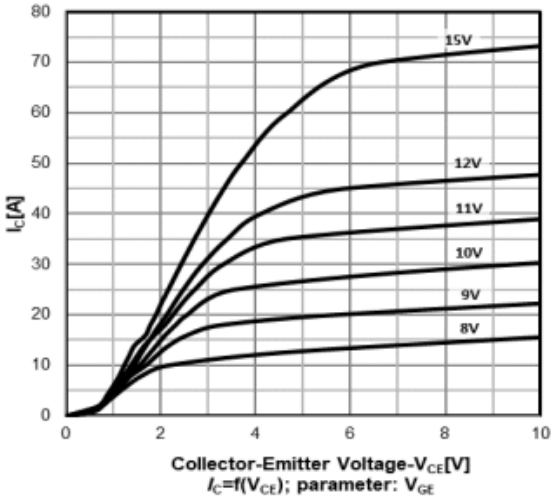
Collector current as a function of
Case temperature



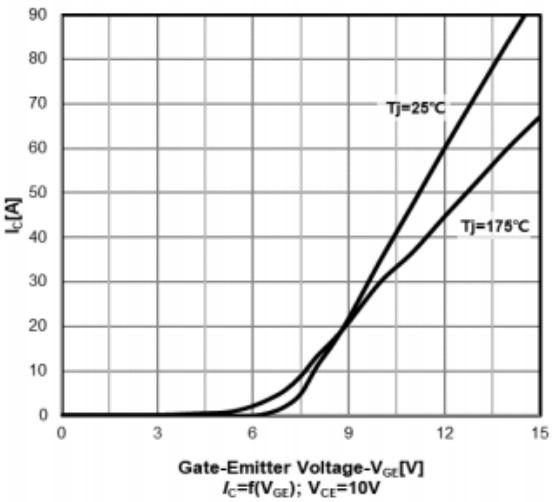
Typ. Output characteristics
Tj=25 ℃



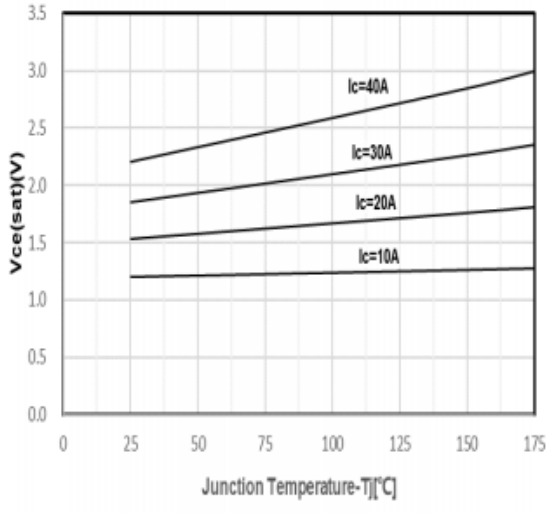
Typ. Output characteristics
Tj=175 ℃



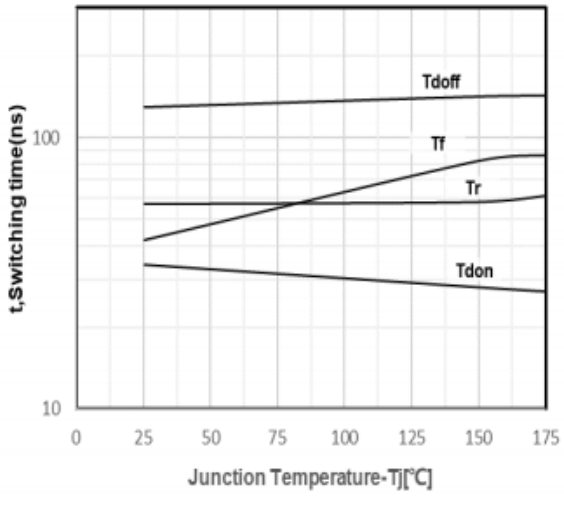
Typ. Transfer characteristics



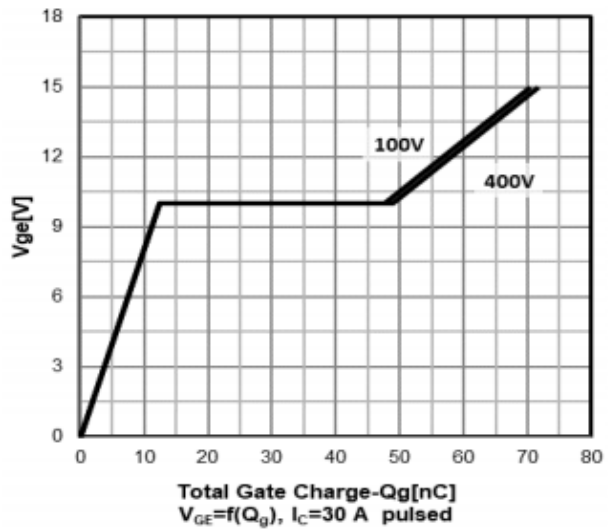
Typ. Collector-emitter saturation voltage as a function of junction temperature (V_{GE}=15V)



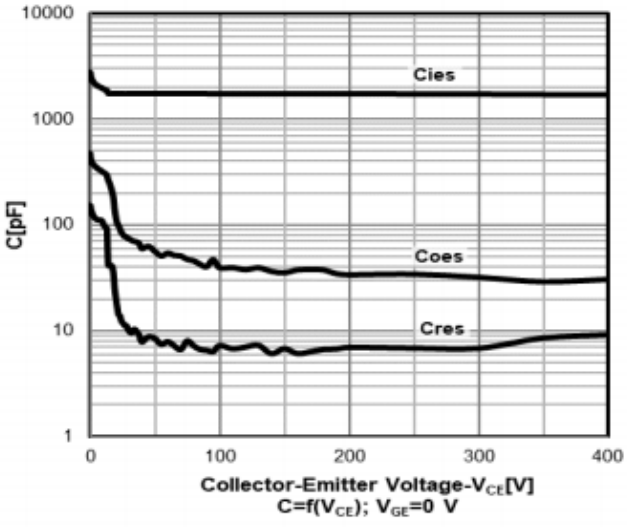
Typ. Switching times as a function of junction temperature (inductive load, V_{CE}=400V, V_{GE}=0/15V), R_G=10Ω



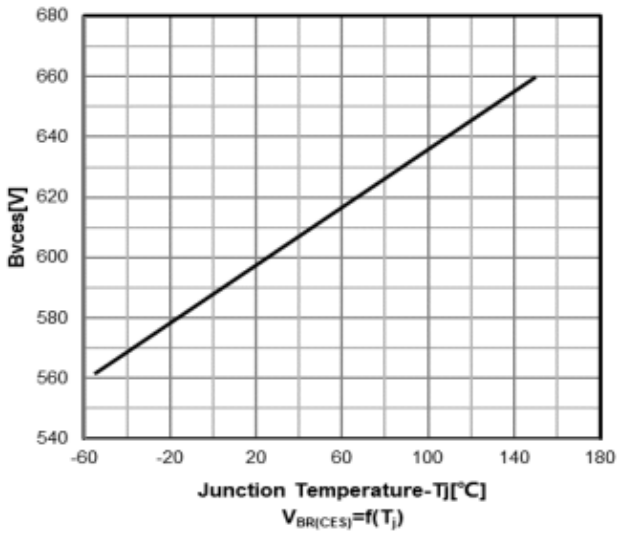
Gate charge characteristics



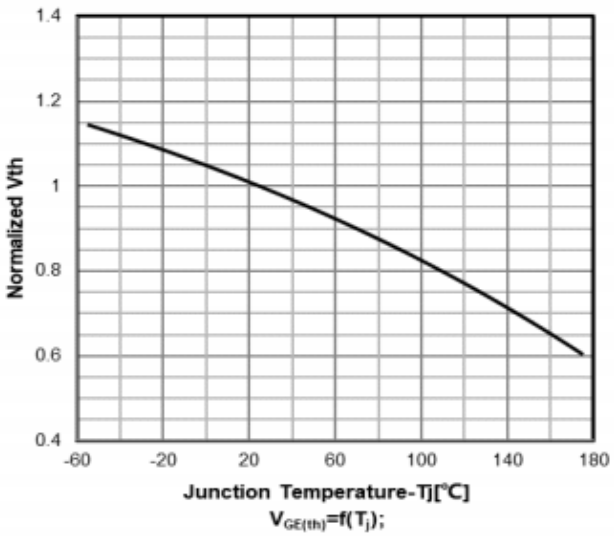
Capacitance characteristics



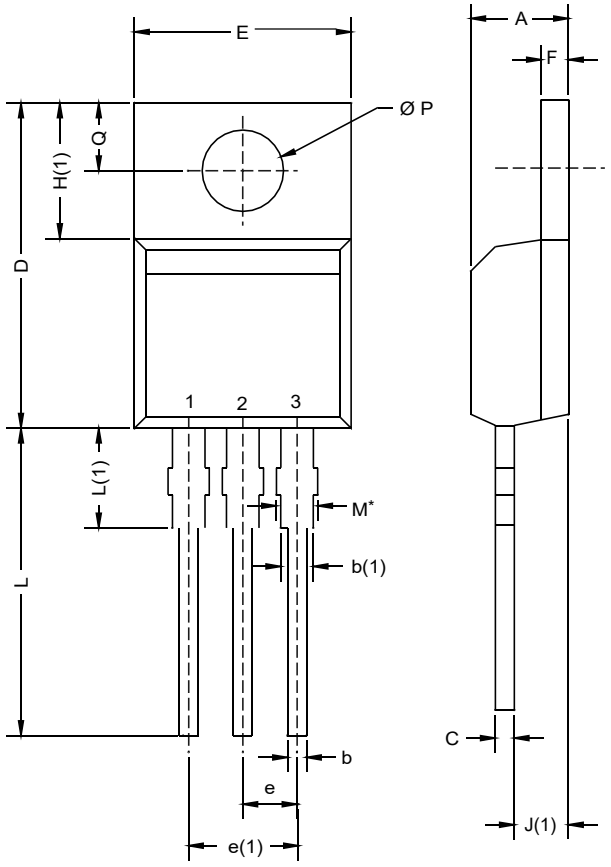
Collector-emitter breakdown voltage vs. temperature



Normalized $V_{GE(th)}$ vs. temperature



TO-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118
ECN: X12-0208-Rev. N, DWG: 5471				

Notes

* M = 1.32 mm to 1.62 mm (dimension including protrusion)
Heatsink hole for HVM

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