

## AOT15B60D-VB Datasheet

### 600V Trench and Fieldstop IGBT

PRODUCT SUMMARY		
$V_{CE}$ (V)	600	
$I_C$ (A)	30 (TC=25 °C)	15 (TC=100 °C)
$V_{CE(sat)}$ (V)	1.6	
$Q_g$ (nC)	65	
$I_{CM}$ (A)	45	

#### 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)



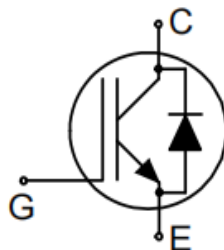
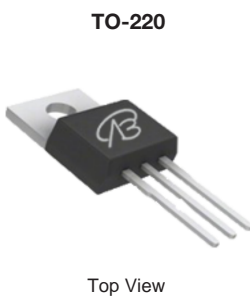
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

#### 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)

#### Package pin definition

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



ABSOLUTE MAXIMUM RATINGS ( $T_C = 25\text{ °C}$ , unless otherwise noted)					
PARAMETER		SYMBOL	LIMIT	UNIT	
Collector-Emitter Voltage		$V_{CE}$	600	V	
Gate-Emitter Voltage		$V_{GE}$	$\pm 30$		
Continuous Collector Current ( $T_J = 150\text{ °C}$ )	$V_{GE}$ at 15 V	$I_C$	$T_C = 25\text{ °C}$	30	A
			$T_C = 100\text{ °C}$	15	
Pulsed Collector Current <sup>a</sup>		$I_{CM}$	45		
Diode Forward Current <sup>b</sup>		$I_F$	60	A	
Maximum Power Dissipation		$P_D$	$T_C = 25\text{ °C}$	170	W
			$T_C = 100\text{ °C}$	31	W
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +175	°C	
Short Circuit Withstand Time $T_C=150$	$V_{GE}= 15V, V_{CE} = 400V$	tsc	3	$\mu s$	
Short Circuit Withstand Time $T_C=100$	$V_{GE}= 15V, V_{CE} = 330V$		5		
Soldering Recommendations (Peak Temperature) <sup>c</sup>	for 10 s		260	°C	

#### Notes

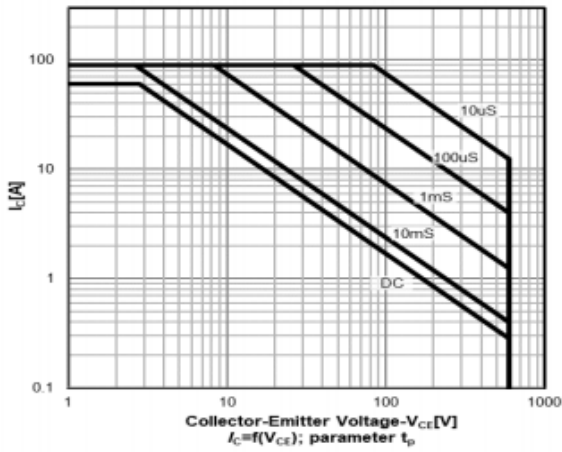
- Repetitive rating; pulse width limited by maximum junction temperature.
- Current limited by maximum junction temperature.
- 1.6 mm from case.

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	

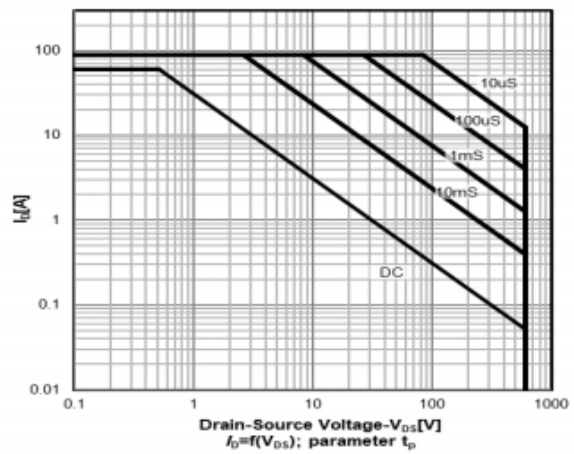
SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Collector-Emitter Breakdown Voltage	$BV_{CE}$	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$ $V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$		600 600	- -	- -	V
Gate-Source Threshold Voltage (N)	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_D = 250\text{ }\mu\text{A}$		4	5	6	V
Zero Gate Voltage Collector Current	$I_{CES}$	$V_{CE} = 480\text{ V}, V_{GE} = 0\text{ V}, T_J = 25\text{ }^\circ\text{C}$		-	1	20	$\mu\text{A}$
		$V_{CE} = 480\text{ V}, V_{GE} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$		-	1000	-	$\mu\text{A}$
Gate-Emitter Leakage Current	$I_{GES}$	$V_{CE} = 0\text{ V}, V_{GS} = \pm 2\text{ V}$		-	-	100	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}$	$I_C = 30\text{ A}$	-	1.6	2.1	V
Forward Transconductance	$g_{fs}$	$V_{CE} = 20\text{ V}, I_C = 30\text{ A}$		-	16	-	S
<b>Dynamic</b>							
Input Capacitance	$C_{ies}$	$V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V},$ $f = 500\text{ KHz}$		-	1800	-	pF
Output Capacitance	$C_{oes}$			-	82	-	
Reverse Transfer Capacitance	$C_{res}$			-	12	-	
Turn-on Energy	$E_{on}$	$V_{CS} = 400\text{ V}, V_{GE} = 0/15\text{ V},$ $I_C = 30\text{ A}, R_g = 10\text{ }\Omega$		-	0.62	-	ns
Turn-off Energy	$E_{off}$			-	0.31	-	
Total Gate Charge	$Q_g$	$V_{GE} = 15\text{ V}$	$I_C = 30\text{ A}, V_{CE} = 400\text{ V}$	-	65	-	nC
Gate-Emitter Charge	$Q_{ge}$			-	14	-	
Gate to Collector Charge	$Q_{gc}$			-	13	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{CS} = 400\text{ V}, V_{GE} = 0/15\text{ V},$ $I_C = 30\text{ A}, R_g = 10\text{ }\Omega$		-	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	-	
<b>Diode Characteristics</b>							
Diode Forward Current	$I_F$	IGBT symbol showing the integral reverse junction diode		-	-	15	A
Pulsed Diode Forward Current	$I_{FM}$			-	-	45	
Diode Forward Voltage	$V_F$	$I_F = 30\text{ A}$		-	1.35	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = 30\text{ A},$ $dI_F/dt = 200\text{ A}/\mu\text{s}, V_R = 400\text{ V}$		-	73	-	ns
Reverse Recovery Charge	$Q_{rr}$			-	45	-	$\mu\text{C}$
Reverse Recovery Current	$I_{RRM}$			-	13	-	A

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

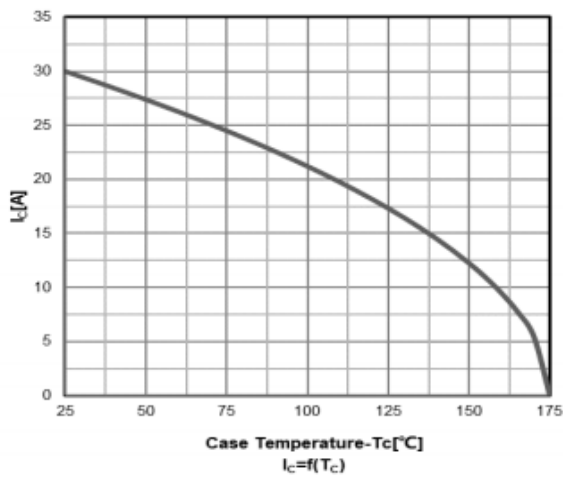
Safe operating area Ta=25 °C  
Non-Full PAK



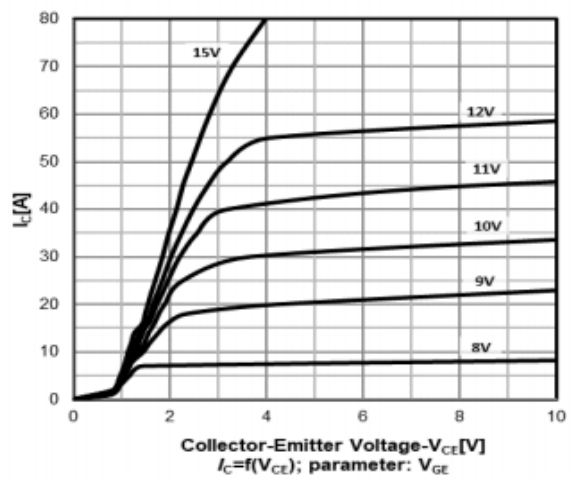
Safe operating area Ta=25 °C  
Full PAK



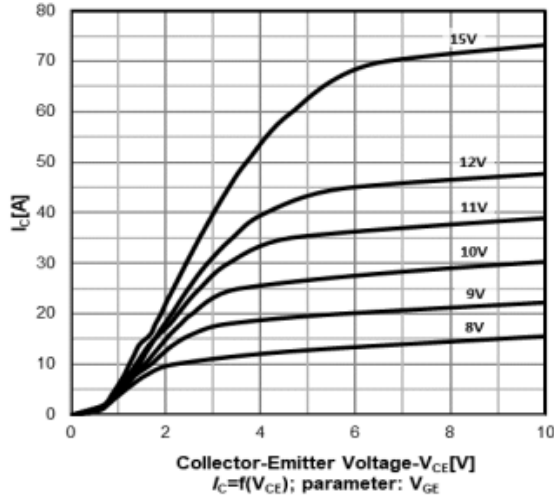
Collector current as a function of  
Case temperature



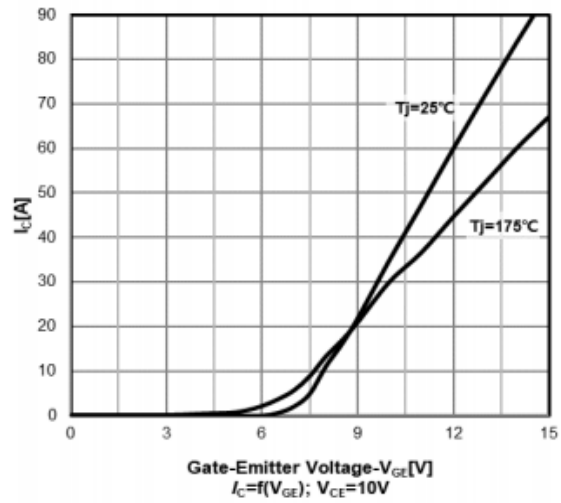
Typ. Output characteristics  
T<sub>j</sub>=25 °C



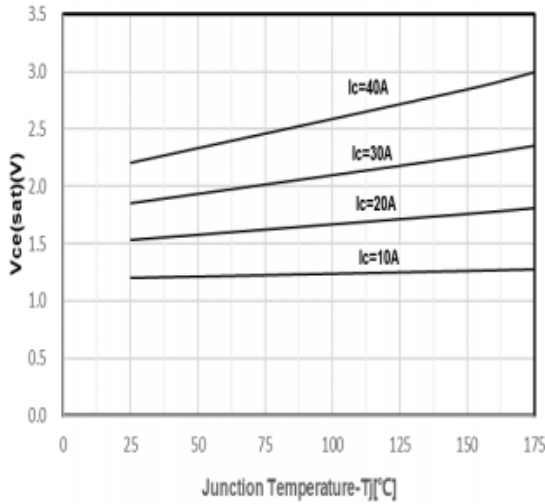
Typ. Output characteristics  
 $T_j=175^\circ\text{C}$



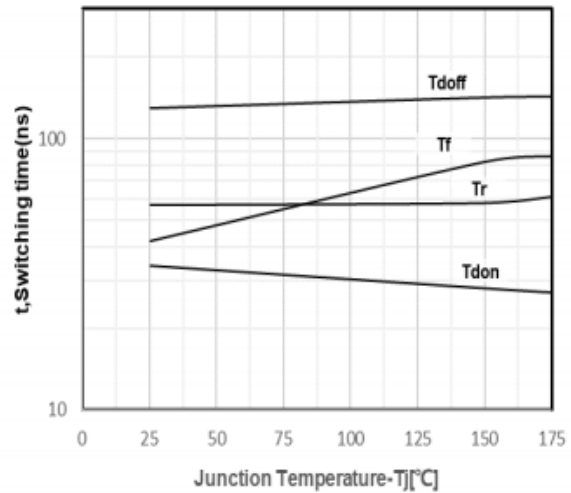
Typ. Transfer characteristics



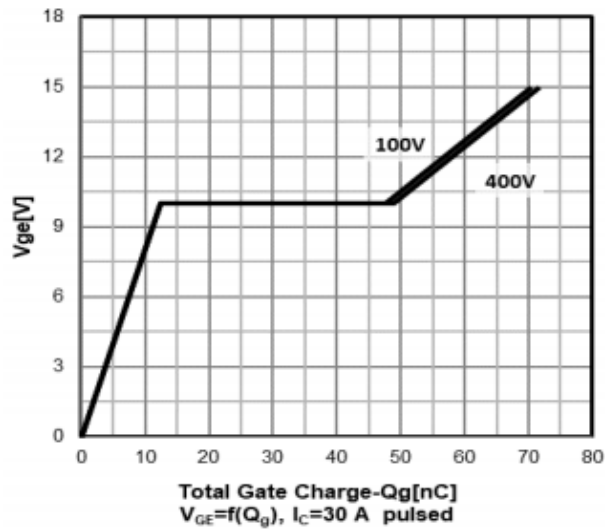
Typ. Collector-emitter saturation voltage as a function of junction temperature ( $V_{ge}=15\text{V}$ )



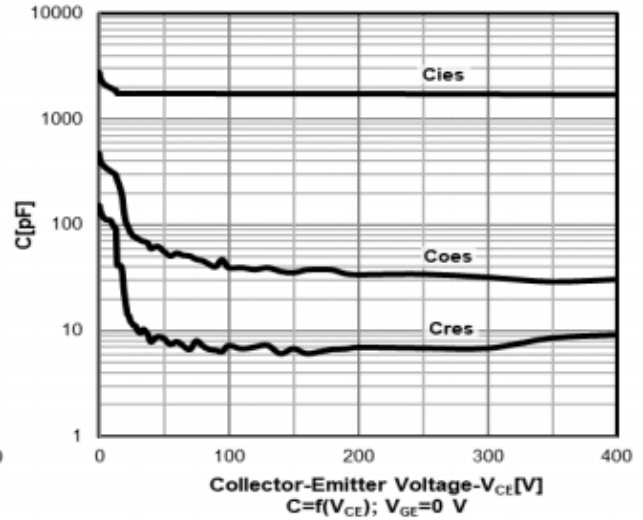
Typ. Switching times as a function of junction temperature (inductive load,  $V_{ce}=400\text{V}$ ,  $V_{ge}=0/15\text{V}$ ,  $R_G=10\Omega$ )



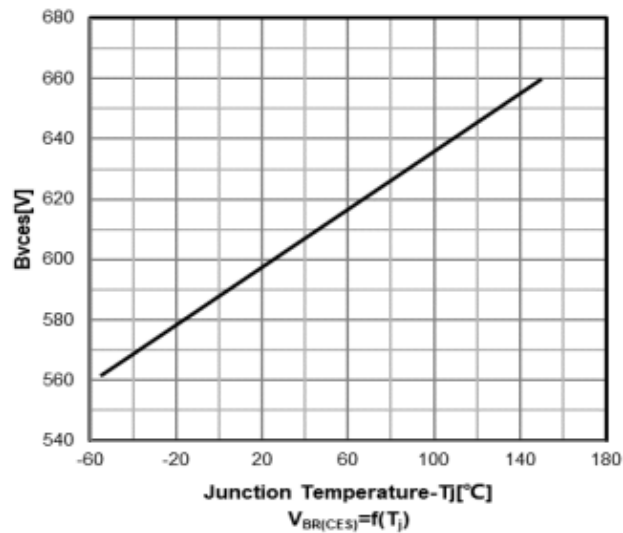
Gate charge characteristics



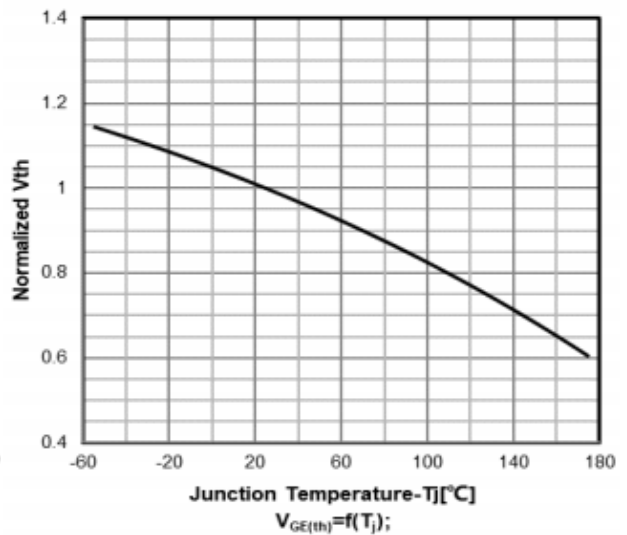
Capacitance characteristics



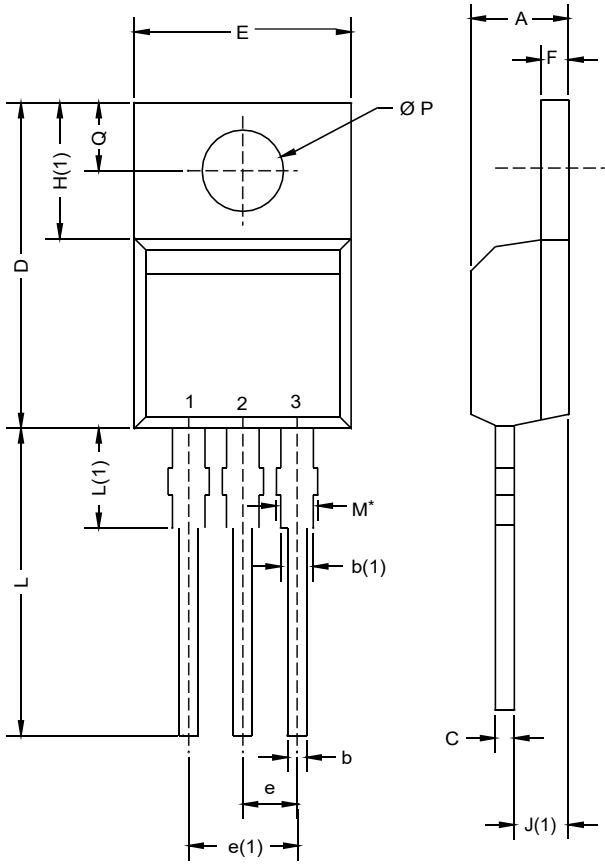
Collector-emitter breakdown voltage vs. temperature



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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