

IGBT - Power, Single N-Channel, Field Stop IV (FS4), High Speed, D2PAK-7L-LV

650 V, 1.55 V, 70 A

AFGBG70T65SQ

Using the novel field stop 4th generation IGBT technology, AFGBG70T65SQ offers the optimum performance with both low conduction and switching losses for high efficiency operations in various applications.

Features

- Maximum Junction Temperature: $T_J = 175^{\circ}\text{C}$
- Positive Temperature Coefficient for Easy Parallel Operation
- High Current Capability
- Low Saturation Voltage: $V_{CE(Sat)} = 1.55\text{ V (Typ.) @ } I_C = 70\text{ A}$
- 100% of the Parts are Tested for I_{LM} (Note 1)
- Fast Switching
- Tight Parameter Distribution
- AECQ101 Qualified and PPAP Capable

Applications

- Automotive HEVEV Onboard Chargers
- Automotive HEVEV DCDC Converters
- Totem Pole Bridgeless PFC

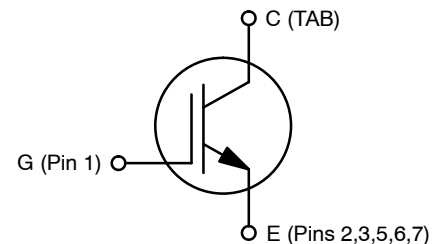
MAXIMUM RATINGS ($T_J = 25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-to-Emitter Voltage	V_{CES}	650	V
Gate-to-Emitter Voltage	V_{GES}	± 20	V
Transient Gate-to-Emitter Voltage	V_{GES}	± 30	V
Collector Current	$T_C = 25^{\circ}\text{C}$	I_C	75
	$T_C = 100^{\circ}\text{C}$		
Power Dissipation	$T_C = 25^{\circ}\text{C}$	P_D	714
	$T_C = 100^{\circ}\text{C}$		
Pulsed Collector Current (Note 2)	$T_C = 25^{\circ}\text{C}$, $t_p = 10\text{ }\mu\text{s}$	I_{CM}	280
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	$^{\circ}\text{C}$
Lead Temperature for Soldering Purposes	T_L	260	$^{\circ}\text{C}$

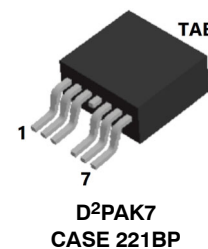
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. $V_{CC} = 400\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 315\text{ A}$, Inductive Load, 100% of the Parts are Tested
2. Single pulse, limited by max junction temperature

BV_{CES}	$V_{CE(SAT)}$	I_C
650 V	1.55 V	70 A



IGBT STANDALONE



MARKING DIAGRAM

AFGB70
65SQ
AYWWZZ

AFGB7065SQ = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping†
AFGBG70T65SQ	D ² PAK7 (Pb-Free)	800 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

AFGBG70T65SQ

THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case for IGBT	$R_{\theta JC}$	0.29	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	40	

ELECTRICAL CHARACTERISTICS OF IGBT ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-to-Emitter Breakdown Voltage	BV_{CES}	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	650			V
Collector-to-Emitter Breakdown Voltage Temperature Coefficient	$\Delta BV_{CES}/\Delta T_J$	$V_{GE} = 0\text{ V}, I_C = 5\text{ mA}$		0.6		mV/°C
Zero Gate Voltage Collector Current	I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = V_{CES}$			250	μA
Gate-to-Emitter Leakage Current	I_{GES}	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$			±400	nA

ON CHARACTERISTICS

Gate Threshold Voltage	$V_{GE(TH)}$	$V_{GE} = V_{CE}, I_C = 70\text{ mA}$	3.4	4.68	6.4	V
Collector-to-Emitter Saturation Voltage	$V_{CE(SAT)}$	$V_{GE} = 15\text{ V}, I_C = 70\text{ A}, T_J = 25^\circ\text{C}$		1.55	2.10	
		$V_{GE} = 15\text{ V}, I_C = 70\text{ A}, T_J = 175^\circ\text{C}$		1.93		

DYNAMIC CHARACTERISTICS

Input Capacitance	C_{IES}	$V_{GE} = 0\text{ V}, V_{CE} = 30\text{ V}, f = 1\text{ MHz}$		4310		pF
Output Capacitance	C_{OES}			56.9		
Reverse Transfer Capacitance	C_{RES}			14.5		
Total Gate Charge	Q_G	$V_{CE} = 400\text{ V}, V_{GE} = 15\text{ V}, I_C = 70\text{ A}$		140.6		nC
Gate-to-Emitter Charge	Q_{GE}			27.8		
Gate-to-Collector Charge	Q_{GC}			36.5		

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{ V}, I_C = 35\text{ A}, R_G = 4.7\ \Omega, T_J = 25^\circ\text{C}$		16.4		ns
Turn-Off Delay Time	$t_{d(off)}$			118.7		
Rise Time	t_r			13.44		
Fall Time	t_f			10.08		
Turn-On Switching Loss	E_{on}			0.25		mJ
Turn-Off Switching Loss	E_{off}			0.19		
Total Switching Loss	E_{ts}			0.44		
Turn-On Delay Time	$t_{d(on)}$	$V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{ V}, I_C = 70\text{ A}, R_G = 4.7\ \Omega, T_J = 25^\circ\text{C}$		18.4		ns
Turn-Off Delay Time	$t_{d(off)}$			114.4		
Rise Time	t_r			25.6		
Fall Time	t_f			20.0		
Turn-On Switching Loss	E_{on}			0.6		mJ
Turn-Off Switching Loss	E_{off}			0.7		
Total Switching Loss	E_{ts}			1.2		

AFGBG70T65SQ

ELECTRICAL CHARACTERISTICS OF IGBT ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{d(on)}$	$V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{ V},$ $I_C = 35\text{ A}, R_G = 4.7\ \Omega, T_J = 175^\circ\text{C}$		12.8		ns
Turn-Off Delay Time	$t_{d(off)}$			147.2		
Rise Time	t_r			16.0		
Fall Time	t_f			7.2		
Turn-On Switching Loss	E_{on}			0.4		mJ
Turn-Off Switching Loss	E_{off}			0.3		
Total Switching Loss	E_{ts}			0.7		
Turn-On Delay Time	$t_{d(on)}$	$V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{ V},$ $I_C = 70\text{ A}, R_G = 4.7\ \Omega, T_J = 175^\circ\text{C}$		18.4		ns
Turn-Off Delay Time	$t_{d(off)}$			134.4		
Rise Time	t_r			28.0		
Fall Time	t_f			18.2		
Turn-On Switching Loss	E_{on}			0.7		mJ
Turn-Off Switching Loss	E_{off}			0.8		
Total Switching Loss	E_{ts}			1.6		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

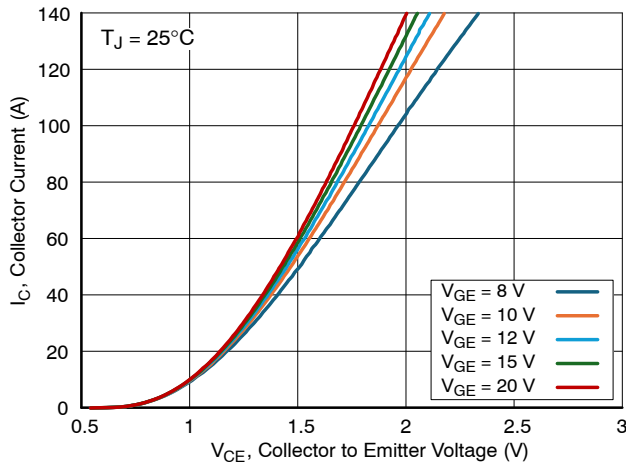


Figure 1. Output Characteristics

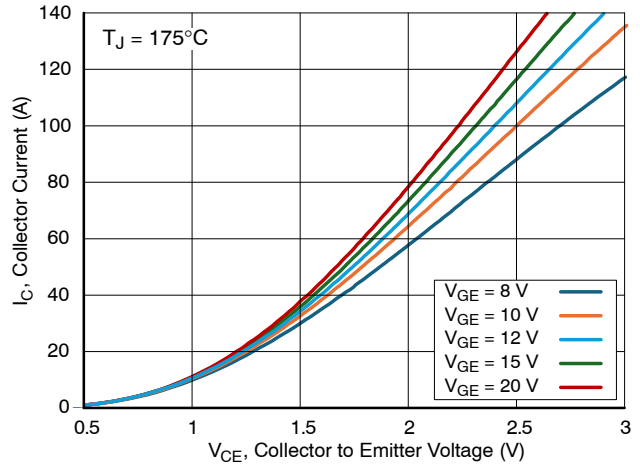


Figure 2. Output Characteristics

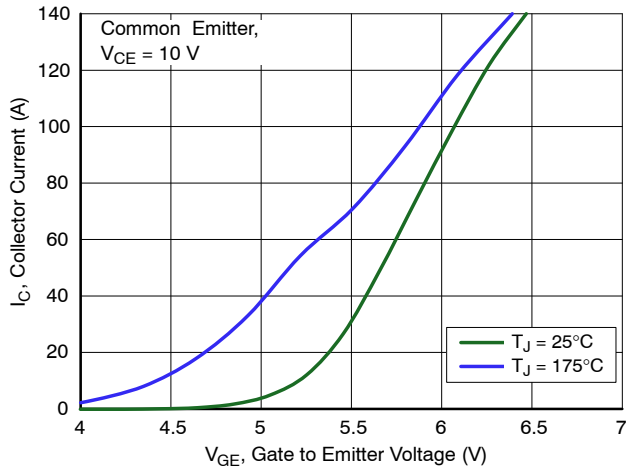


Figure 3. Transfer Characteristics

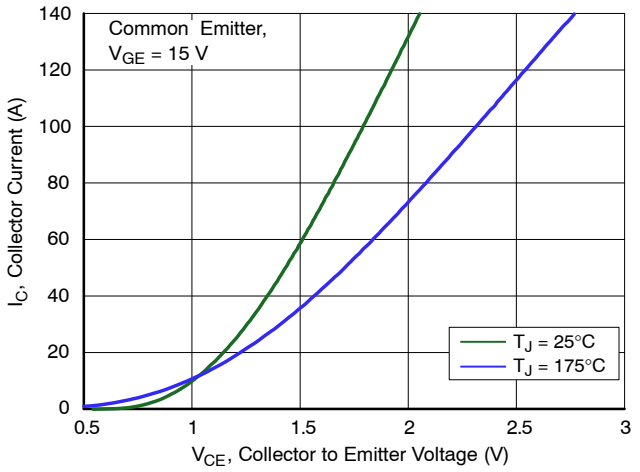


Figure 4. Saturation Characteristics

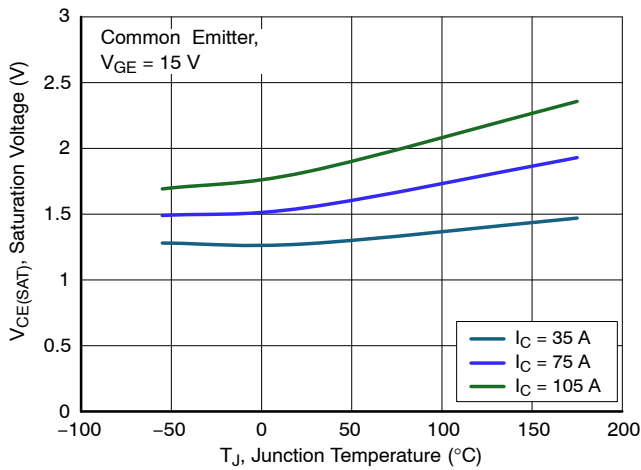


Figure 5. Saturation Voltage vs. Junction Temperature

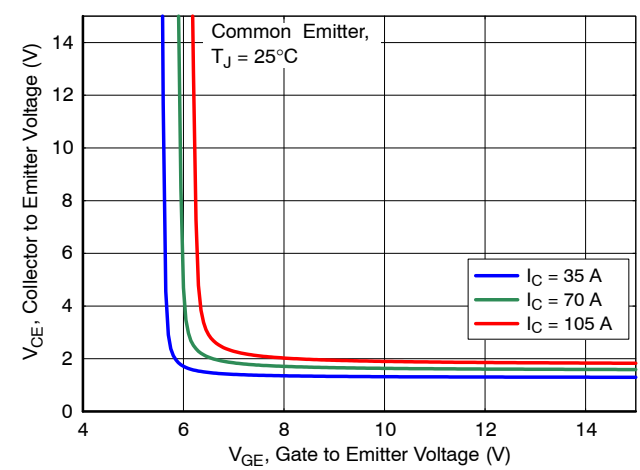


Figure 6. Saturation Voltage vs. Gate-to-Emitter Voltage

TYPICAL CHARACTERISTICS (CONTINUED)

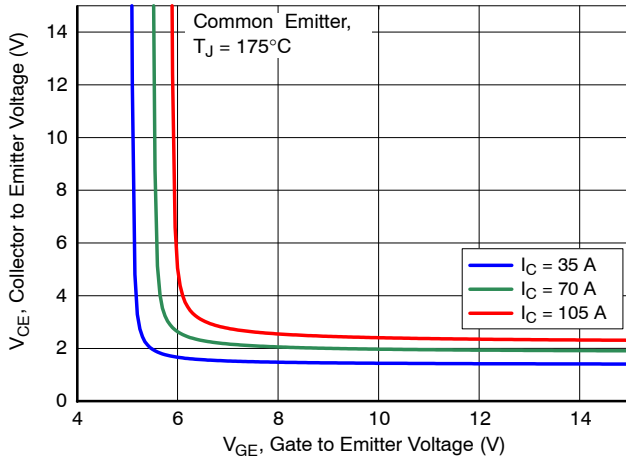


Figure 7. Saturation Voltage vs. Gate-to-Emitter Voltage

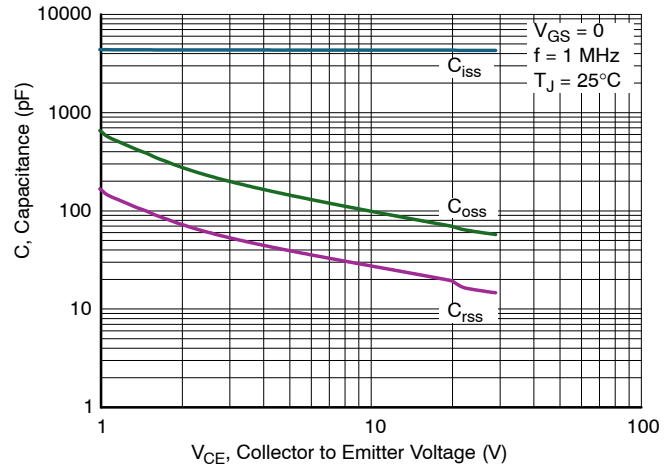


Figure 8. Capacitance Characteristics

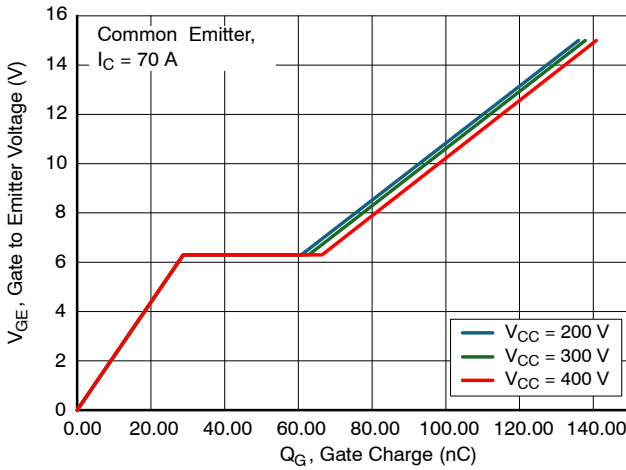


Figure 9. Gate Charge Characteristics

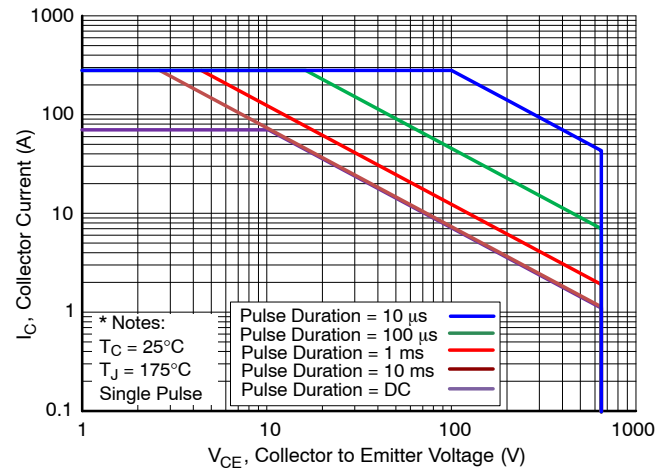


Figure 10. SOA Characteristics

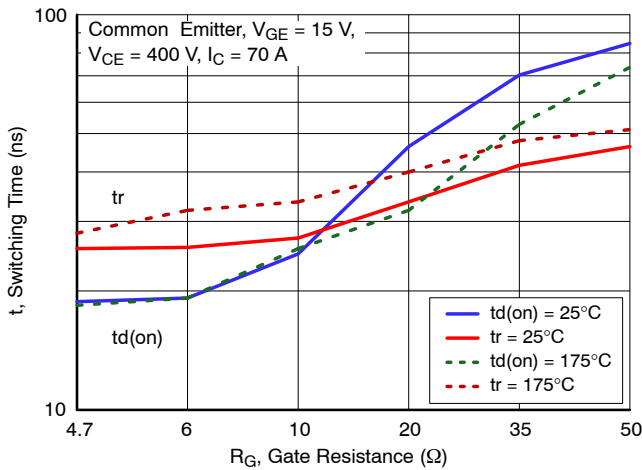


Figure 11. Turn-On Switching Time vs. Gate Resistance

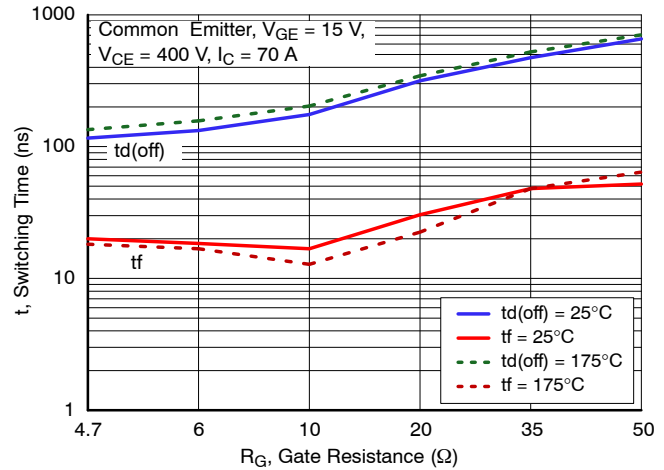


Figure 12. Turn-Off Switching Time vs. Gate Resistance

TYPICAL CHARACTERISTICS (CONTINUED)

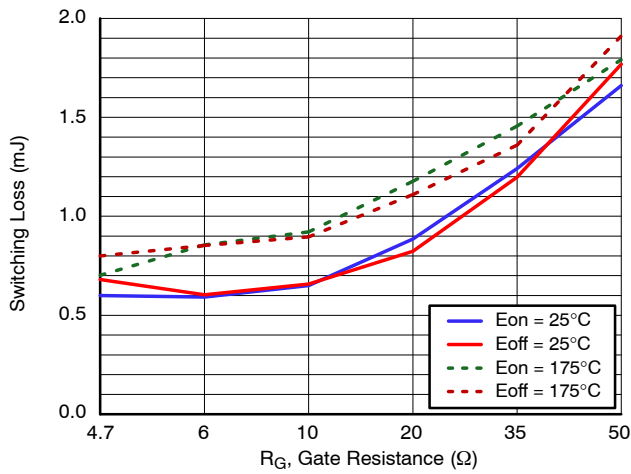


Figure 13. Switching Loss vs. Gate Resistance

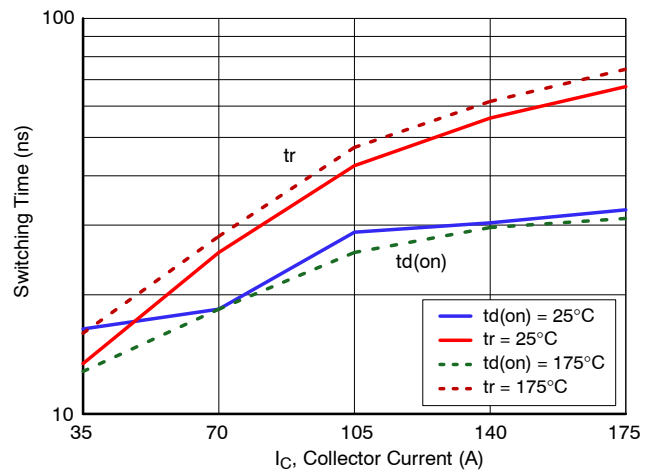


Figure 14. Turn-On Switching Time vs. Collector Current

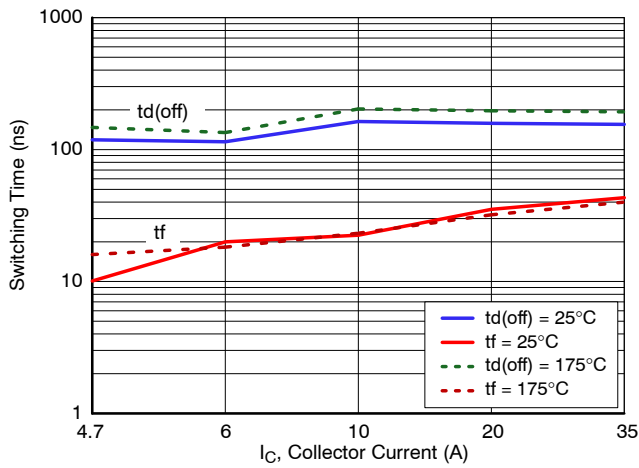


Figure 15. Turn-Off Switching Time vs. Collector Current

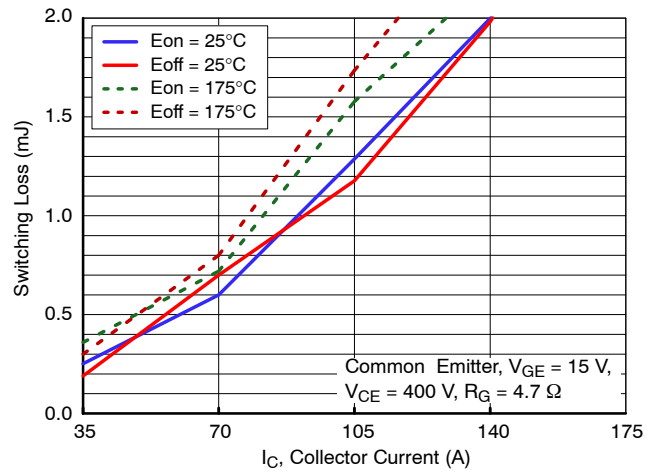


Figure 16. Switching Loss vs. Collector Current

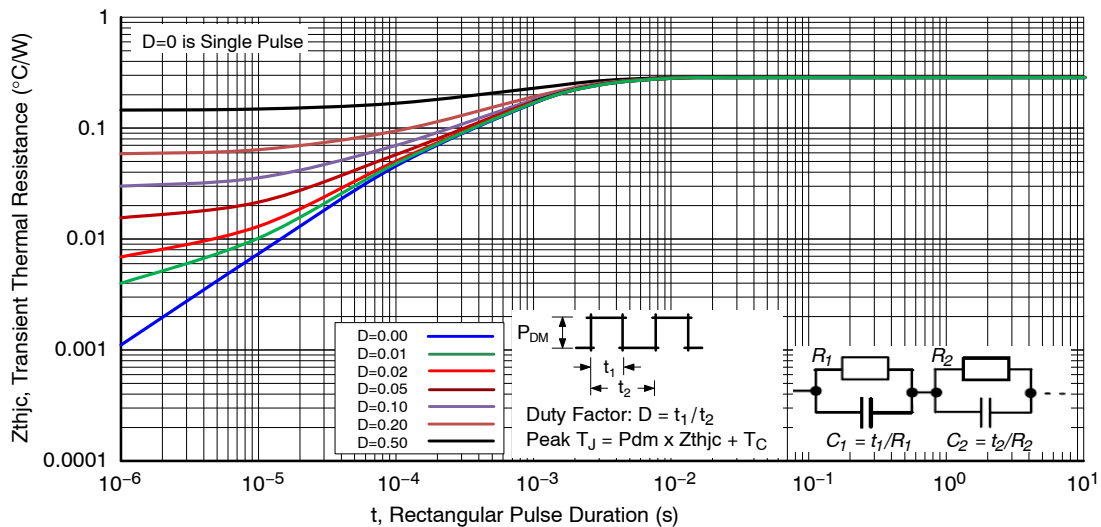


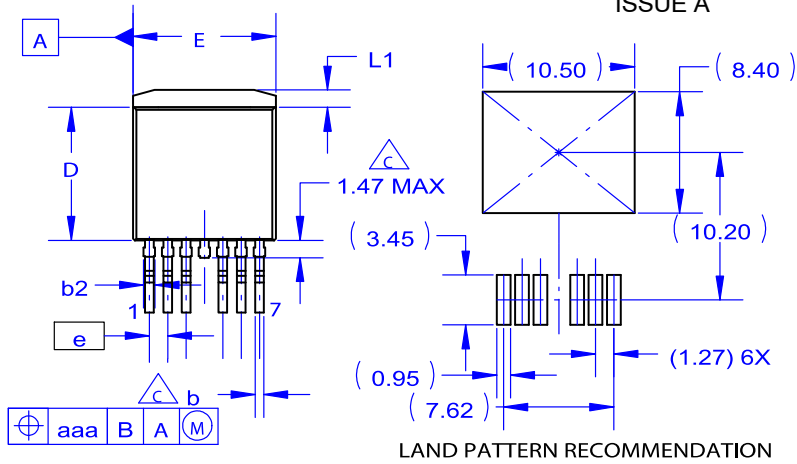
Figure 17. Transient Thermal Impedance of IGBT

AFGBG70T65SQ

PACKAGE DIMENSIONS

D2PAK7 (TO-263-7LD) 15.4x9.9x4.5

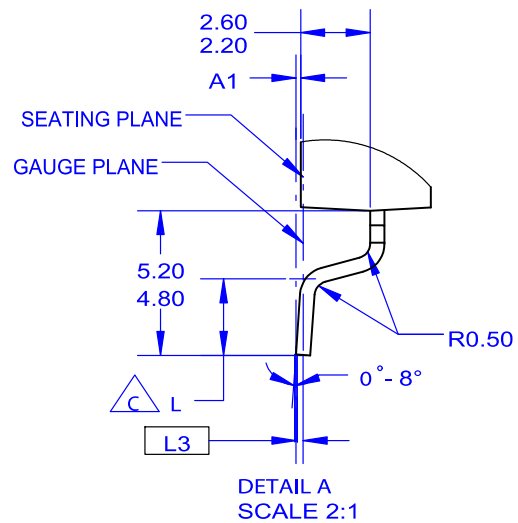
CASE 221BP
ISSUE A



NOTES:

- A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. OUT OF JEDEC STANDARD VALUE.
- D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- F. LAND PATTERN RECOMMENDATION PER IPC. TO127P1524X465-8N.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	0.00	0.10	0.20
b2	0.60	0.70	0.80
b	0.50	0.60	0.70
c	0.40	0.50	0.60
c2	1.20	1.30	1.40
D	9.00	9.20	9.40
D1	7.30	7.80	8.20
E	9.70	9.90	10.20
E1	7.15	8.05	8.55
e	~	1.27	~
H	15.10	15.40	15.70
L	2.44	2.64	2.84
L1	1.00	1.20	1.40
L3	~	0.25	~
aaa	~	~	0.25



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