

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

650 V, 1.54 V, 70 A

AFGBG70T65SQDC

Using the novel field stop 4th generation IGBT technology and generation 1.5 SiC Schottky Diode technology, AFGBG70T65SQDC offers the optimum performance with both low conduction and switching losses for high efficiency operations in various applications.

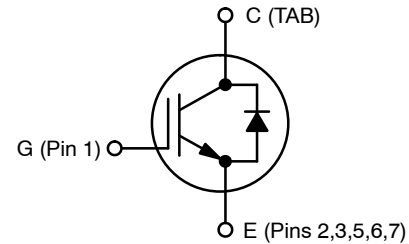
Features

- Maximum Junction Temperature: $T_J = 175^{\circ}\text{C}$
- Positive Temperature Coefficient for Easy Parallel Operation
- High Current Capability
- Low Saturation Voltage: $V_{CE(Sat)} = 1.54\text{ V (Typ.) @ } I_C = 70\text{ A}$
- 100% of the Parts are Tested for I_{LM} (Note 1)
- Fast Switching
- Tight Parameter Distribution
- No Reverse Recovery, No Forward Recovery
- AECQ101 Qualified and PPAP Capable

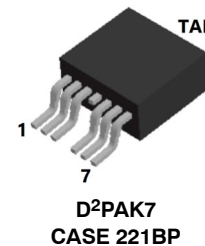
Applications

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

BV_{CES}	$V_{CE(SAT)}$	I_C
650 V	1.54 V	70 A



COPAK IGBT



MARKING DIAGRAM

AFGB70
65SQDC
AYWWZZ

AFGB7065SQDC = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping [†]
AFGBG70T65SQDC	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.

AFGBG70T65SQDC

MAXIMUM RATINGS (T_J = 25°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°C	I _C	75	A
	T _C = 100°C		70	
Power Dissipation	T _C = 25°C	P _D	617	W
	T _C = 100°C		309	
Pulsed Collector Current	T _C = 25°C, t _p = 10 μs	I _{CM}	280	A
Diode Forward Current	T _C = 25°C	I _F	35	A
	T _C = 100°C		20	
Pulsed Diode Maximum Forward Current	T _C = 25°C, t _p = 10 μs	I _{FM}	80	A
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55 to +175	°C
Lead Temperature for Soldering Purposes		T _L	260	°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.

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

THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case for IGBT	R _{θJC}	0.32	°C/W
Thermal Resistance, Junction-to-Case for Diode	R _{θJC}	1.01	
Thermal Resistance, Junction-to-Ambient	R _{θJA}	40	

ELECTRICAL CHARACTERISTICS OF IGBT (T_J = 25°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 V, I _C = 1 mA	650			V
Collector-to-Emitter Breakdown Voltage Temperature Coefficient	ΔBV _{CES} /ΔT _J			0.6		V/°C
Zero Gate Voltage Collector Current	I _{CES}	V _{GE} = 0 V, V _{CE} = V _{CES}			250	μA
Gate-to-Emitter Leakage Current	I _{GES}	V _{GE} = 20 V, V _{CE} = 0 V			±400	nA

ON CHARACTERISTICS

Gate Threshold Voltage	V _{GE(TH)}	V _{GE} = V _{CE} , I _C = 70 mA	3.40	4.59	6.40	V
Collector-to-Emitter Saturation Voltage	V _{CE(SAT)}	V _{GE} = 15 V, I _C = 70 A, T _J = 25°C		1.54	2.10	
		V _{GE} = 15 V, I _C = 70 A, T _J = 175°C		1.89		

DYNAMIC CHARACTERISTICS

Input Capacitance	C _{IES}	V _{GE} = 0 V, V _{CE} = 30 V, f = 1 MHz		4490		pF
Output Capacitance	C _{OES}			284		
Reverse Transfer Capacitance	C _{RES}			13.2		
Total Gate Charge	Q _G	V _{CE} = 400 V, V _{GE} = 15 V, I _C = 70 A		146.7		nC
Gate-to-Emitter Charge	Q _{GE}			28.4		
Gate-to-Collector Charge	Q _{GC}			37.7		

AFGBG70T65SQDC

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 V, V _{GE} = 0/15 V, I _C = 35 A, R _G = 4.7 Ω, T _J = 25°C		20		ns
Turn-Off Delay Time	t _{d(off)}			133.2		
Rise Time	t _r			10.4		
Fall Time	t _f			7.2		
Turn-On Switching Loss	E _{on}			0.30		mJ
Turn-Off Switching Loss	E _{off}			0.22		
Total Switching Loss	E _{ts}			0.52		
Turn-On Delay Time	t _{d(on)}	V _{CE} = 400 V, V _{GE} = 0/15 V, I _C = 70 A, R _G = 4.7 Ω, T _J = 25°C		22.4		ns
Turn-Off Delay Time	t _{d(off)}			118.8		
Rise Time	t _r			22.4		
Fall Time	t _f			18.7		
Turn-On Switching Loss	E _{on}			0.6		mJ
Turn-Off Switching Loss	E _{off}			0.6		
Total Switching Loss	E _{ts}			1.3		
Turn-On Delay Time	t _{d(on)}	V _{CE} = 400 V, V _{GE} = 0/15 V, I _C = 35 A, R _G = 4.7 Ω, T _J = 175°C		18.4		ns
Turn-Off Delay Time	t _{d(off)}			160.5		
Rise Time	t _r			13.6		
Fall Time	t _f			7.33		
Turn-On Switching Loss	E _{on}			0.32		mJ
Turn-Off Switching Loss	E _{off}			0.31		
Total Switching Loss	E _{ts}			0.63		
Turn-On Delay Time	t _{d(on)}	V _{CE} = 400 V, V _{GE} = 0/15 V, I _C = 70 A, R _G = 4.7 Ω, T _J = 175°C		20.0		ns
Turn-Off Delay Time	t _{d(off)}			136.0		
Rise Time	t _r			29.6		
Fall Time	t _f			17.6		
Turn-On Switching Loss	E _{on}			0.8		mJ
Turn-Off Switching Loss	E _{off}			0.8		
Total Switching Loss	E _{ts}			1.6		
DIODE CHARACTERISTICS						
Forward Voltage	V _F	I _F = 20 A, T _J = 25°C		1.41	1.75	V
		I _F = 20 A, T _J = 175°C		1.81		

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.

AFGBG70T65SQDC

Typical Characteristics

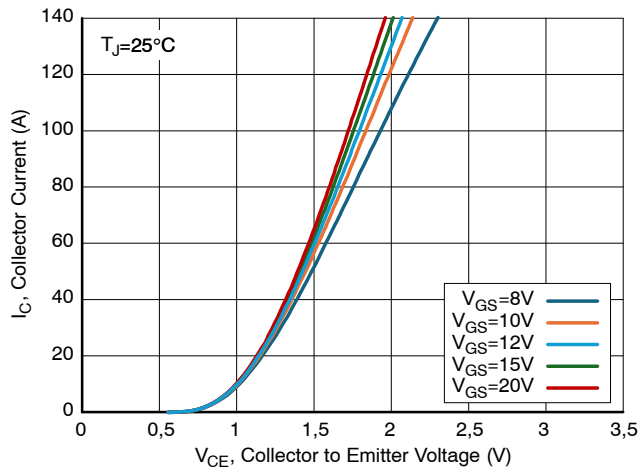


Figure 1. Output Characteristics

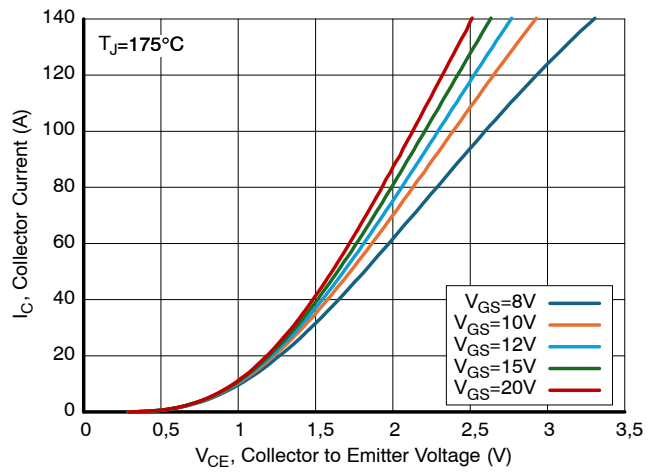


Figure 2. Output Characteristics

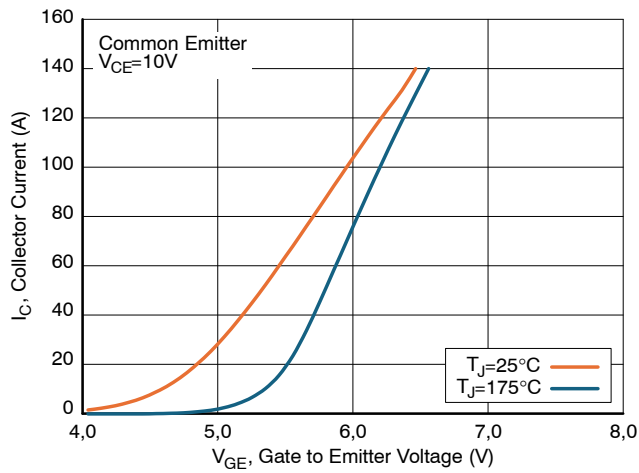


Figure 3. Transfer Characteristics

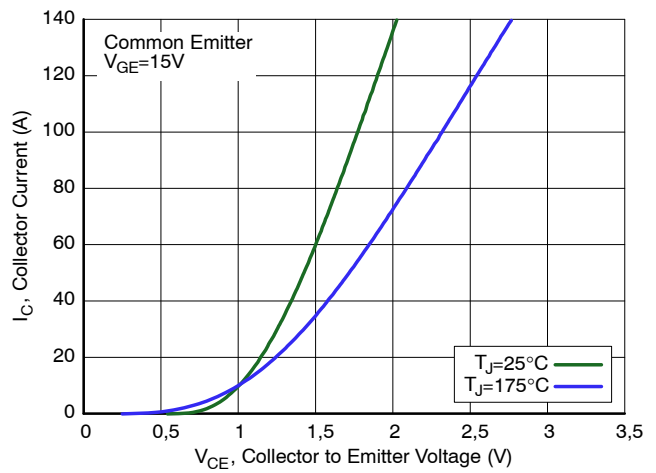


Figure 4. Saturation Characteristics

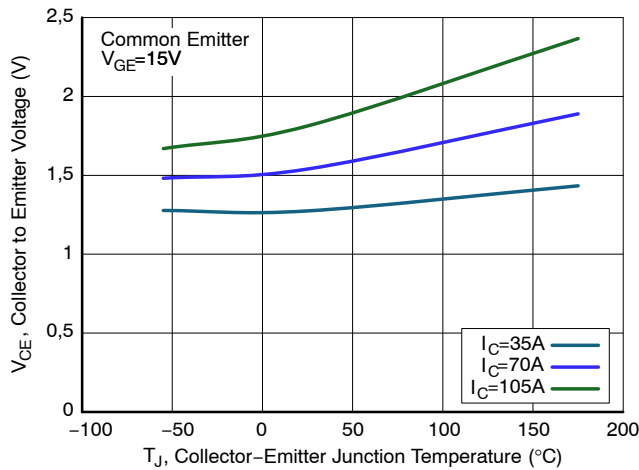


Figure 5. Saturation Voltage vs. Junction Temperature

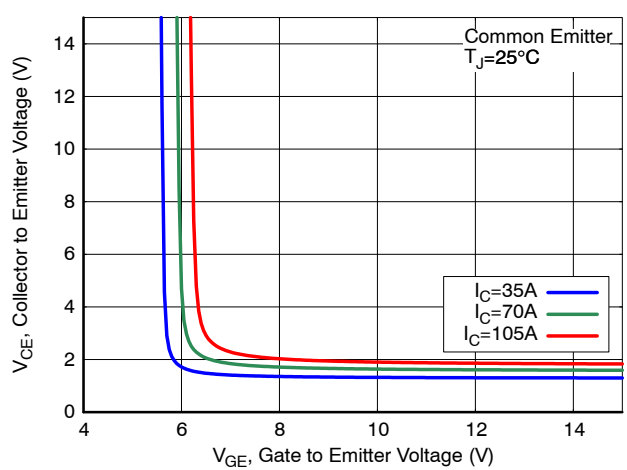


Figure 6. Saturation Voltage vs. Gate-to-Emitter Voltage

AFGBG70T65SQDC

Typical Characteristics

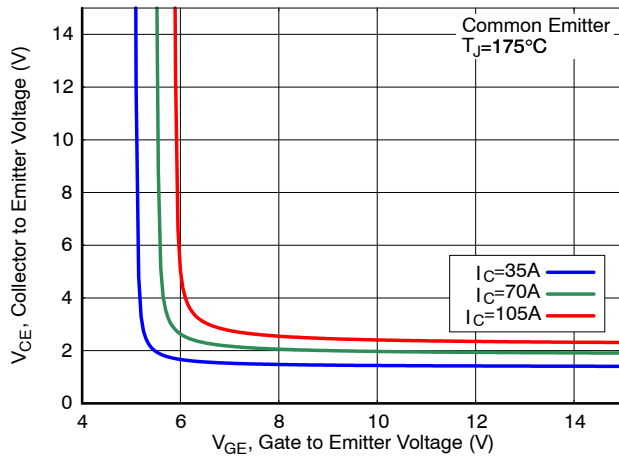


Figure 7. Saturation Voltage vs. Gate-to-Emitter Voltage

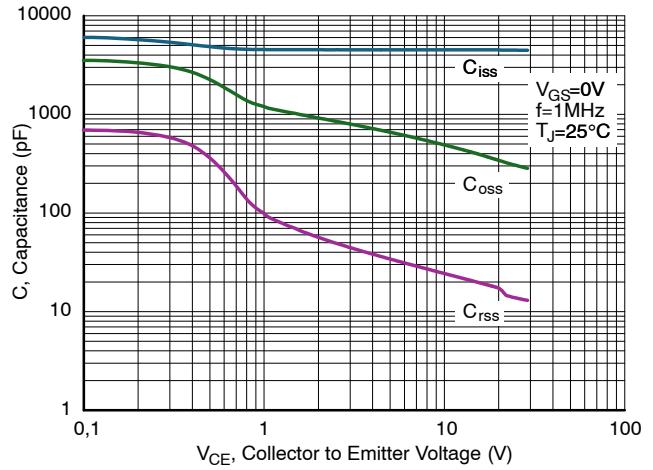


Figure 8. Capacitance Characteristics

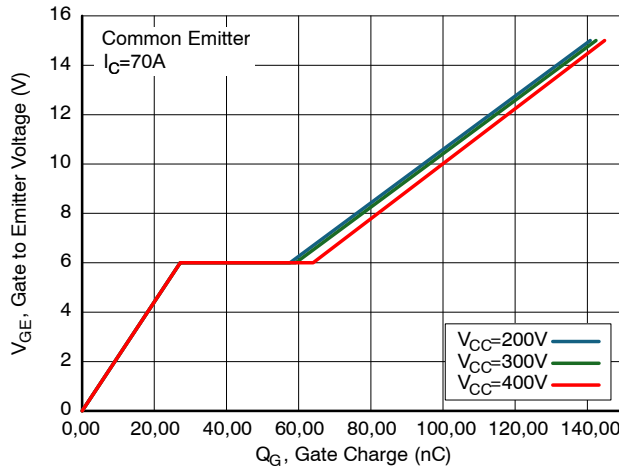


Figure 9. Gate Charge Characteristics

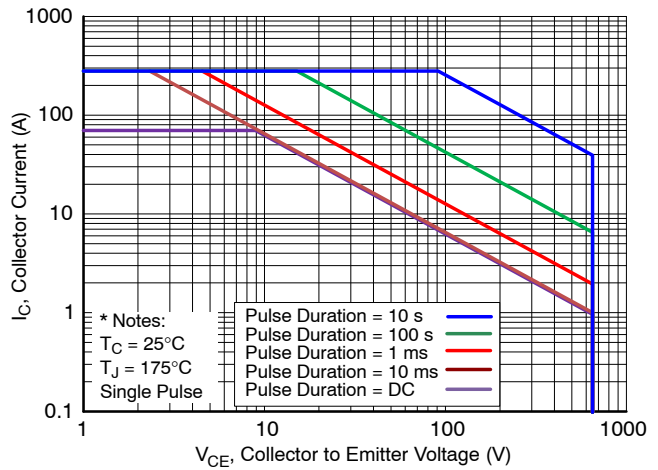


Figure 10. SOA Characteristics

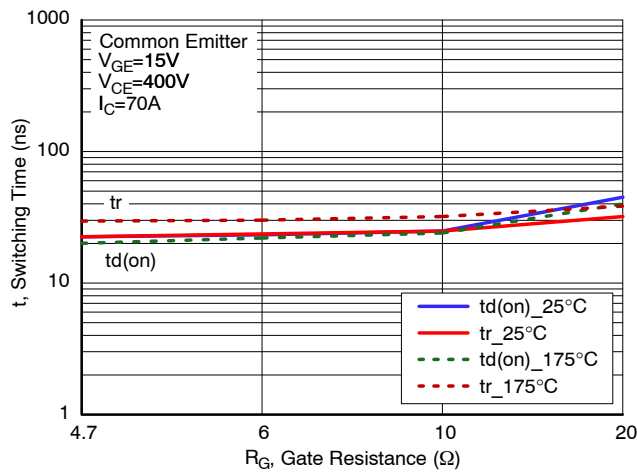


Figure 11. Turn-On Switching Time vs. Gate Resistance

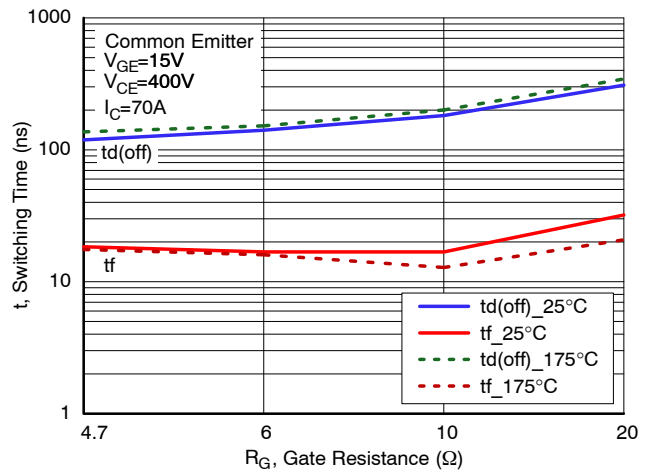


Figure 12. Turn-Off Switching Time vs. Gate Resistance

AFGBG70T65SQDC

Typical Characteristics

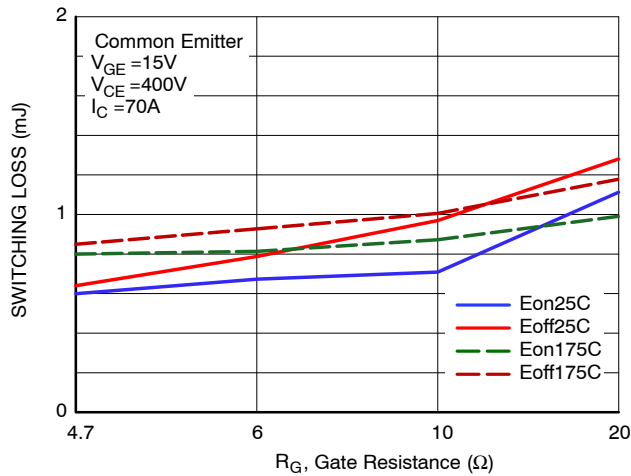


Figure 13. Switching Loss vs. Gate Resistance

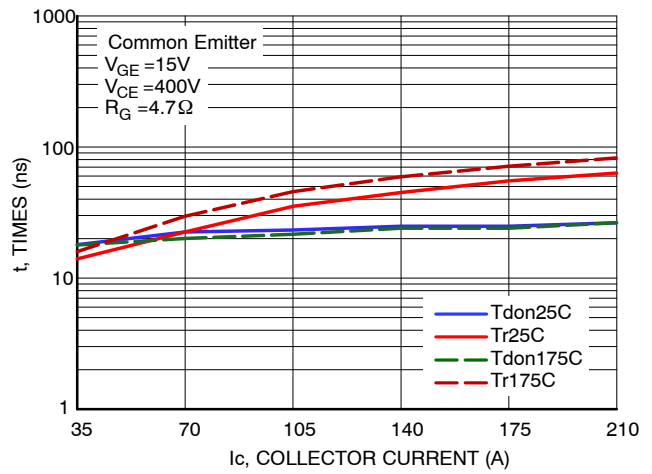


Figure 14. Turn-On Switching Time vs. Collector Current

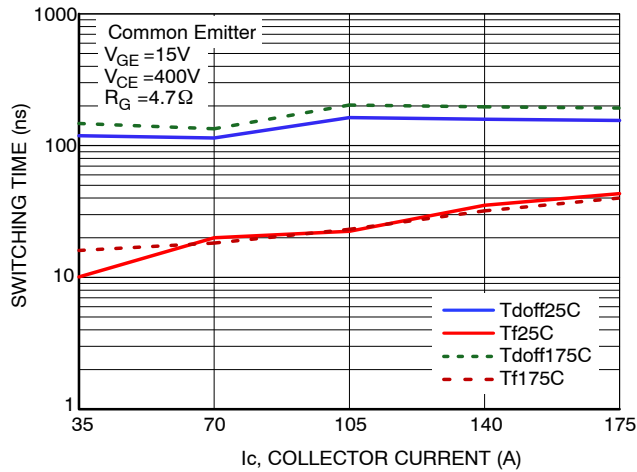


Figure 15. Turn-Off Switching Time vs. Collector Current

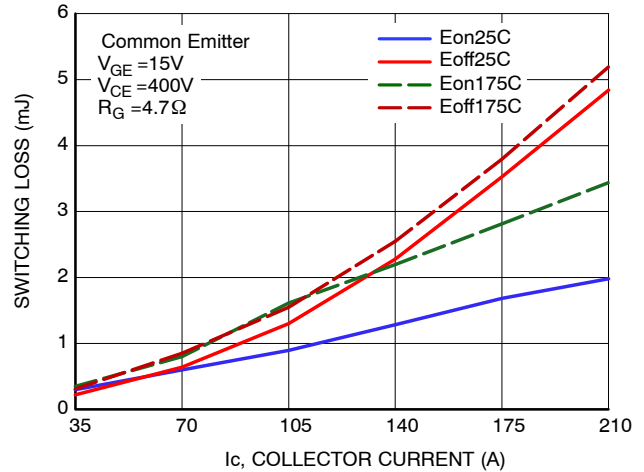


Figure 16. Switching Loss vs. Collector Current

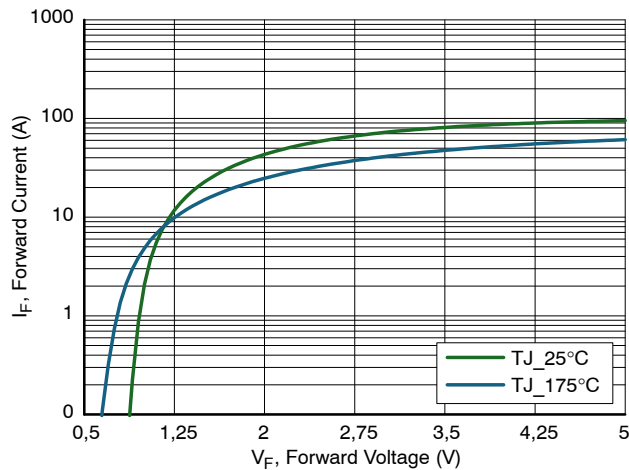


Figure 17. Diode Forward Characteristics

Typical Characteristics

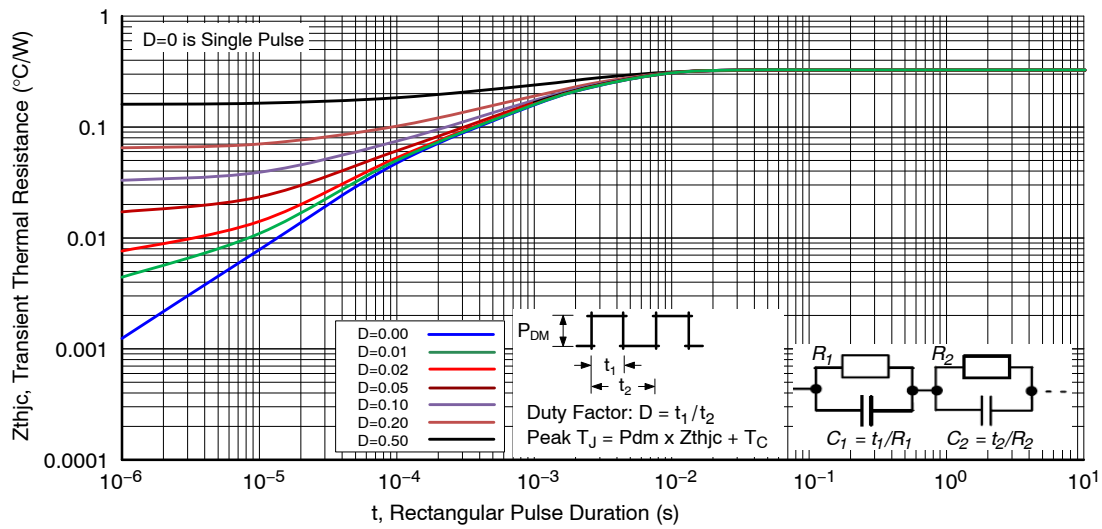


Figure 18. Transient Thermal Impedance of IGBT

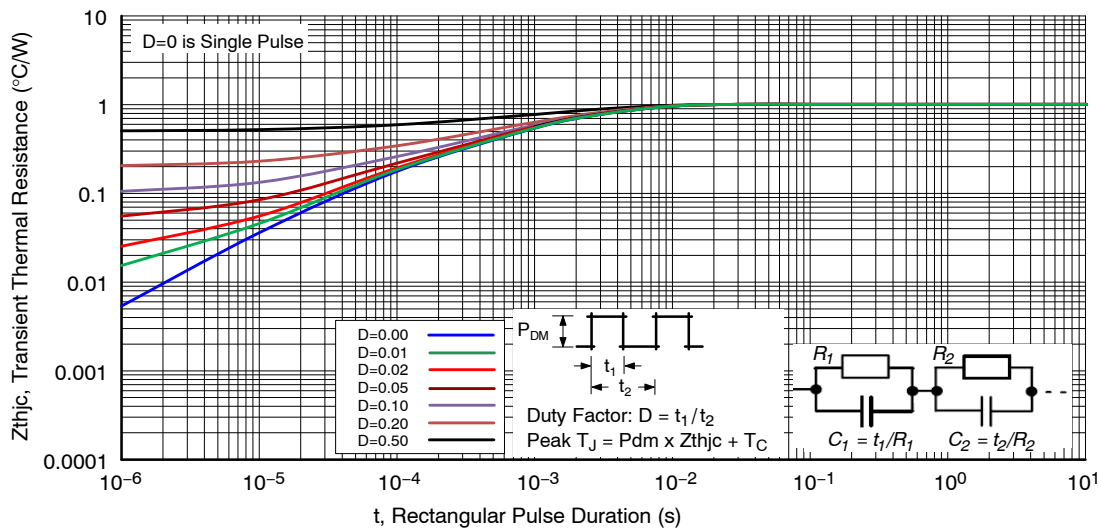


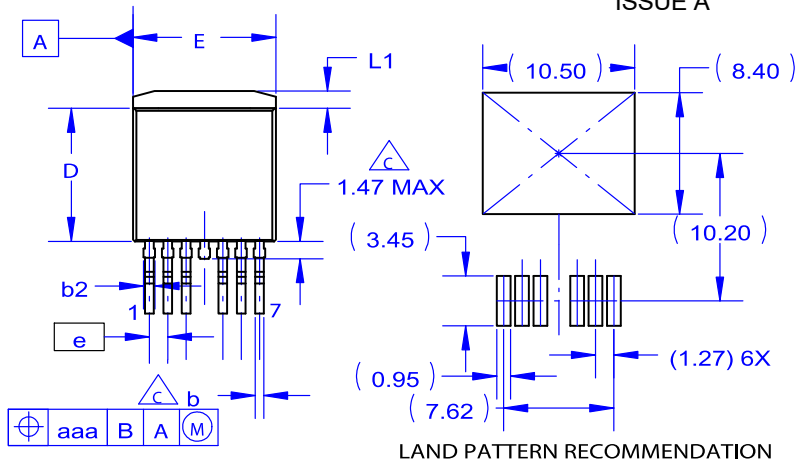
Figure 19. Transient Thermal Impedance of Diode

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

CASE 221BP

ISSUE A

DATE 13 FEB 2020

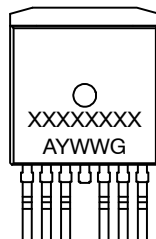


NOTES:

- 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.

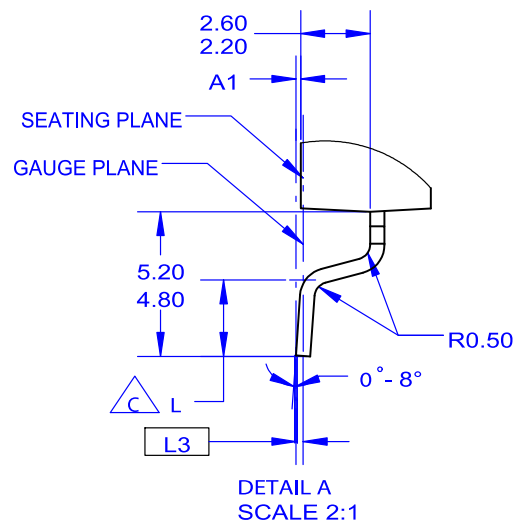
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	0.00	0.10	0.20
b2	0.60	0.70	0.80
b	0.50	0.60	0.70
c	0.40	0.50	0.60
c2	1.20	1.30	1.40
D	9.00	9.20	9.40
D1	7.30	7.80	8.20
E	9.70	9.90	10.20
E1	7.15	8.05	8.55
e	~	1.27	~
H	15.10	15.40	15.70
L	2.44	2.64	2.84
L1	1.00	1.20	1.40
L3	~	0.25	~
aaa	~	~	0.25

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.



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DESCRIPTION:	D2PAK7 (TO-263-7LD) 15.4x9.9x4.5	PAGE 1 OF 1

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