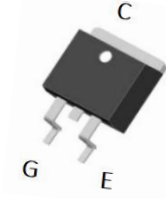


650V 50A CoolFAST™ 7 Technology IGBT

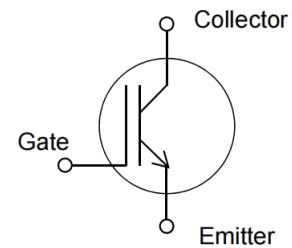
Features:

- Low Switching Power Loss
- Low Switching Surge and Noise
- Advanced Field Stop Technology
- Low EMI
- Maximum Junction Temperature 175°C
- Qualified According to JEDEC For Target Applications
- Pb-free Lead Plating, Halogen-free Mold Compound, RoHS Compliant



Applications:

- Industrial UPS
- Welding Machine
- Solar Converters
- Energy Storage
- EV Charger



Key Performance and Package Parameters

Type	V _{CE}	I _C	V _{CEsat} , T _{vj} =25°C	T _{vjmax}	Marking	Package	Packing
DGB50N65X7	650V	50A	1.55 V	175°C	DGB50N65X7	TO-263-3	Reel

Maximum Ratings and Characteristics

Absolute Maximum Ratings at T_{vj}= 25°C (unless otherwise specified)

Items	Symbols	Value	Units
Collector-emitter voltage	V _{CEs}	650	V
Gate-emitter voltage	V _{GES}	±20	V
Transient gate-emitter voltage (t _p ≤ 10μs, D < 0.010)	V _{GES}	±30	V
DC collector current, limited by T _{vjmax}	I _C	90	A
T _C = 25°C		90	
T _C = 100°C		50	
Pulsed collector current, t _p limited by T _{vjmax}	I _{CP}	300	A
Short circuit withstand time, V _{GE} = 15V, V _{CE} ≤ 400V	T _{SC}	5	μs
IGBT max. power dissipation	P _{D, IGBT}	365	W
Operating junction temperature	T _{vj}	-40 ~ +175	°C
Storage temperature	T _{stg}	-55 ~ +175	°C

Electrical Characteristics at $T_{vj}= 25^{\circ}\text{C}$ (unless otherwise specified)

Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}= 0\text{V}, I_C= 0.25\text{mA}$	650	-	-	V
Zero gate voltage collector current	I_{CES}	$V_{CE}= 650\text{V}, V_{GE}= 0\text{V}$	-	-	200	μA
Gate-emitter leakage current	I_{GES}	$V_{CE}= 0\text{V}, V_{GE}= \pm 20\text{V}$	-	-	± 200	nA
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE}= V_{GE}, I_C= 250\mu\text{A}$	5.0	5.8	6.6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}= 15\text{V}, I_C= 50\text{A}$	-	1.55	2.25	V
		$T_{vj}= 25^{\circ}\text{C}$ $T_{vj}= 175^{\circ}\text{C}$	-	2.0		
Input capacitance	C_{ies}	$V_{CE}= 25\text{V}, V_{GE}= 0\text{V}$ $f= 1\text{MHz}$	-	5805	-	pF
Output capacitance	C_{oes}		-	164	-	pF
Reverse transfer capacitance	C_{res}		-	57	-	pF
Gate charge	Q_G		$V_{CC}= 520\text{V}, I_C= 50\text{A}, V_{GE}= 15\text{V}$	-	223	-

Switching Characteristics at $T_{vj}= 25^{\circ}\text{C}$

Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}= 400\text{V}$ $I_C= 50\text{A}$ $V_{GE}= 15\text{V}$ $R_G= 10\Omega$ Inductive load	-	42	-	ns
Rise time	t_r		-	77	-	ns
Turn-off delay time	$t_{d(off)}$		-	153	-	ns
Fall time	t_f		-	31	-	ns
Turn-on energy	E_{on}		-	1.9	-	mJ
Turn-off energy	E_{off}		-	0.5	-	mJ
Total switching energy	E_{ts}		-	2.4	-	mJ

Switching Characteristics at $T_{vj}= 175^{\circ}\text{C}$

Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}= 400\text{V}$ $I_C= 50\text{A}$ $V_{GE}= 15\text{V}$ $R_G= 10\Omega$ Inductive load	-	36	-	ns
Rise time	t_r		-	73	-	ns
Turn-off delay time	$t_{d(off)}$		-	176	-	ns
Fall time	t_f		-	41	-	ns
Turn-on energy	E_{on}		-	1.9	-	mJ
Turn-off energy	E_{off}		-	0.8	-	mJ
Total switching energy	E_{ts}		-	2.7	-	mJ

Thermal Resistance

Items	Symbols	Characteristics			Unit
		Min	Typ	Max	
Thermal resistance, junction-ambient	$R_{th(j-a)}$	-	-	65	$^{\circ}\text{C} / \text{W}$
Thermal resistance, IGBT junction to case	$R_{th(j-c)}$	-	-	0.5	

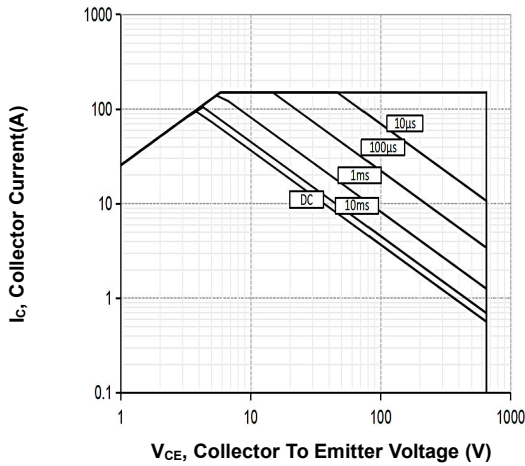


Figure 1. Forward bias safe operating area
($D = 0$, $T_c = 25^\circ\text{C}$, $T_{vj} \leq 175^\circ\text{C}$; $V_{GE} = 15\text{V}$)

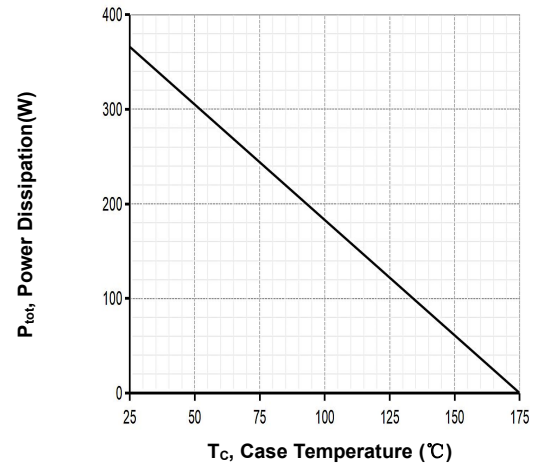


Figure 2. Power dissipation vs. case temperature
($T_{vj} \leq 175^\circ\text{C}$)

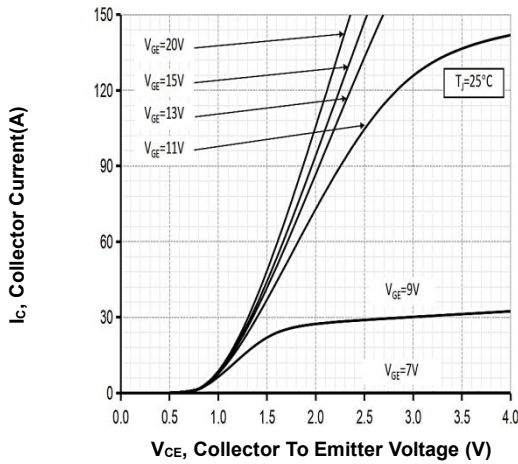


Figure 3. Typical output characteristic
($T_{vj} = 25^\circ\text{C}$)

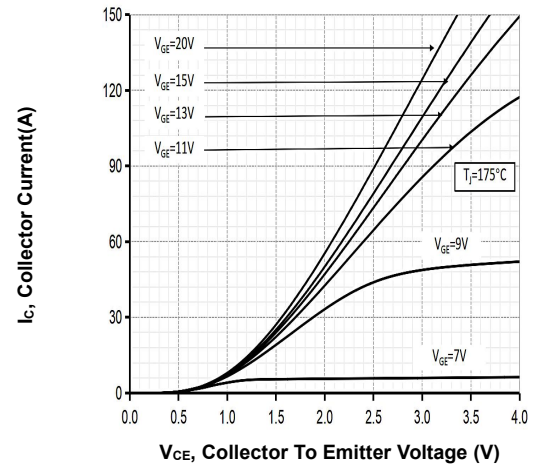


Figure 4. Typical output characteristic
($T_{vj} = 175^\circ\text{C}$)

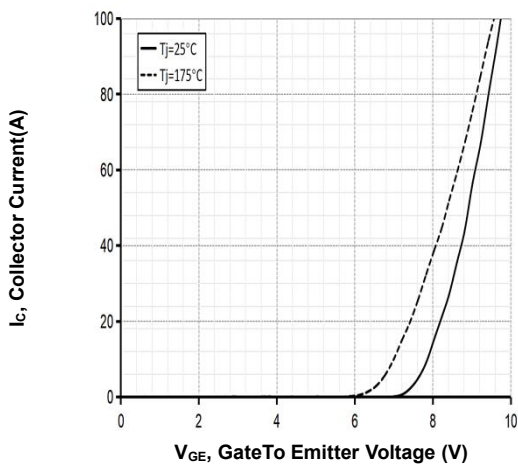


Figure 5. Typical transfer characteristic
($V_{CE} = 20\text{V}$)

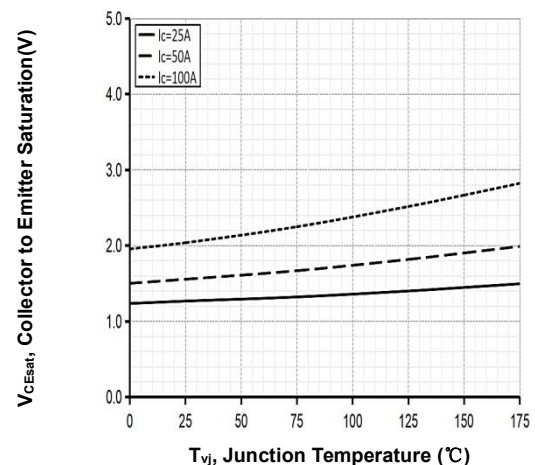


Figure 6. Typical collector-emitter saturation voltage vs. T_{vj} ($V_{GE} = 20\text{V}$)

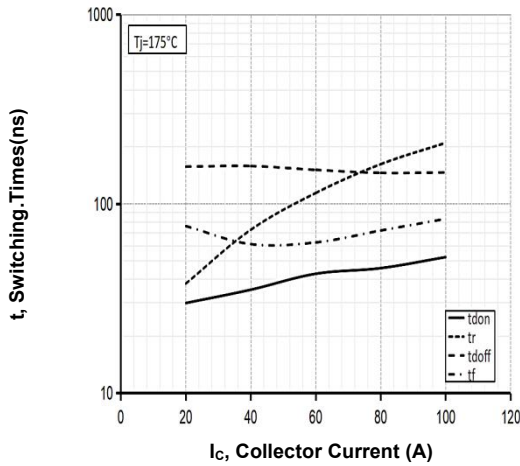


Figure 7. Typical switching times vs. collector current (Ind. load, $T_{vj}=175^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $R_G=10\Omega$)

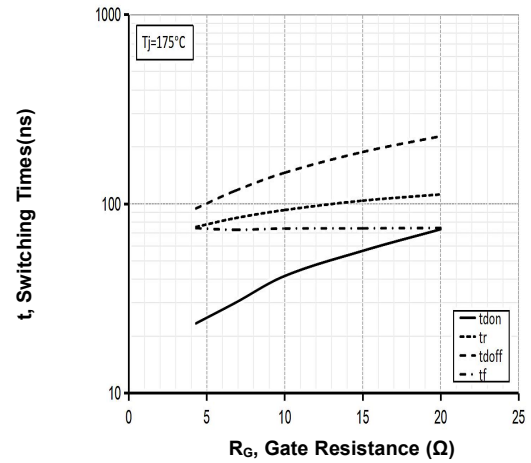


Figure 8. Typical switching times vs. gate resistor (Ind. Load, $T_{vj}=175^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=50\text{A}$)

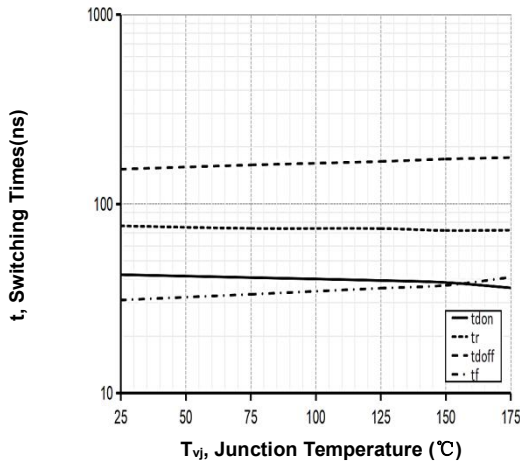


Figure 9. Typical switching times vs. T_{vj} (Ind. Load, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=50\text{A}$, $R_G=10\Omega$)

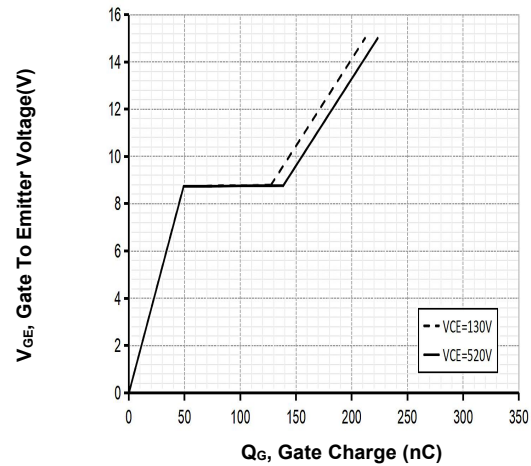


Figure 10. Typical gate charge ($I_C=50\text{A}$)

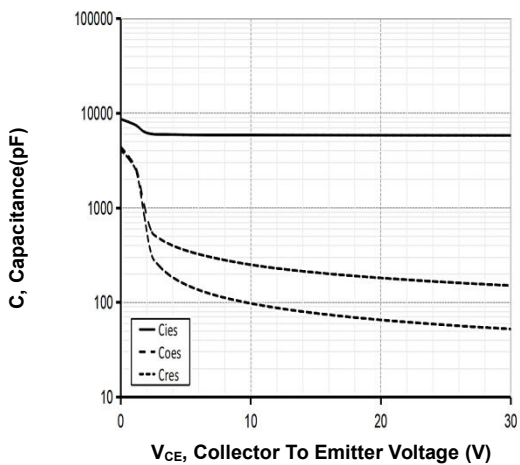


Figure 11. Typical capacitance vs. collector-emitter voltage ($V_{GE}=0\text{V}$, $f=1\text{MHz}$)

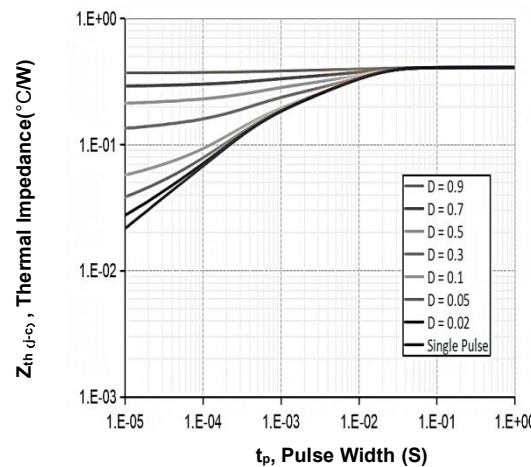
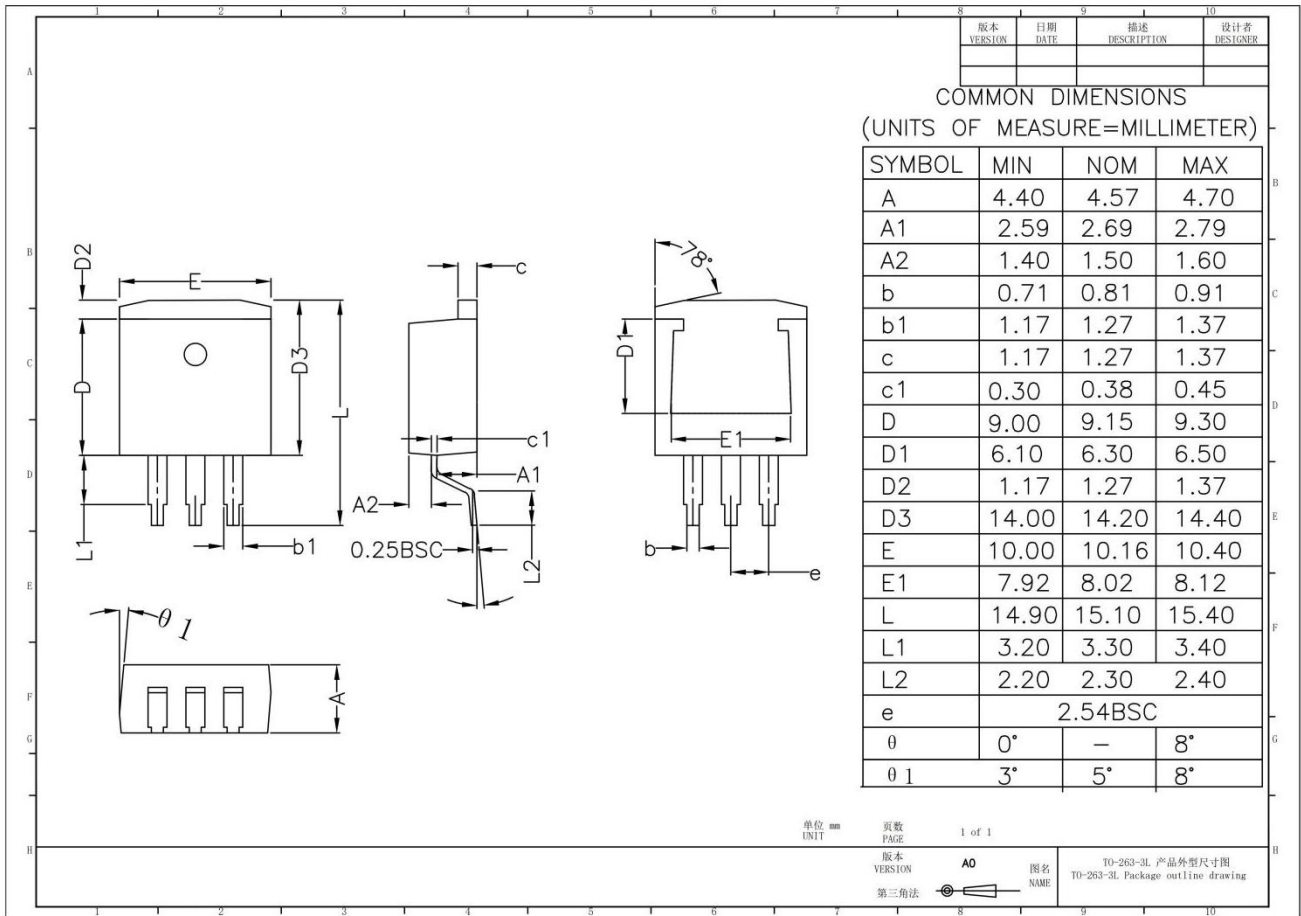


Figure 12. IGBT transient thermal impedance ($D=t_p/T$)

TO263-3 Package Outline



Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2023-2-20	Preliminary version
1.1	2024-3-25	MP version

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