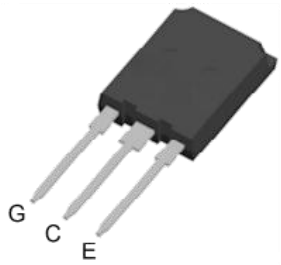
1200V 75A CoolFAST™ 7 Technology IGBT

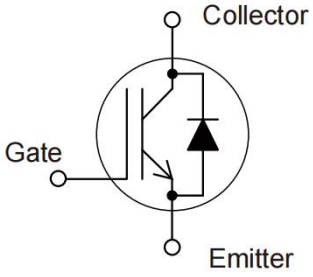
Features:

- 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
DKQ75N120EF7	1200V	75A	1.96V	175°C	DKQ75N120EF7	TO-247PLUS-3L

Maximum Ratings and Characteristics

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

Items	Symbols	Value	Units
Collector-emitter voltage	V_{CES}	1200	V
Gate-emitter voltage Transient gate-emitter voltage (t_p≤ 10μs, D< 0.010)	V_{GES}	±20 ±30	V
DC collector current, limited by T_{vjmax} Tc= 25°C Tc= 100°C	I_C	 115 82	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{CP}	300	A
Turn-off safe operating area V_{ce}≤ 1200V, T_j≤ 175°C, t_p= 1μs	-	300	A
Diode forward current, limited by T_{vjmax} Tc= 25°C Tc= 100°C	I_F	 150 75	A
Diode pulsed collector current, t_p limited by T_{vjmax}	I_{FP}	300	A
IGBT max. power dissipation	P_{D_IGBT}	625	W
FWD max. power dissipation	P_{D_FWD}	349	W
Operating junction temperature	T_{vj}	-40 ~ +175	°C
Storage temperature	T_{stg}	-55 ~ +150	°C

Electrical Characteristics at T_{vj}= 25°C (unless otherwise specified)

Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}= 0V, I_C= 0.50mA	1200	-	-	V
Zero gate voltage collector current	I_{CES}	V_{CE}= 1200V, V_{GE}= 0V	-	-	200	μA
Gate-emitter leakage current	I_{GES}	V_{CE}= 0V, V_{GE}= ±20V	-	-	±200	nA
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE}= V_{GE}, I_C= 250uA	5.0	5.9	6.6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}= 15V, I_C= 75A T_{vj}= 25°C T_{vj}= 175°C	 - -	 1.96 2.72	 2.40 	V
Input capacitance	C_{ies}	V_{CE}= 25V, V_{GE}= 0V f= 1MHz	-	19.5	-	nF
Output capacitance	C_{oes}		-	240	-	pF
Reverse transfer capacitance	C_{res}		-	130	-	pF
Gate charge	Q_G	V_{CC}= 960V, I_C= 75A, V_{GE}= 15V	-	570	-	nC
Forward voltage drop	V_F	I_F= 75A T_{vj}= 25°C T_{vj}= 175°C	 - -	 2.3 1.8	 3.0 	V

Switching Characteristics at T_{vj}= 25°C

Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	V_{CC}= 600V I_C= 75A V_{GE}= 15V R_G= 10Ω	-	118	-	ns
Rise time	t_r		-	138	-	ns
Turn-off delay time	$t_{d(off)}$		-	472	-	ns
Fall time	t_f		-	82	-	ns
Turn-on energy	E_{on}		-	4.97	-	mJ
Turn-off energy	E_{off}		-	3.52	-	mJ
Total switching energy	E_{ts}		-	8.49	-	mJ
Diode Characteristics						
Diode reverse recovery time	t_{rr}	V_{CC}= 600V I_F= 75A di_F/dt= 1000A/μs	-	127.9	-	ns
Diode reverse recovery charge	Q_{rr}		-	2.97	-	μC
Diode peak reverse recovery current	I_{rrm}		-	66.18	-	A

Switching Characteristics at T_{vj}=175°C

Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	V_{CC}= 600V I_C= 75A V_{GE}= 15V R_G= 10Ω	-	100	-	ns
Rise time	t_r		-	128	-	ns
Turn-off delay time	$t_{d(off)}$		-	534	-	ns
Fall time	t_f		-	104	-	ns
Turn-on energy	E_{on}		-	4.86	-	mJ
Turn-off energy	E_{off}		-	4.04	-	mJ
Total switching energy	E_{ts}		-	8.9	-	mJ
Diode Characteristics						
Diode reverse recovery time	t_{rr}	V_{CC}= 600V I_F= 75A di_F/dt= 1000A/μs	-	301.3	-	ns
Diode reverse recovery charge	Q_{rr}		-	12.78	-	μC
Diode peak reverse recovery current	I_{rrm}		-	86.19	-	A

Thermal Resistance

Items	Symbols	Characteristics			Unit
		Min	Typ	Max	
Thermal resistance, junction-ambient	$R_{th(j-a)}$	-	-	50	°C/W
Thermal resistance, IGBT junction to case	$R_{th(j-c)}$	-	-	0.24	
Thermal resistance, diodes junction to case	$R_{th(j-c)}$	-	-	0.43	

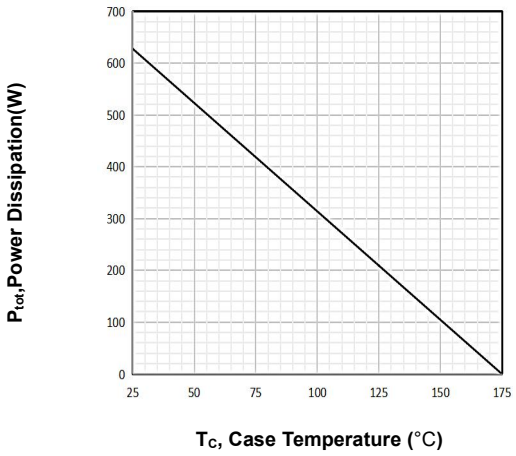


Figure 1. Power dissipation vs. case temparature
(T_{vj}≤ 175°C)

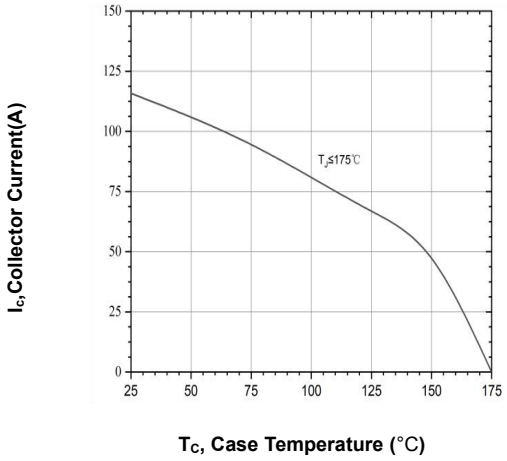


Figure 2. DC Collector current vs. Case temperature (V_{GE}≤ 15V, T_{vj}≤ 175°C)

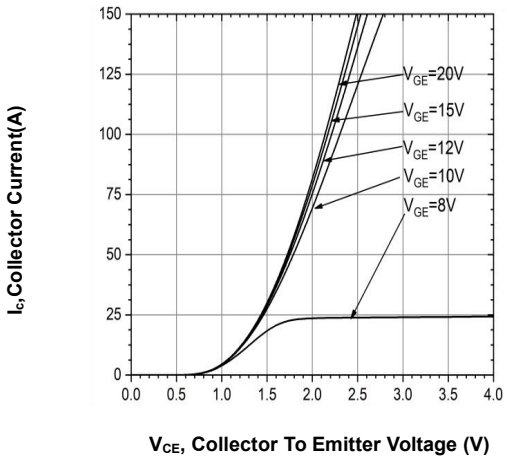


Figure 3. Typical output characteristic
(T_{vj}= 25°C)

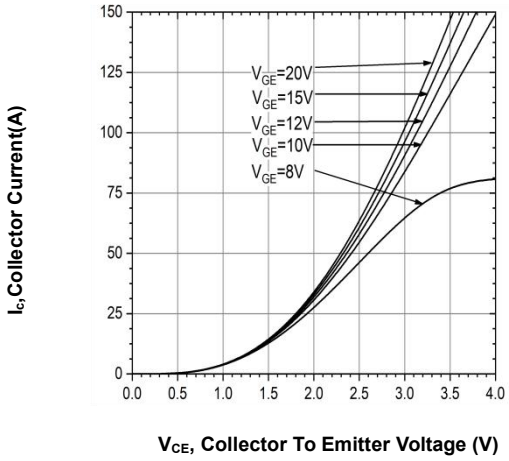


Figure 4. Typical output characteristic
(T_{vj}= 175°C)

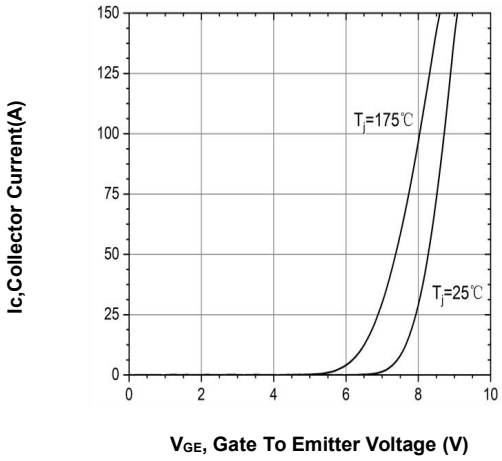


Figure 5. Typical transfer characteristic
(V_{CE}= 20V)

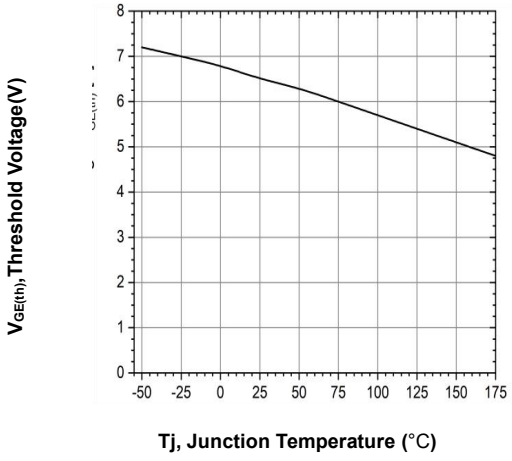


Figure 6. Gate threshold voltage
(I_C= 75mA, V_{CE}= 20V)

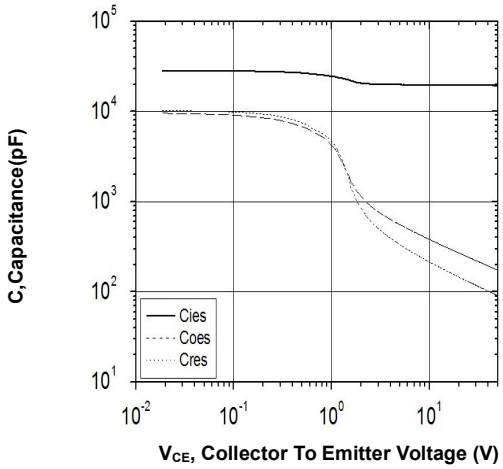


Figure 7. Typical capacitance vs. collector-emitter voltage (V_{GE}= 0V, f= 1MHz)

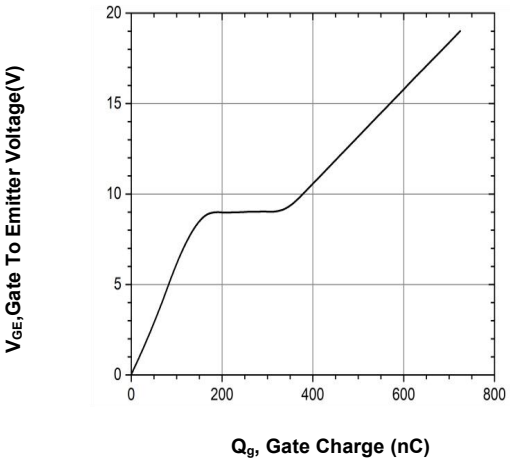


Figure 8. Typical gate charge
(I_C= 75A, V_{CE}= 960V, T_{vj}= 25°C)

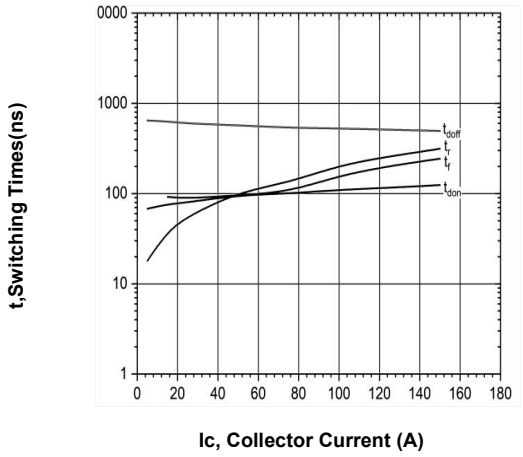


Figure 9. Typical switching times vs. collector current (T_{vj}= 175°C, V_{CE}= 600V, V_{GE}= 15V, R_g= 10Ω)

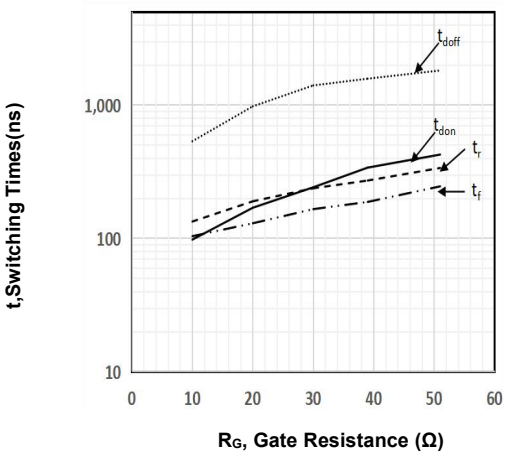


Figure 10. Typical switching times vs. gate resistor
(T_{vj}= 175°C, V_{CE}= 600V, V_{GE}= 15V, I_C= 75A)

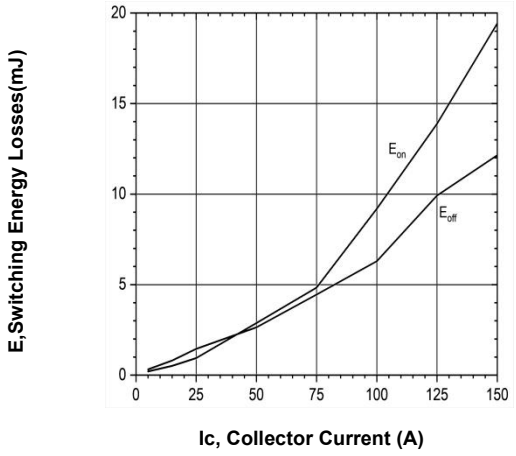


Figure 11. Typical switching losses vs. Collector current
(T_{vj}= 175°C, V_{CE}= 600V, V_{GE}= 15V, R_g= 10Ω)

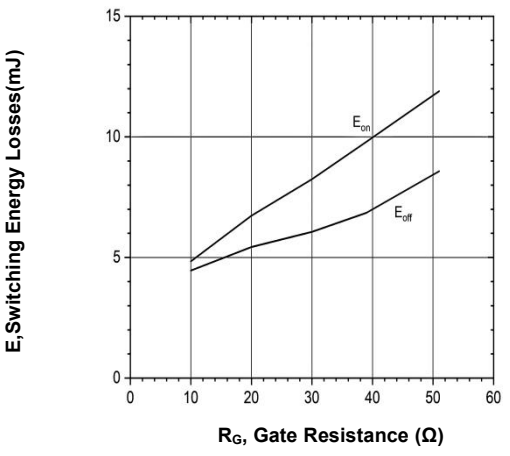


Figure 12. Typical capacitance vs. collector-emitter voltage
(T_{vj}= 175°C, V_{CE}= 600V, V_{GE}= 15V, R_g= 10Ω)

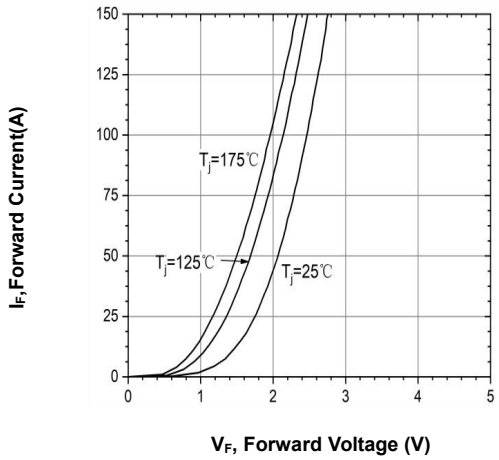


Figure 13. Typical forward characteristics of diode
(V_{CE}= 600V, V_{GE}= 15V, R_g= 10Ω)

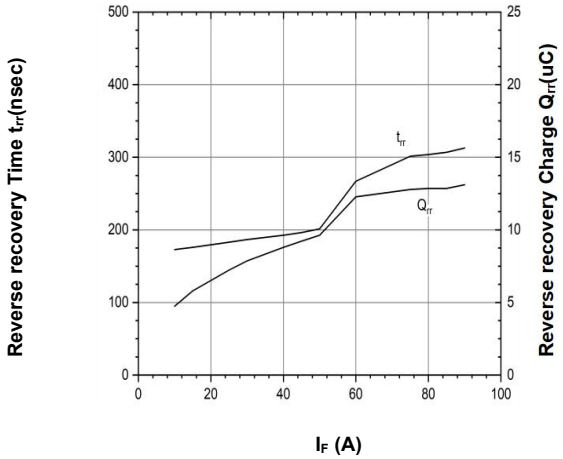


Figure 14. Typical reverse recovery characteristics vs. forward current of diode
(T_{vj}= 175°C, V_{CE}= 600V, V_{GE}= 15V, R_g= 10Ω)

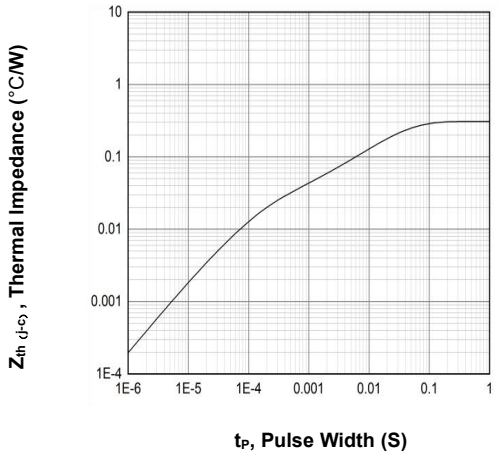


Figure 15. Transient thermal impedance of IGBT
(D= 0)

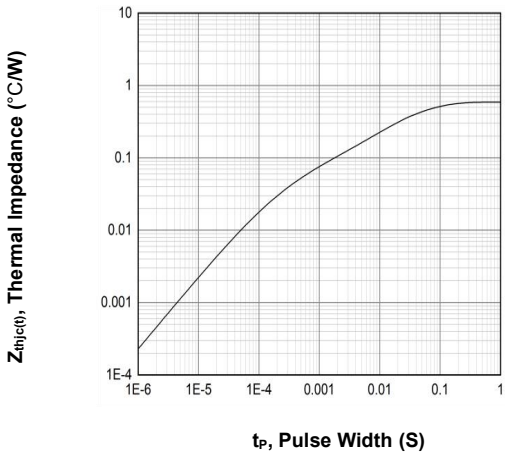


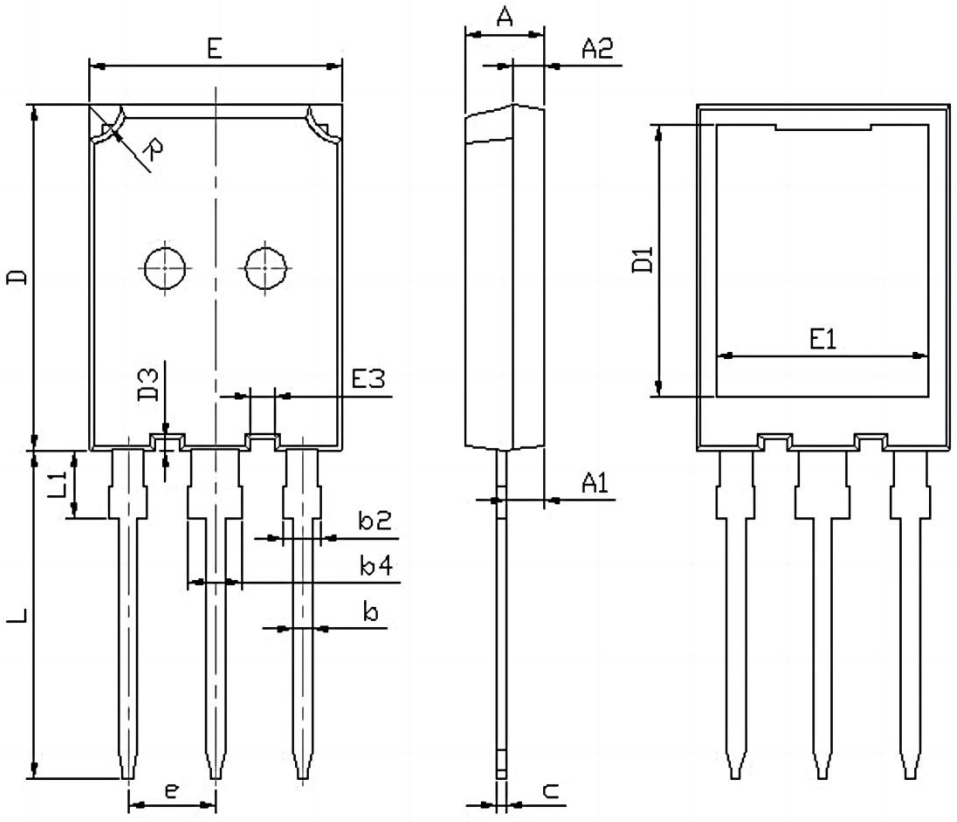
Figure 16. Transient thermal impedance of diode
(D= 0)

TO-247PLUS-3 Package Outline

TO-247plus-3L MECHANICAL DATA

UNIT: mm

SYMBOL	MIN	NOM	MAX	SYMBOL	MIN	NOM	MAX
A	4.80	5.00	5.20	D3	0.53	0.68	0.83
A1	2.21	2.40	2.61	E	15.50	15.80	16.10
A2	1.85		2.15	E1	13.10	13.30	13.50
b	1.07	1.20	1.33	E3	1.30	1.45	1.60
b2	1.90		2.16	e		5.44	
b4	2.90		3.20	L	19.62	19.92	20.22
c	0.52	0.60	0.68	L1			4.30
D	20.70	21.00	21.30	R	1.85	2.00	2.15
D1	16.25	16.55	16.85				



Revision History

Revision	Date	Subjects (major changes since last revision)
0.1	2021-03-20	Target version
1.1	2022-11-11	Preliminary version
1.2	2024-1-16	MP version

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