

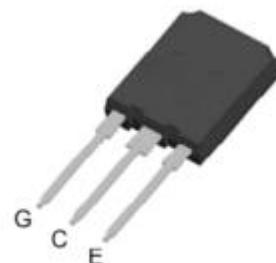
1200V 75A CoolFAST™ 7 Technology IGBT

Part No.: HM75N120FT3

Package: TO-247Plus-3L

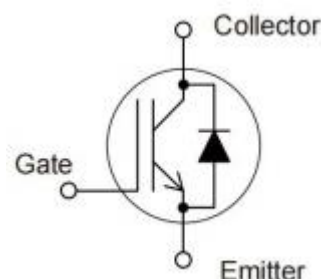
Features:

- 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	Vce	Ic	VCEsat, Tvj=25°C	Tvjmax	Marking	Package
HM75N120FT3	1200V	75A	1.6V	175°C	HM75N120FT3	TO-247Plus-3L

Maximum Ratings and Characteristics

Absolute Maximum Ratings at Tvj= 25°C (unless otherwise specified)

Items	Symbols	Value	Units
Collector-emitter voltage	V _{CEs}	1200	V
Gate-emitter voltage	V _{GES}	±20	V
Transient gate-emitter voltage (t _p ≤ 10μs, D < 0.010)		±30	V
DC collector current, limited by T _{vjmax}	I _c	150	A
T _c = 25°C		75	
T _c = 100°C			
Pulsed collector current, t _p limited by T _{vjmax}	I _{cP}	300	A
Diode forward current, limited by T _{vjmax}	I _F	150	A
T _c = 25°C		75	
T _c = 100°C			
Diode Pulsed collector current, t _p limited by T _{vjmax}	I _{FP}	300	A
Short circuit withstand time, V _{GE} = 15V, V _{CE} ≤ 600V	T _{SC}	5	μs
IGBT max. power dissipation	P _{D_IGBT}	750	W
FWD max. power dissipation	P _{D_FWD}	500	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	$V_{(BR)CES}$	$V_{GE}= 0\text{V}, I_C= 0.25\text{mA}$	1200	-	-	V
Zero gate voltage collector current	I_{CES}	$V_{CE}= 1200\text{V}, V_{GE}= 0\text{V}$	-	-	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	$V_{CE(sat)}$	$V_{GE}= 15\text{V}, I_C= 75\text{A}$ $T_{vj}= 25^{\circ}\text{C}$ $T_{vj}= 175^{\circ}\text{C}$	-	1.6	2.25	V
			-	2.0		
Input capacitance	C_{ies}	$V_{CE}= 25\text{V}, V_{GE}= 0\text{V}$ $f= 1\text{MHz}$	-	17800	-	pF
Output capacitance	C_{oes}		-	237	-	pF
Reverse transfer capacitance	C_{res}		-	69	-	pF
Gate charge	Q_G	$V_{CC}= 960\text{V}, I_C= 75\text{A}, V_{GE}= 15\text{V}$	-	607	-	nC
Forward voltage drop	V_F	$I_F= 75\text{A}$ $T_{vj}= 25^{\circ}\text{C}$ $T_{vj}= 175^{\circ}\text{C}$	-	2.0	3.0	V
			-	1.7		

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

Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}= 600\text{V}$ $I_C= 75\text{A}$ $V_{GE}= 15\text{V}$ $R_G= 10\Omega$ Inductive load	-	115	-	ns
Rise time	t_r		-	79	-	ns
Turn-off delay time	$t_{d(off)}$		-	314	-	ns
Fall time	t_f		-	104	-	ns
Turn-on energy	E_{on}		-	5.7	-	mJ
Turn-off energy	E_{off}		-	3.4	-	mJ
Total switching energy	E_{ts}		-	9.1	-	mJ
Diode Characteristics						
Diode reverse recovery time	t_{rr}	$V_{CC}= 600\text{V}$ $I_F= 75\text{A}$ $di_F/dt= 500\text{A}/\mu\text{s}$	-	312	-	ns
Diode reverse recovery charge	Q_{rr}		-	2.5	-	μC
Diode peak reverse recovery current	I_{rrm}		-	20.1	-	A

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

Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}= 600\text{V}$ $I_C= 75\text{A}$ $V_{GE}= 15\text{V}$ $R_G= 10\Omega$ Inductive load	-	92	-	ns
Rise time	t_r		-	81	-	ns
Turn-off delay time	$t_{d(off)}$		-	364	-	ns
Fall time	t_f		-	184	-	ns
Turn-on energy	E_{on}		-	9.2	-	mJ
Turn-off energy	E_{off}		-	4.9	-	mJ
Total switching energy	E_{ts}		-	14.1	-	mJ
Diode Characteristics						
Diode reverse recovery time	t_{rr}	$V_{CC}= 600\text{V}$ $I_F= 75\text{A}$ $di_F/dt= 500\text{A}/\mu\text{s}$	-	532	-	ns
Diode reverse recovery charge	Q_{rr}		-	11.2	-	μC
Diode peak reverse recovery current	I_{rrm}		-	44.5	-	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	$R_{th(j-c)}$	-	-	0.2	
Thermal resistance, diodes junction to case	$R_{th(j-c)}$	-	-	0.3	

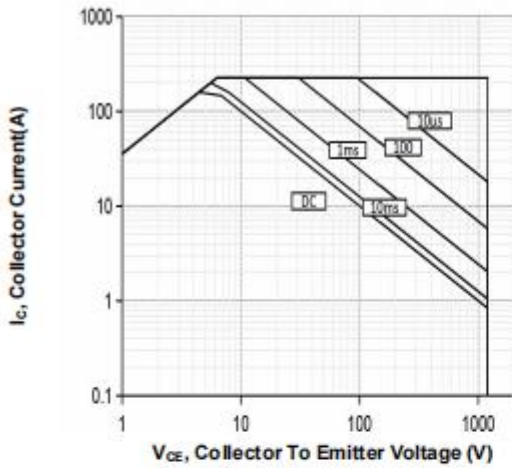


Figure 1. Forward bias safe operating area
($D = 0$, $T_C = 25^\circ\text{C}$, $T_{vj} \leq 175^\circ\text{C}$; $V_{CE} = 15\text{V}$)

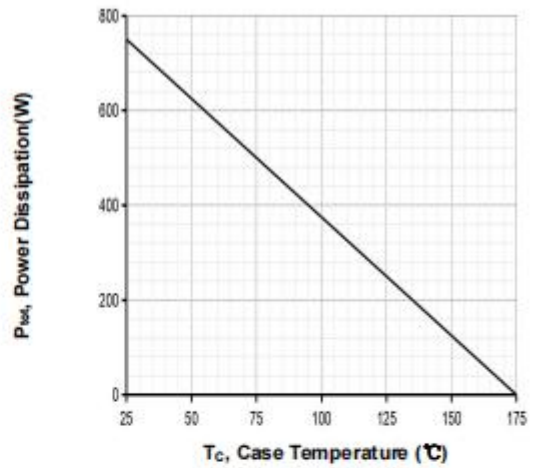


Figure 2. Power dissipation vs. case temperature
($T_{vj} \leq 175^\circ\text{C}$)

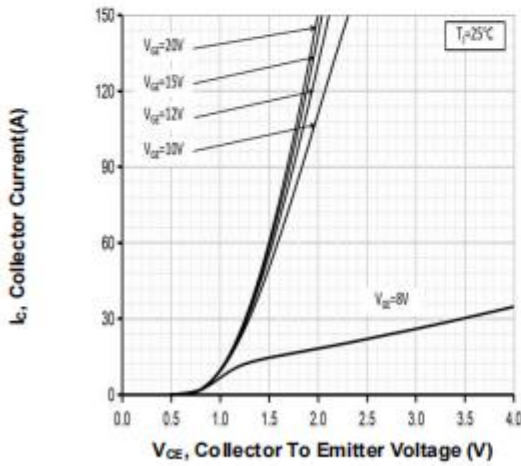


Figure 3. Typical output characteristic
($T_{vj} = 25^\circ\text{C}$)

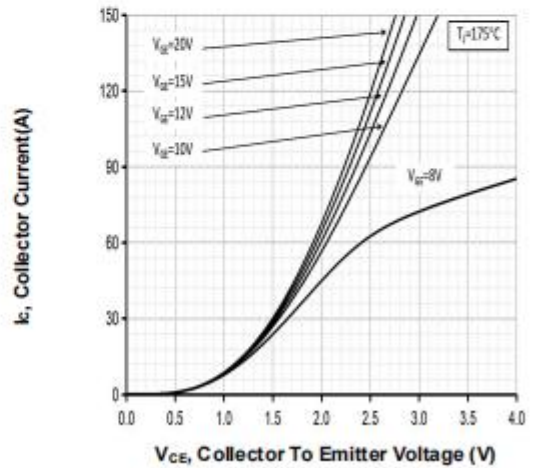


Figure 4. Typical output characteristic
($T_{vj} = 175^\circ\text{C}$)

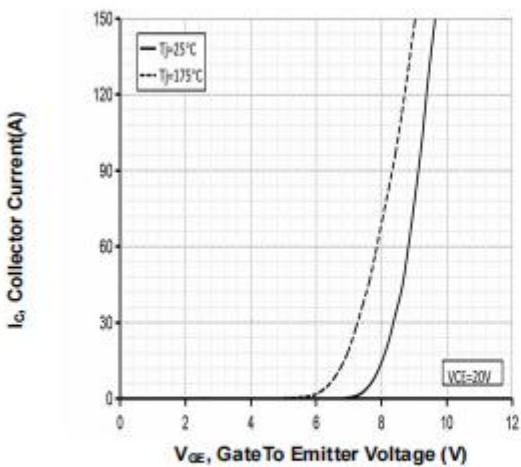


Figure 5. Typical transfer characteristic
($V_{CE} = 20\text{V}$)

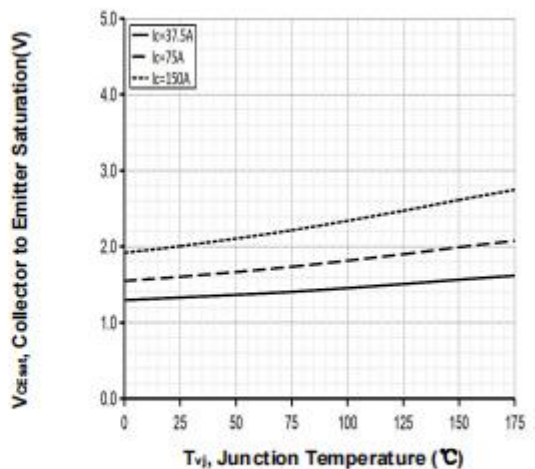


Figure 6. Typical collector-emitter saturation voltage vs. T_{vj} ($V_{CE} = 20\text{V}$)

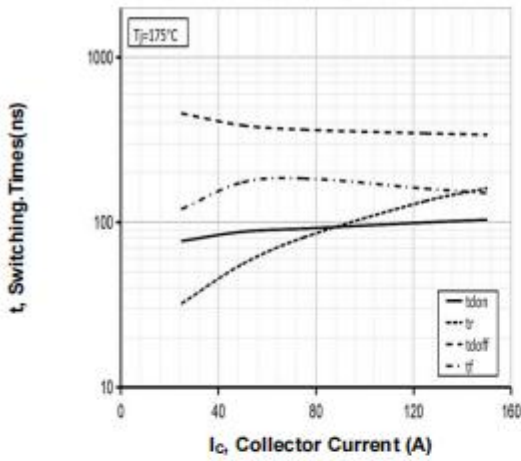


Figure 7. Typical switching times vs. collector current (Ind. load, $T_j = 175^\circ\text{C}$, $V_{CE} = 600\text{V}$, $V_{GE} = 15.0\text{V}$, $R_G = 10\Omega$)

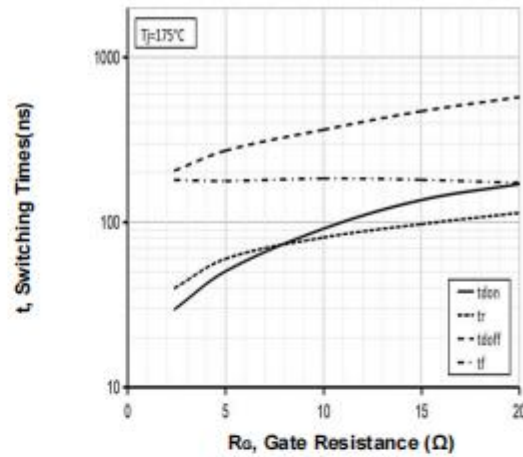


Figure 8. Typical switching times vs. gate resistor (Ind. Load, $T_j = 175^\circ\text{C}$, $V_{CE} = 600\text{V}$, $V_{GE} = 15.0\text{V}$, $I_C = 75\text{A}$)

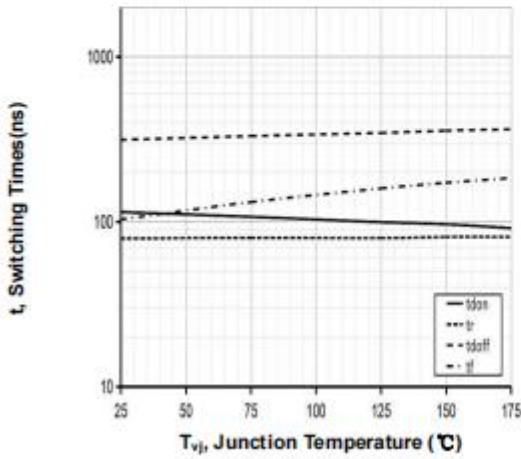


Figure 9. Typical switching times vs. T_j (Ind. Load, $V_{CE} = 600\text{V}$, $V_{GE} = 15.0\text{V}$, $I_C = 75\text{A}$, $R_G = 10\Omega$)

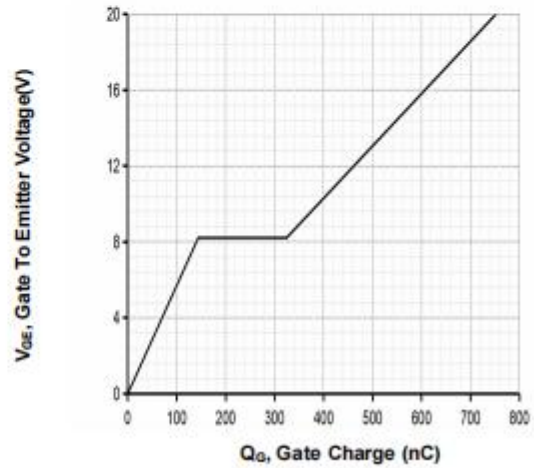


Figure 10. Typical gate charge ($I_C = 75\text{A}$)

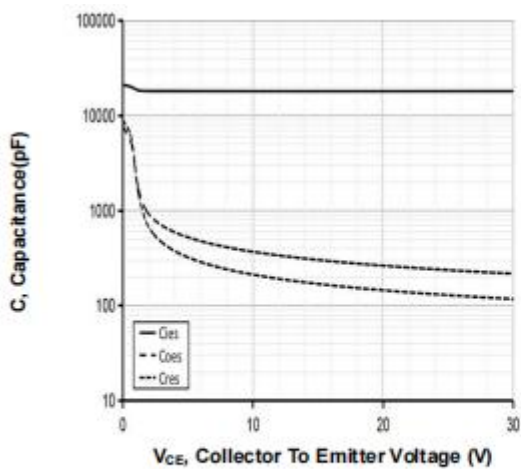


Figure 11. Typical capacitance vs. collector-emitter voltage ($V_{GE} = 0\text{V}$, $f = 1\text{MHz}$)

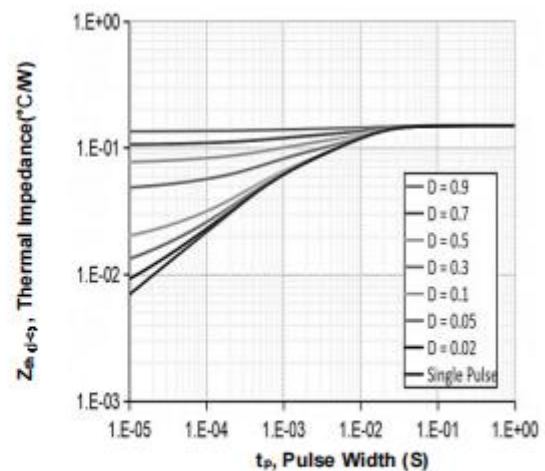


Figure 12. IGBT transient thermal impedance ($D = t_p/T$)

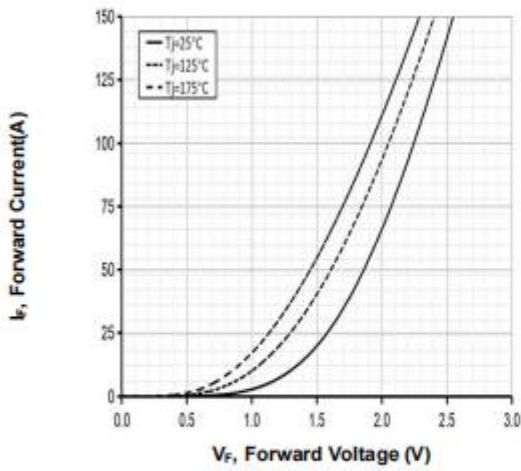


Figure 13. Typical diode forward current vs. forward voltage

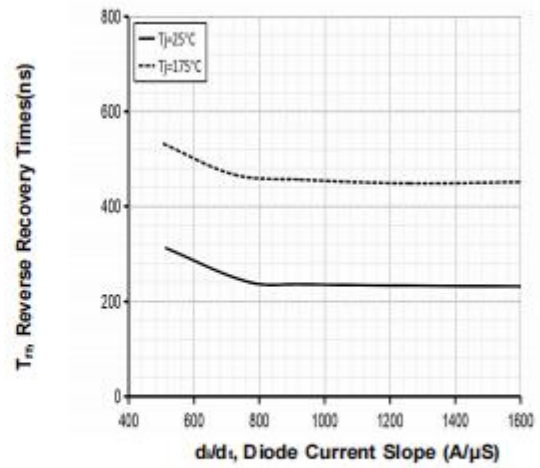


Figure 14. Typical reverse recovery time vs. diode current slope ($V_R=600V$)

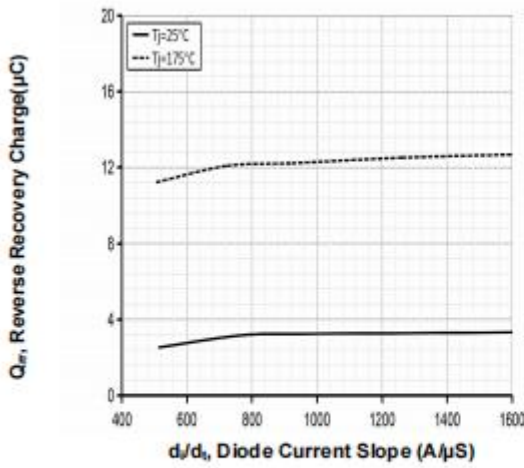


Figure 15. Typical reverse recovery charge vs. diode current slope ($V_R=600V$)

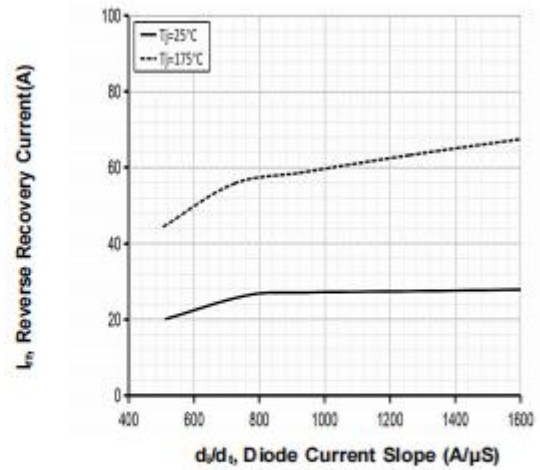


Figure 16. Typical reverse recovery current vs. diode current slope ($V_R=600V$)

TO-247PLUS-3L Package Outline

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				

