

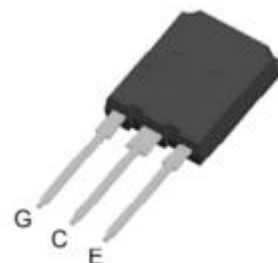
## 1200V 75A CoolFAST™ 7 Technology IGBT

**Part No.:** HM75N120FT3

**Package:** TO-247Plus-3L

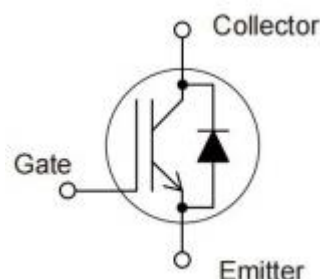
### Features:

- 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 <sub>CES</sub>	1200	V
Gate-emitter voltage	V <sub>GES</sub>	±20	V
Transient gate-emitter voltage (t <sub>p</sub> ≤ 10μs, D < 0.010)		±30	V
DC collector current, limited by T <sub>vjmax</sub>	I <sub>C</sub>	150	A
T <sub>C</sub> = 25°C		75	
T <sub>C</sub> = 100°C			
Pulsed collector current, t <sub>p</sub> limited by T <sub>vjmax</sub>	I <sub>CP</sub>	300	A
Diode forward current, limited by T <sub>vjmax</sub>	I <sub>F</sub>	150	A
T <sub>C</sub> = 25°C		75	
T <sub>C</sub> = 100°C			
Diode Pulsed collector current, t <sub>p</sub> limited by T <sub>vjmax</sub>	I <sub>FP</sub>	300	A
Short circuit withstand time, V <sub>GE</sub> = 15V, V <sub>CE</sub> ≤ 600V	T <sub>SC</sub>	5	μs
IGBT max. power dissipation	P <sub>D_IGBT</sub>	750	W
FWD max. power dissipation	P <sub>D_FWD</sub>	500	W
Operating junction temperature	T <sub>vj</sub>	-40 ~ +175	°C
Storage temperature	T <sub>stg</sub>	-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	$V_{(BR)CES}$	$V_{GE} = 0V, I_C = 0.25mA$	1200	-	-	V
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = 1200V, V_{GE} = 0V$	-	-	200	$\mu A$
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	$\pm 200$	nA
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\mu A$	5.0	5.8	6.6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 75A$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	-	1.6	2.25	V
			-	2.0	-	
Input capacitance	$C_{ies}$	$V_{CE} = 25V, V_{GE} = 0V$ $f = 1MHz$	-	17800	-	pF
Output capacitance	$C_{oes}$		-	237	-	pF
Reverse transfer capacitance	$C_{res}$		-	69	-	pF
Gate charge	$Q_G$	$V_{CC} = 960V, I_C = 75A, V_{GE} = 15V$	-	607	-	nC
Forward voltage drop	$V_F$	$I_F = 75A$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	-	2.0	3.0	V
			-	1.7	-	

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

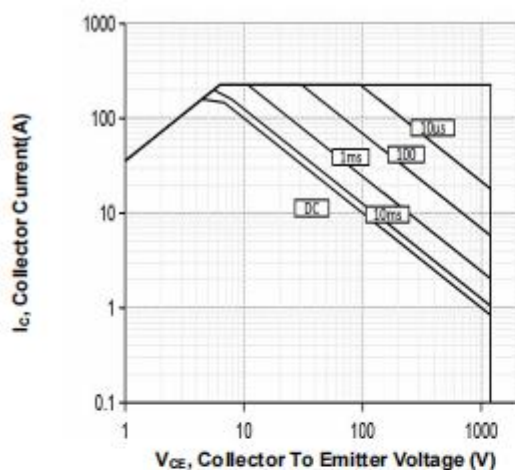
Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}= 600V$ $I_C= 75A$ $V_{GE}= 15V$ $R_G= 10\Omega$ Inductive load	-	115	-	ns
Rise time	$t_r$		-	79	-	ns
Turn-off delay time	$t_{d(off)}$		-	314	-	ns
Fall time	$t_f$		-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

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

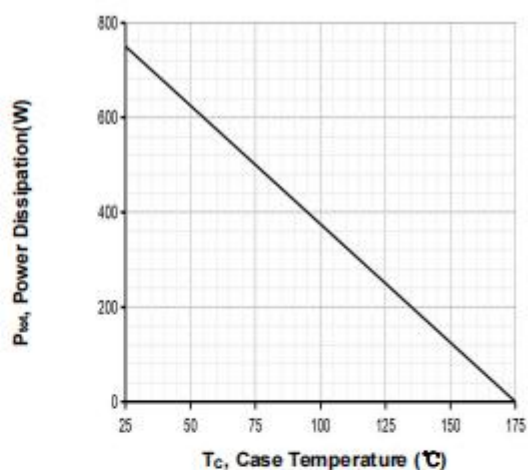
Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}= 600V$ $I_C= 75A$ $V_{GE}= 15V$ $R_G= 10\Omega$ Inductive load	-	92	-	ns
Rise time	$t_r$		-	81	-	ns
Turn-off delay time	$t_{d(off)}$		-	364	-	ns
Fall time	$t_f$		-	184	-	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	$t_{rr}$	$V_{CC}= 600V$ $I_F= 75A$ $di_F/dt= 500A/\mu s$	-	532	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	11.2	-	$\mu C$
Diode peak reverse recovery current	$I_{rrm}$		-	44.5	-	A

## Thermal Resistance

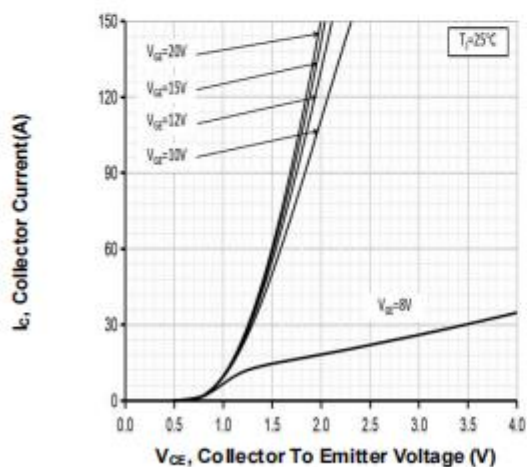
Items	Symbols	Characteristics			Unit
		Min	Typ	Max	
Thermal resistance, junction-ambient	$R_{th(j-a)}$	-	-	50	°C /W
Thermal resistance, IGBT junction to case	$R_{th(j-c)}$	-	-	0.2	
Thermal resistance, diodes junction to case	$R_{th(j-c)}$	-	-	0.3	



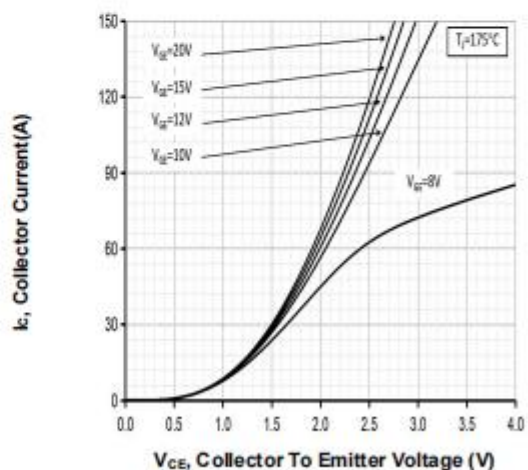
**Figure 1. Forward bias safe operating area**  
( $D=0$ ,  $T_C=25^\circ\text{C}$ ,  $T_{vj}\leq 175^\circ\text{C}$ ;  $V_{GE}=15\text{V}$ )



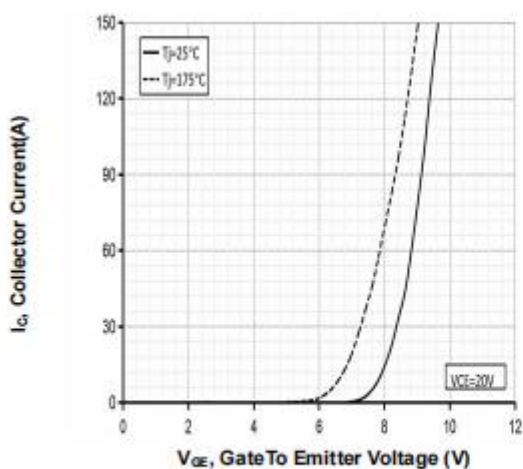
**Figure 2. Power dissipation vs. case temperature**  
( $T_{vj}\leq 175^\circ\text{C}$ )



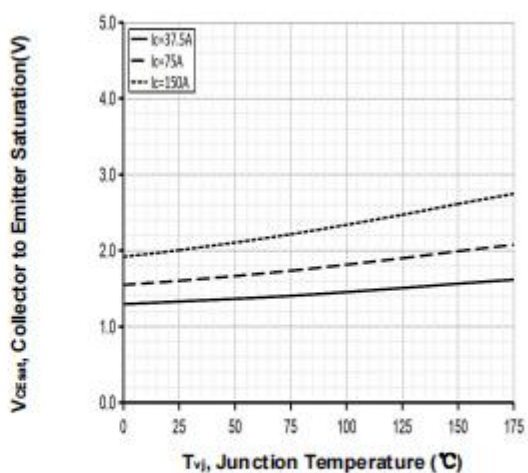
**Figure 3. Typical output characteristic**  
( $T_{vj}=25^\circ\text{C}$ )



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

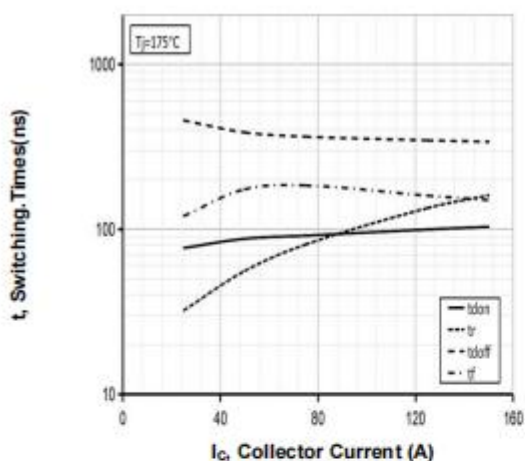


**Figure 5. Typical transfer characteristic**  
( $V_{CE}=20\text{V}$ )

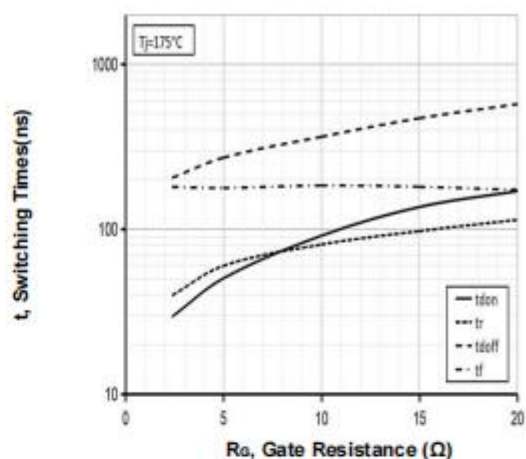


**Figure 6. Typical collector-emitter saturation voltage vs.  $T_{vj}$**  ( $V_{GE}=20\text{V}$ )

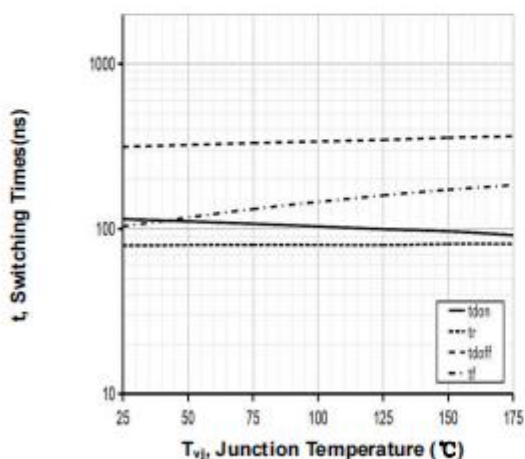




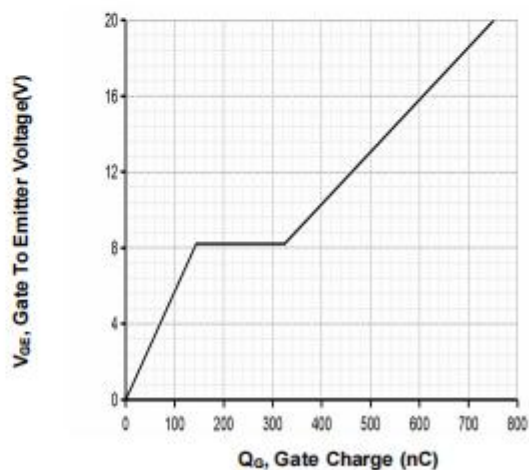
**Figure 7. Typical switching times vs. collector current** (Ind. load,  $T_j = 175^\circ\text{C}$ ,  $V_{CE} = 600\text{V}$ ,  $V_{GE} = 15.0\text{V}$ ,  $R_G = 10\Omega$ )



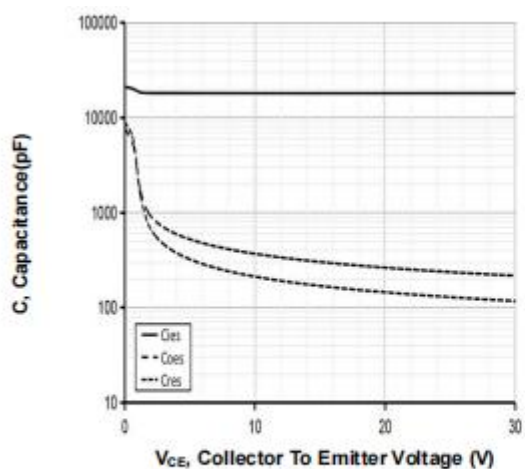
**Figure 8. Typical switching times vs. gate resistor** (Ind. Load,  $T_j = 175^\circ\text{C}$ ,  $V_{CE} = 600\text{V}$ ,  $V_{GE} = 15.0\text{V}$ ,  $I_C = 75\text{A}$ )



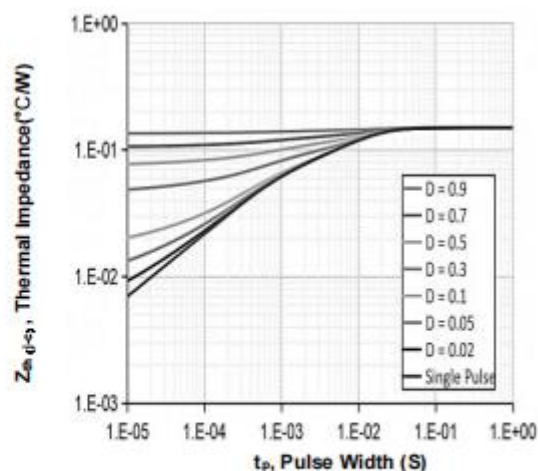
**Figure 9. Typical switching times vs.  $T_j$**  (Ind. Load,  $V_{CE} = 600\text{V}$ ,  $V_{GE} = 15.0\text{V}$ ,  $I_C = 75\text{A}$ ,  $R_G = 10\Omega$ )



**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** ( $D = t_p/T$ )

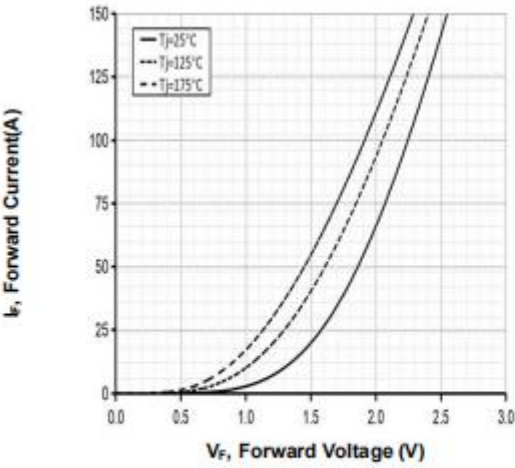


Figure 13. Typical diode forward current vs. forward voltage

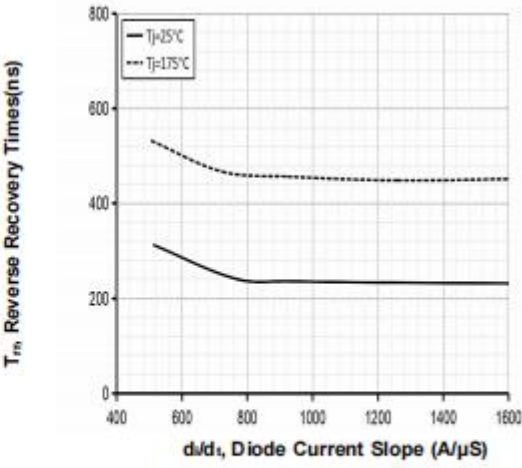


Figure 14. Typical reverse recovery time vs. diode current slope ( $V_R = 600V$ )

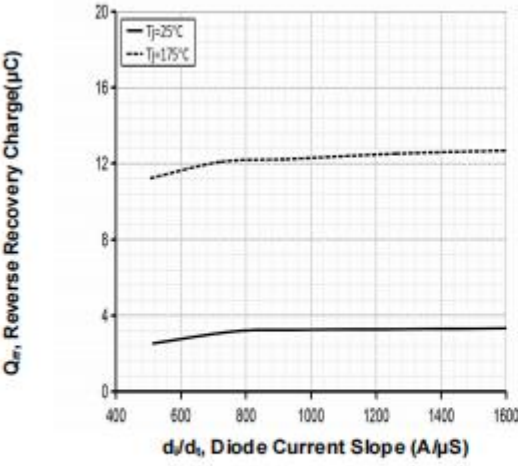


Figure 15. Typical reverse recovery charge vs. diode current slope ( $V_R = 600V$ )

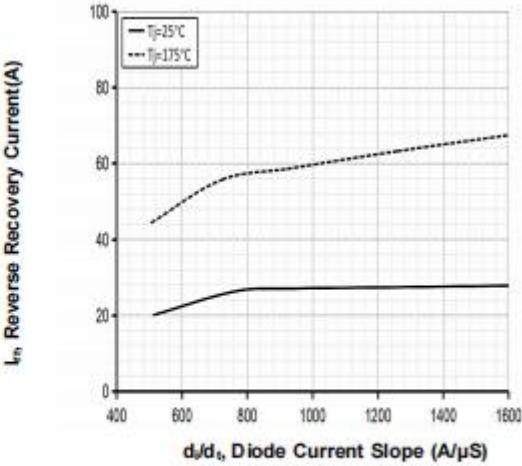
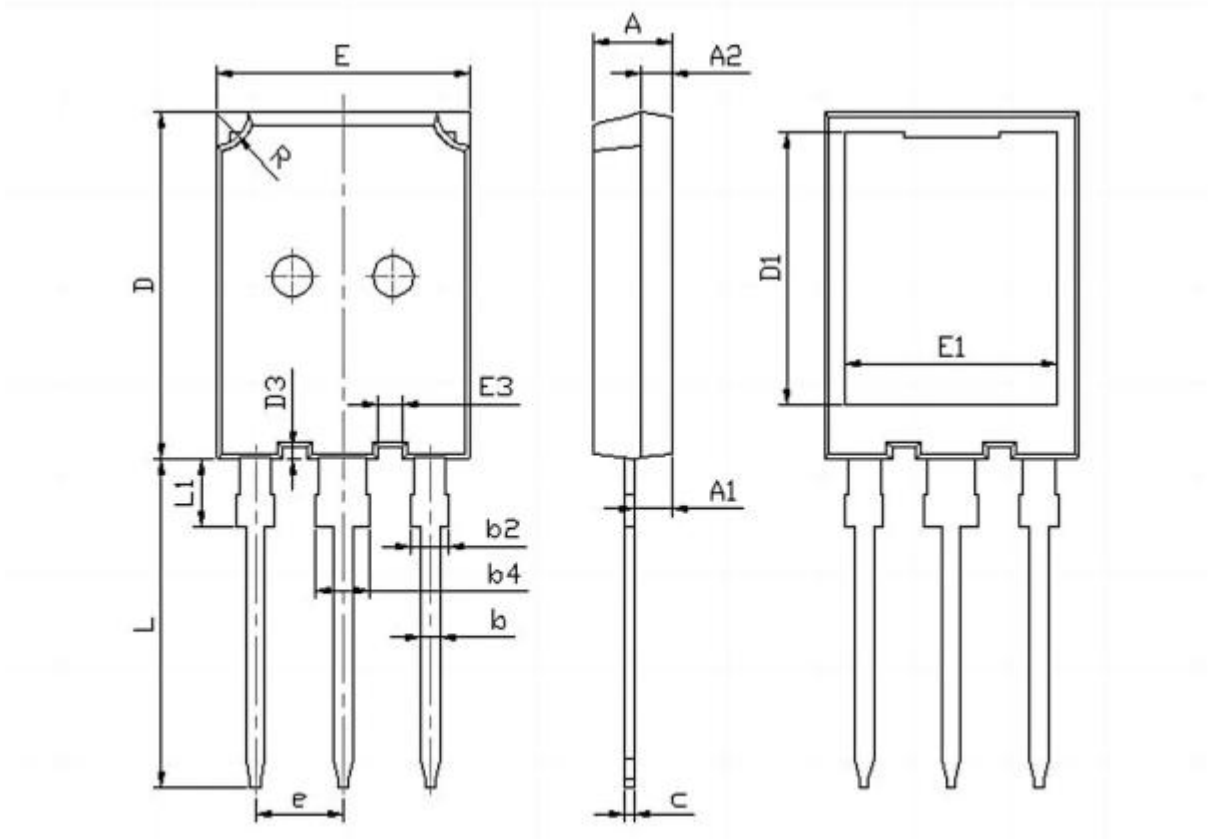


Figure 16. Typical reverse recovery current vs. diode current slope ( $V_R = 600V$ )

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				



HG