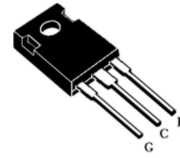


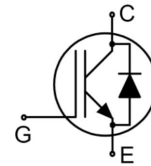
## Features

- Low gate charge
- FS Technology
- Saturation voltage:  $V_{CE(sat),typ} = 1.75V @ I_C=25A$  and  $T_C=25^\circ C$
- RoHS product



## Applications

- General purpose inverters
- Induction heating(IH)
- UPS



Order Codes	Marking	Package
MSG25T120FQC	MSG25T120FQC	TO-247

## Absolute Ratings (T<sub>c</sub>=25°C)

Parameter	Symbol	MSG25T120FQC	Unit
Collector-Emmitter Voltage	V <sub>ces</sub>	1200	V
Collector Current-continuous	I <sub>c</sub> T=25°C	50	A
		25	A
Collector Current-pulse(note 1)	I <sub>CM</sub>	60	A
Diode forward current @ T <sub>C</sub> = 100°C	I <sub>F</sub>	25	A
Gate-Emmitter Voltage	V <sub>GES</sub>	±20	V
Turn-off safe area	-	60	A
Power Dissipation	P <sub>D</sub> T <sub>C</sub> =25°C	350	W
Diode Forward Current	T <sub>C</sub> =100°C	25	A
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55~+150	°C
Maximum Lead Temperature for Soldering Purposes	T <sub>L</sub>	300	°C

Collector current limited by maximum junction temperature

## Thermal Characteristic

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
Off-Characteristics						



Collector-Emmitter Voltage	$BV_{CES}$	$I_C=500\mu A, V_{GE}=0V$	1200	-	-	V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{CES}/\Delta T_J$	$I_C=1mA$ , referenced to 25°C	-	0.6	-	V/°C
Zero Gate Voltage Collector Current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V, T_C=25^\circ C$	-	-	0.2	mA
		$T_C=100^\circ C$	-	-	2	mA
		$T_C=150^\circ C$	-	-	2.5	mA
Gate-body leakage current, forward	$I_{GESF}$	$V_{CE}=0V, V_{GE}=-20V$	-	-	-100	nA
<b>On-Characteristics</b>						
Gate-Emmitter Threshold Voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=600\mu A$	4.5	-	6.5	V
Collector-Emmitter saturation Voltage	$V_{CESAT}$	$V_{GE}=15V, I_C=25A$	-	1.75	2.5	V
		$T_C=25^\circ C$	-	2	-	
		$T_C=150^\circ C$	-	2.1	-	
Short Collector current (Note 2)	$I_C(sc)$	$V_{GE}=15V$ $V_{CE}=600V$ tsc< 10us $T_C=25^\circ C$	-	160	-	A
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{ies}$	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1.0MHZ$	-	1600	2400	pF
Output capacitance	$C_{oes}$		-	120	190	pF
Reverse transfer capacitance	$C_{res}$		-	80	130	pF
<b>Switching Characteristics</b>						
Turn-On delay time	$t_d(on)$	$V_{CE}=600V, I_C=25A,$ $R_G=10\Omega$ $T_C=25^\circ C$ Inductive Load	-	93	-	ns
Turn-On rise time	$t_r$		-	77	-	ns
Turn-off delay time	$t_d(off)$		-	216	-	ns
Turn-off Fall time	$t_f$		-	108	-	ns
Turn-on energy	$E_{on}$		-	2.8	-	mJ
Turn-off energy	$E_{off}$		-	1.0	-	mJ
Total switching Energy	$E_{total}$		-	3.8	-	mJ
Total Gate Charge	$Q_g$	$V_{CE}=600V, I_C=25A,$ $V_{GE}=15V$ (note3,4)	-	120	-	nC
<b>Anti-Paraller Diode Characteristics and Maximum Ratings</b>						
Diode Forward Voltage	$V_F$	$V_{GE}=0V, I_F=25A$	-	1.77	2.8	V

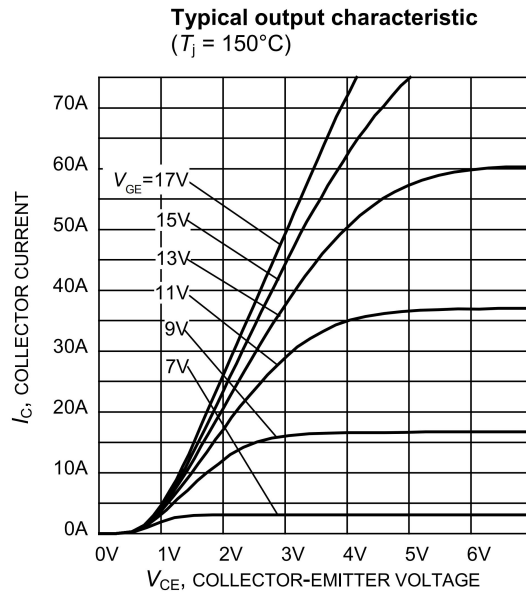
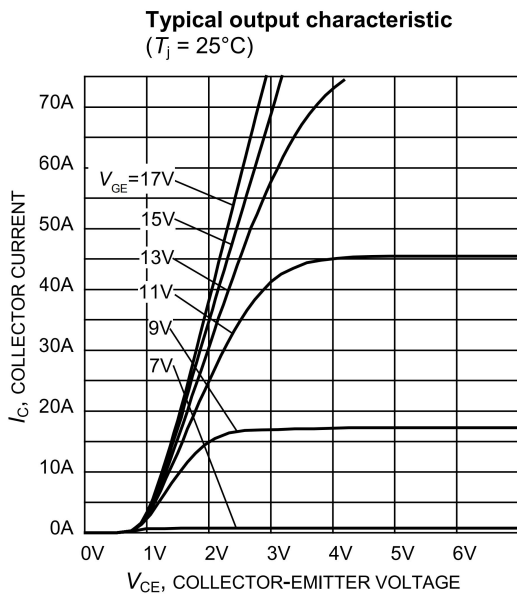


Diode Reverse recovery time	$t_{rr}$	VGE=0V, VR=800V IF=25A	-	236	-	ns
Reverse recovery charge	$Q_{rr}$	dl=dt=200/us (note 4)	-	1.3	-	uC
Parameter	Symbol	Max	Unit			
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.4	°C/W			
Thermal Resistance, Junction to Ambient	$R_{th(j-A)}$	40	°C/W			

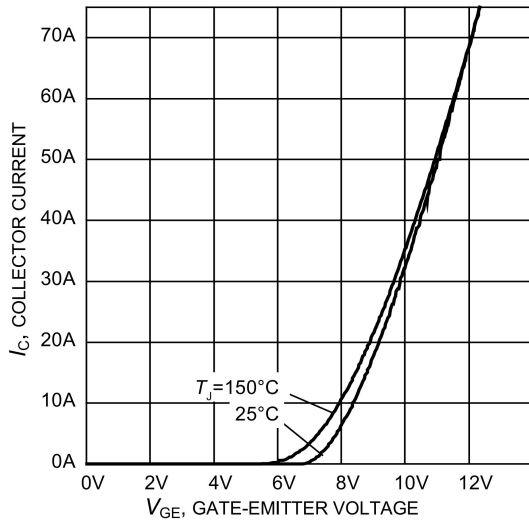
Notes:

- 1: Pulse width limited by maximum junction temperature
- 2: Allowed number of short circuits:<1000; time between short circuits:>1s.
- 3: Pulse Test: Pulse Width ≤300us, Duty Cycles2%
- 4: Essentially independent of operating temperature

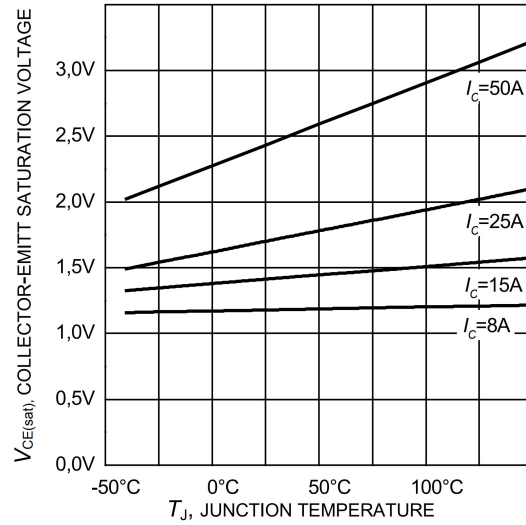
**Electrical Characteristics(curves)**



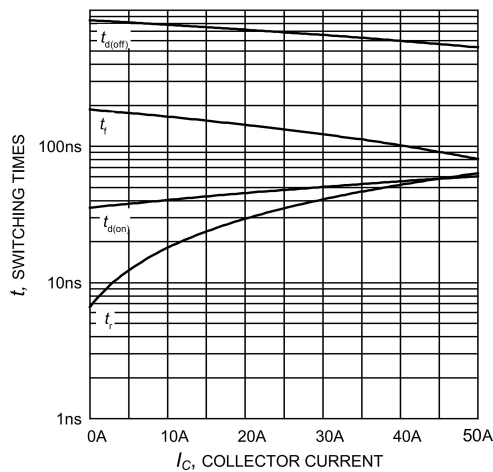
**Typical transfer characteristic**  
( $V_{CE}=20V$ )



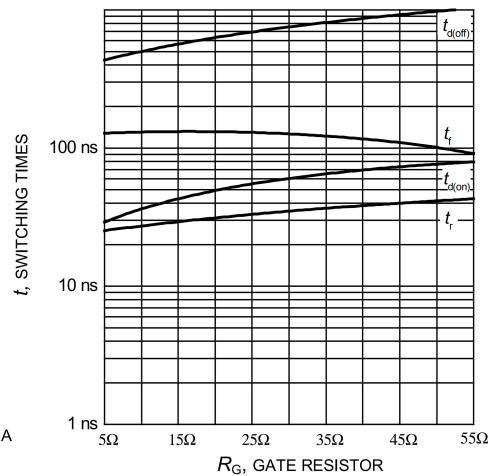
**Typical collector-emitter saturation voltage**  
as a function of junction temperature  
( $V_{GE} = 15V$ )



**Typical switching times as a function of gate resistor** (inductive load,  $T_J=150^\circ C$ ,  $V_{CE}=600V$ ,  $V_{GE}=0/15V$ ,  $R_G=22\Omega$ )

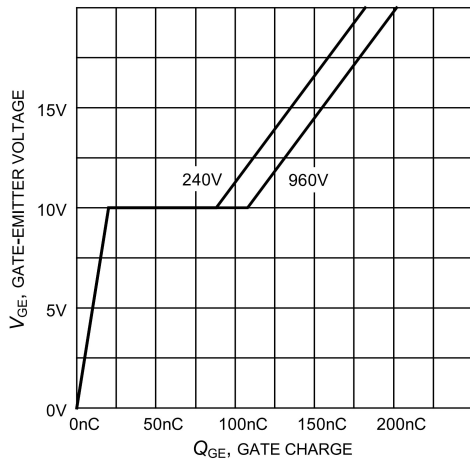


**Typical switching times as a function of gate resistor** (inductive load,  $T_J=150^\circ C$ ,  $V_{CE}=600V$ ,  $V_{GE}=0/15V$ ,  $I_C=25A$ )

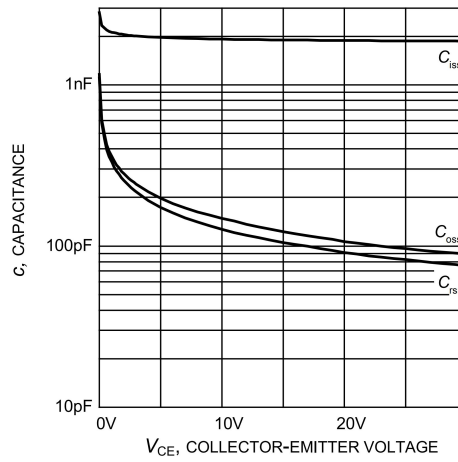




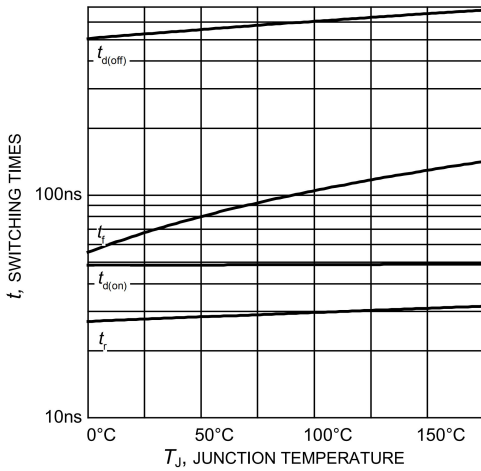
Typical gate charge ( $I_C=25\text{ A}$ )



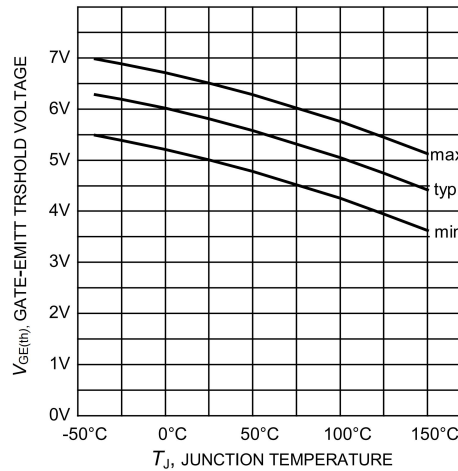
Typical capacitance as a function of collector-emitter voltage ( $V_{GE}=0\text{V}$ ,  $f=1\text{ MHz}$ )



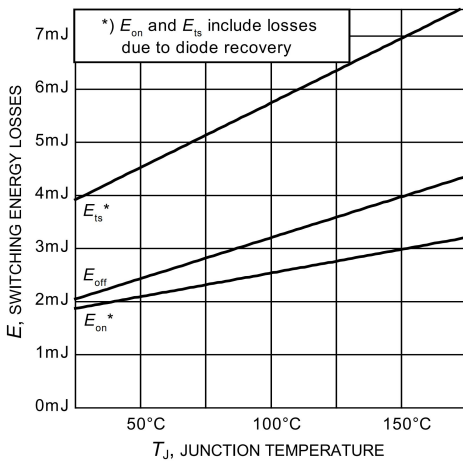
Typical switching times as a function of junction temperature (inductive load,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=25\text{A}$ ,  $R_G=22\Omega$ .)



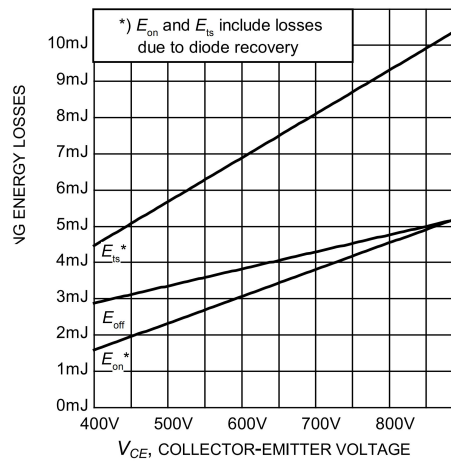
Gate-emitter threshold voltage as a function of junction temperature ( $I_C=1.0\text{mA}$ )



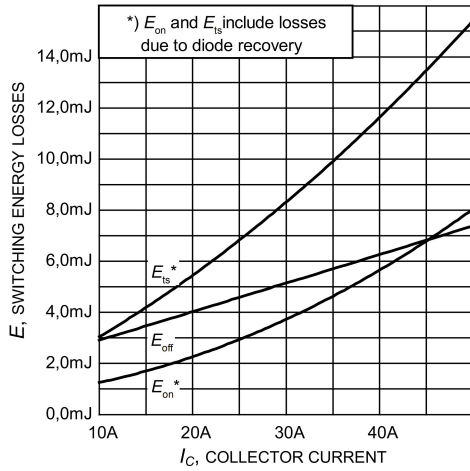
Typical switching energy losses as a function of junction temperature (inductive load,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=25\text{A}$ ,  $R_G=22\Omega$ )



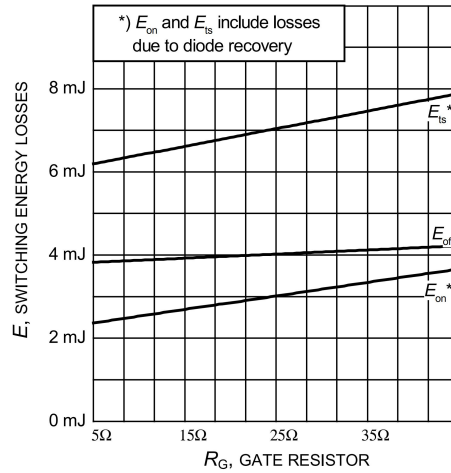
Typical switching energy losses as a function of collector emitter voltage (inductive load,  $V_{GE}=0/15\text{V}$ ,  $I_C=25\text{A}$ ,  $R_G=22\Omega$ ,  $T_J=150^\circ\text{C}$ .)



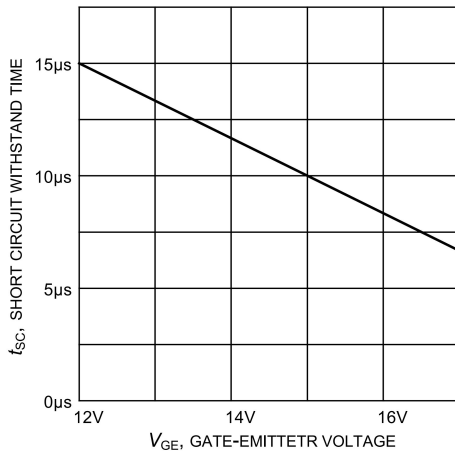
**Typical switching energy losses as a function of collector current** (inductive load,  $T_J=150^\circ\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $R_G=22\Omega$ .)



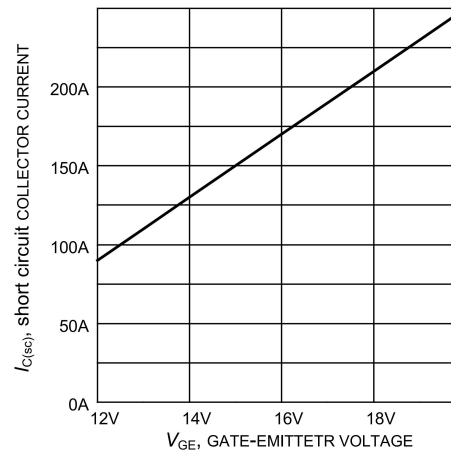
**Typical switching energy losses as a function of gate resistor** (inductive load,  $T_J=150^\circ\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=25\text{A}$ .)



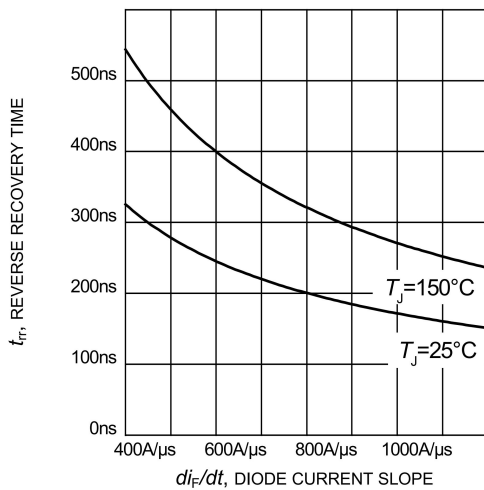
**Short circuit withstand time as a function of gate-emitter voltage** ( $V_{CE}=600\text{V}$ , start at  $T_J=25^\circ\text{C}$ )



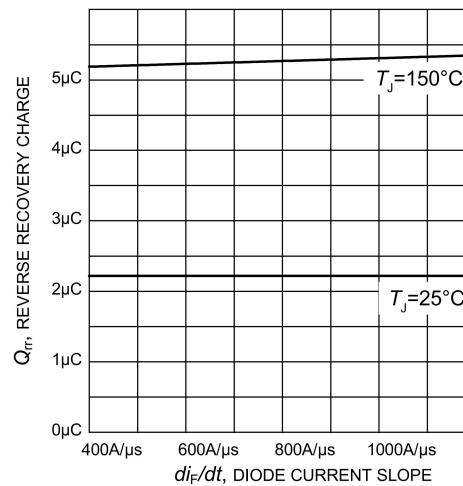
**Typical short circuit collector current as a function of gate-emitter voltage** ( $V_{CE} \leq 600\text{V}$ ,  $T_J \leq 150^\circ\text{C}$ )



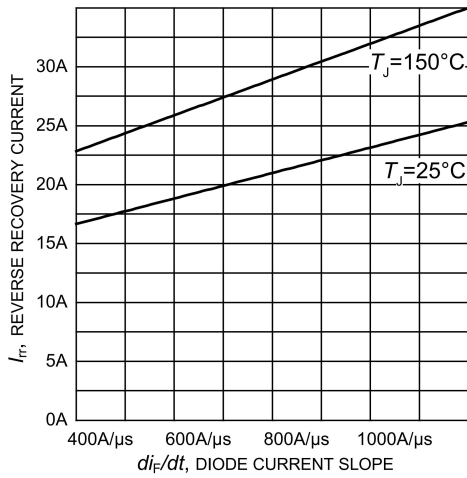
**Typical reverse recovery time as a function of diode current slope** ( $V_R=600\text{V}$ ,  $I_F=25\text{A}$ )



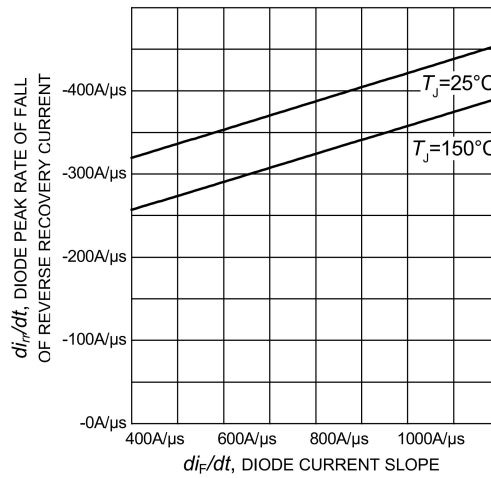
**Typical reverse recovery charge as a function of diode current slope** ( $V_R=600\text{V}$ ,  $I_F=25\text{A}$ )



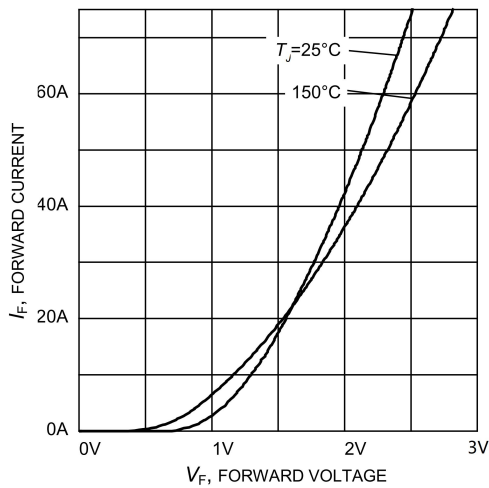
**Typical reverse recovery current as a function of diode current slope**  
 ( $V_R=600V, I_F=25A$ )



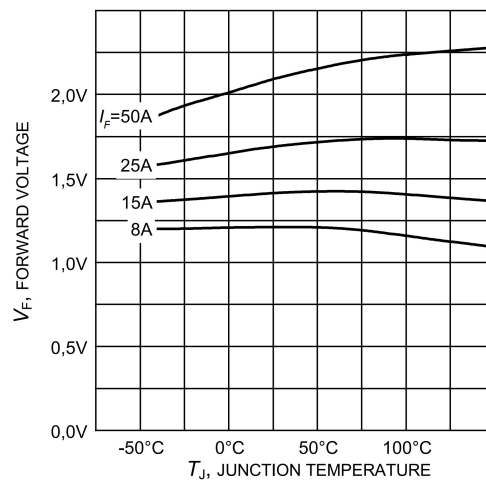
**Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**  
 ( $V_R=600V, I_F=25A$ )



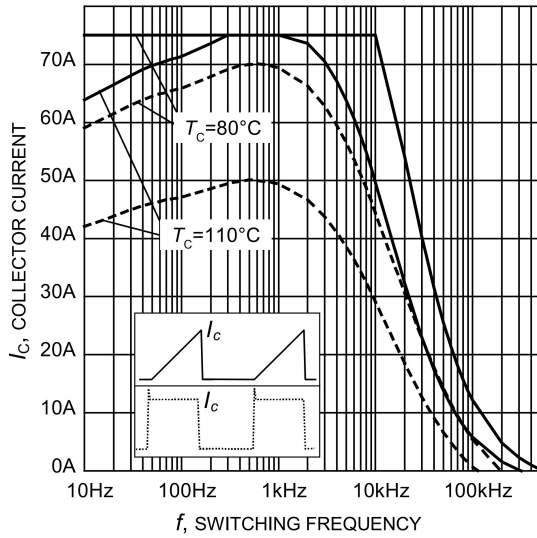
**Typical diode forward current as a function of forward voltage**



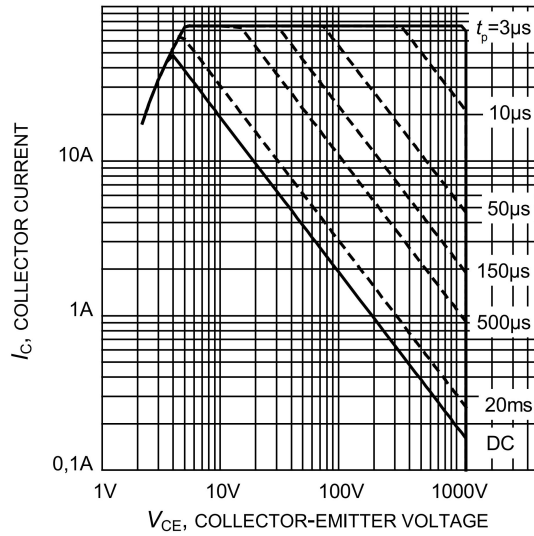
**Typical diode forward voltage as a function of junction temperature**



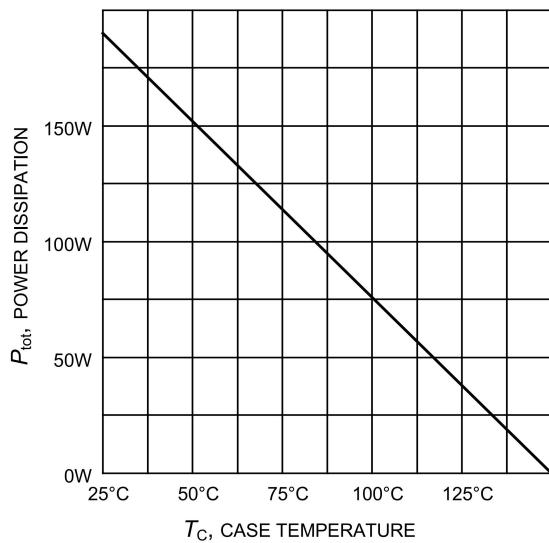
**Collector current as a function of switching frequency** ( $T_j \leq 150^\circ\text{C}$ ,  $D = 0.5$ ,  $V_{CE} = 600\text{V}$ ,  $V_{GE} = 0/+15\text{V}$ ,  $R_G = 22\Omega$ )



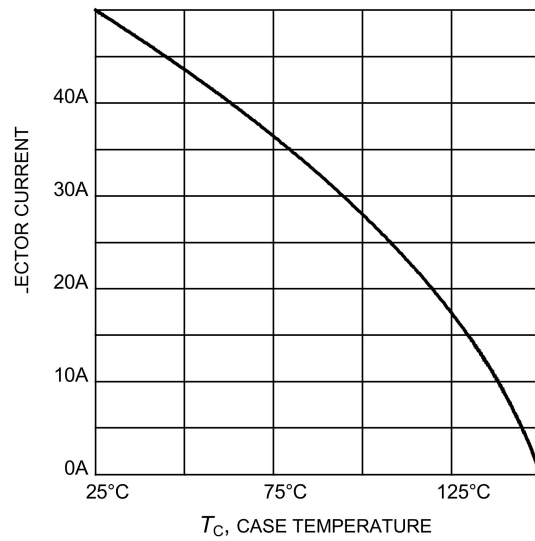
**Safe operating area** ( $D = 0$ ,  $T_C = 25^\circ\text{C}$ ,  $T_j \leq 150^\circ\text{C}$ ;  $V_{GE} = 15\text{V}$ )



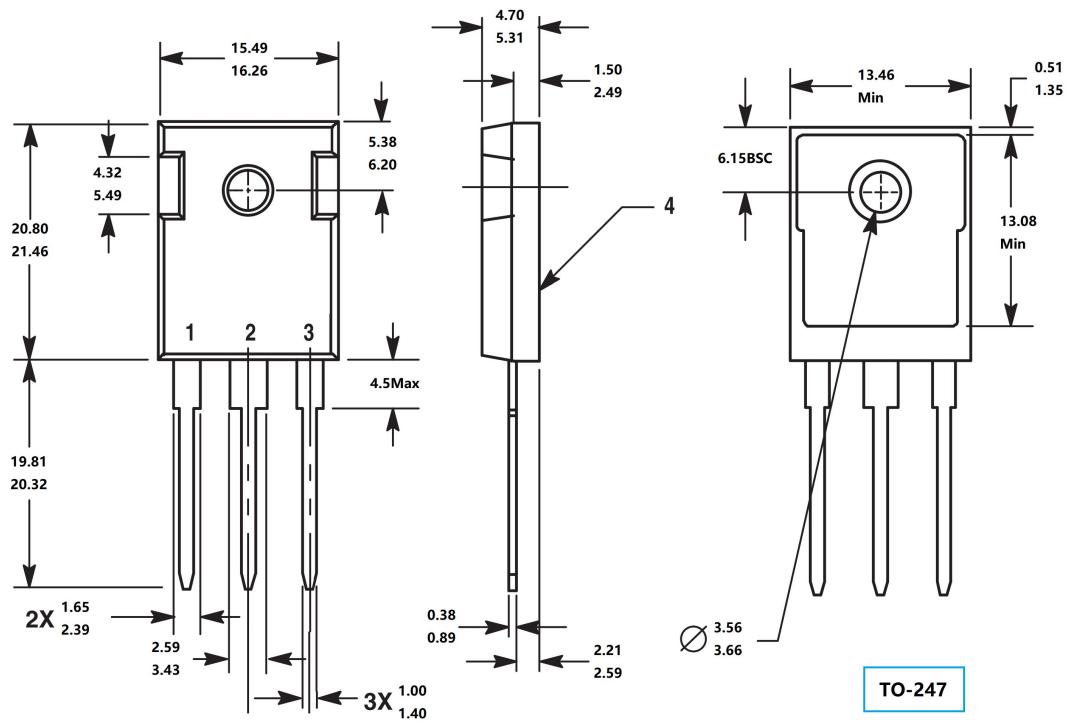
**Power dissipation as a function of case temperature** ( $T_j \leq 150^\circ\text{C}$ )



**Collector current as a function of case temperature** ( $V_{GE} \geq 15\text{V}$ ,  $T_j \leq 150^\circ\text{C}$ )



## Package Mechanical DATA



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