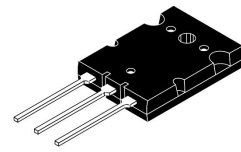
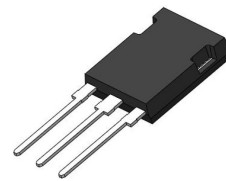


### Features

- High efficiency in hard switching  
And resonant topologies
- 10μsec short circuit withstand  
Time at  $T_{vj}=175^{\circ}\text{C}$
- Low Gate Charge QG
- Very soft,fast recovery full  
Current anti-parallel diode
- Maximum junction temperature  
 $T_{vjmax}=175^{\circ}\text{C}$



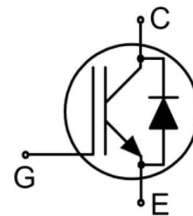
TO-264



TO-247plus

### Applications

- UPS
- Charger
- Energy Storage
- Three-level Solar String Inverter



### Absolute Ratings( $T_c=25^{\circ}\text{C}$ )

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{ce}$	1200	V
Collector Current-continuous	$I_c$ $T=25^{\circ}\text{C}$ $T=100^{\circ}\text{C}$	200	A
		100	A
Diode forward current	$I_{FT}=25^{\circ}\text{C}$ $T_c=100^{\circ}\text{C}$	200	A
		100	A
Collector Current-pulse (note 1)	$I_{CM}$	300	A
Gate-Emitter Voltage	$V_{GES}$	$\pm 20$	V
Power Dissipation (TO-264)	PD	625	W
Power Dissipation (TO-247Plus)		882	W
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55~+150	$^{\circ}\text{C}$
Diode Maximum Forward Current (Note 1)	$I_{FM}$	300	A
Short Circuit Withstand Time	$t_{sc}$	10	us
Maximum Lead Temperature for Soldering Purposes	$T_L$	260	$^{\circ}\text{C}$

**Electrical Characteristics**

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
<b>Off-Characteristics</b>						
Collector-Emitter Voltage	$BV_{CES}$	$I_C=0.5mA, V_{GE}=0V$	1200	-	-	V
Zero Gate Voltage Collector Current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V, T_C=25^\circ C$	-	-	450	$\mu A$
Gate-body leakage current, forward	$I_{GESF}$	$V_{CE}=0V, V_{GE}=20V$	-	-	100	nA
Gate-body leakage current, reverse	$I_{GESR}$	$V_{CE}=0V, V_{GE}=-20V$	-	-	-100	nA
Trans-conductance	$g_{fs}$	$V_{CE}=20V, I_C=100A$		26.0		S
<b>On-Characteristics</b>						
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=2.6mA$	5.1	5.8	6.5	V
Collector-Emitter saturation Voltage	$V_{CESAT}$	$V_{GE}=15V, I_C=100A$				V
		$T_C=25^\circ C$		2.00	2.35	V
		$T_C=175^\circ C$		2.50		V
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V, f=1.0MHZ$	-	4856	-	pF
Output capacitance	$C_{oes}$		-	505	-	pF
Reverse transfer capacitance	$C_{res}$		-	290	-	pF
Internal emitter inductance measured 5mm from case	$L_E$			13		nH

**Electrical Characteristics**

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V, I_C=100A, R_G=6\Omega, V_{GE}=15V, \text{ Inductive Load } T_C=25^\circ C$	-	34	-	ns
Turn-On rise time	$t_r$		-	47	-	ns
Turn-Off delay time	$t_{d(off)}$		-	282	-	ns
Turn-Off Fall time	$t_f$		-	29	-	ns
Turn-on Loss	$E_{on}$		-	6.40	-	mJ
Turn-off Loss	$E_{off}$		-	2.80	-	mJ
Total Loss	$E_{ts}$		-	9.20	-	mJ

Turn-on delay time	td(on)	V <sub>CC</sub> =600V, I <sub>c</sub> =100A, R <sub>G</sub> =6Ω, V <sub>GE</sub> =15V, Inductive Load T <sub>C</sub> =175°C	-	33	-	ns
Turn-On rise time	tr		-	48	-	ns
Turn-Off delay time	td(off)		-	388	-	ns
Turn-Off Fall time	t <sub>f</sub>		-	66	-	ns
Turn-on switching Loss	E <sub>on</sub>		-	10.20	-	mJ
Turn-off switching Loss	E <sub>off</sub>		-	6.00	-	mJ
Total switching Loss	E <sub>ts</sub>		-	16.20	-	mJ
Gate Charge	Q <sub>g</sub>	V <sub>CC</sub> =960V, I <sub>c</sub> =100A V <sub>GE</sub> =15V	-	370	-	nC
<b>Anti-Parallel Diode Characteristics and Maximum Ratings</b>						
Drain-Source Diode Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =100A(T <sub>J</sub> =25°C)	-	1.9	2.3	V
		T <sub>J</sub> =175°C		1.85		V
Diode Reverse recovery time	t <sub>rr</sub>	V <sub>CE</sub> =600V I <sub>F</sub> =100A di <sub>F</sub> =/dt=600A/us T <sub>J</sub> =25°C	-	370	-	ns
Diode Reverse recovery charge	Q <sub>rr</sub>		-	5.10	-	μC
Diode Reverse recovery Current	I <sub>R<sub>RM</sub></sub>		-	25	-	A
Diode Peak rate of fall of reverse recovery current during t <sub>b</sub>	di <sub>rr</sub> /dt			-170		A/μs
Diode Reverse recovery time	t <sub>rr</sub>	V <sub>CE</sub> =600V I <sub>F</sub> =100A di <sub>F</sub> =/dt=600A/us T <sub>J</sub> =175°C	-	640	-	ns
Reverse recovery charge	Q <sub>rr</sub>		-	12.30	-	μC
Diode Reverse recovery Current	I <sub>R<sub>RM</sub></sub>		-	34	-	A
Diode Peak rate of fall of reverse recovery current during t <sub>b</sub>	di <sub>rr</sub> /dt			-100		A/μs

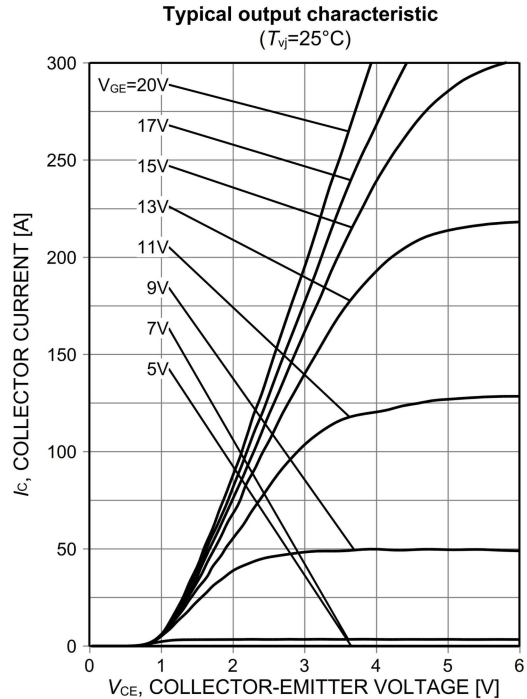
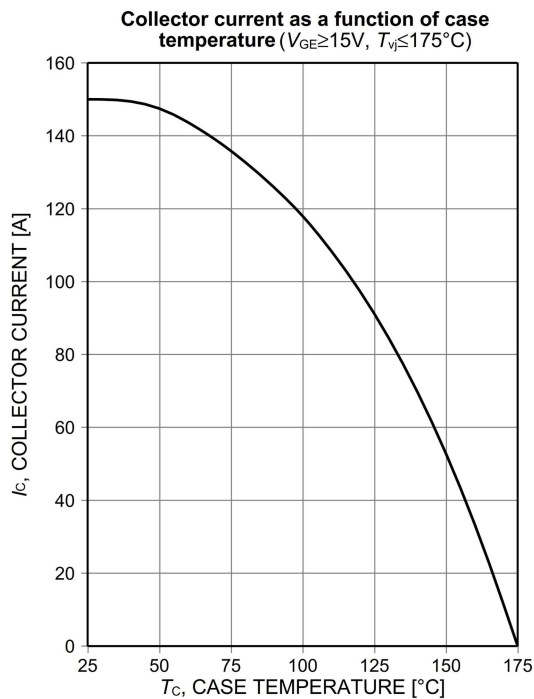
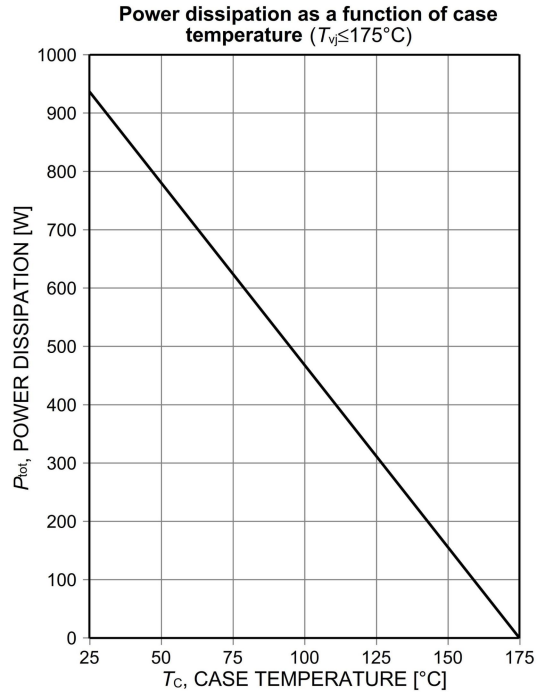
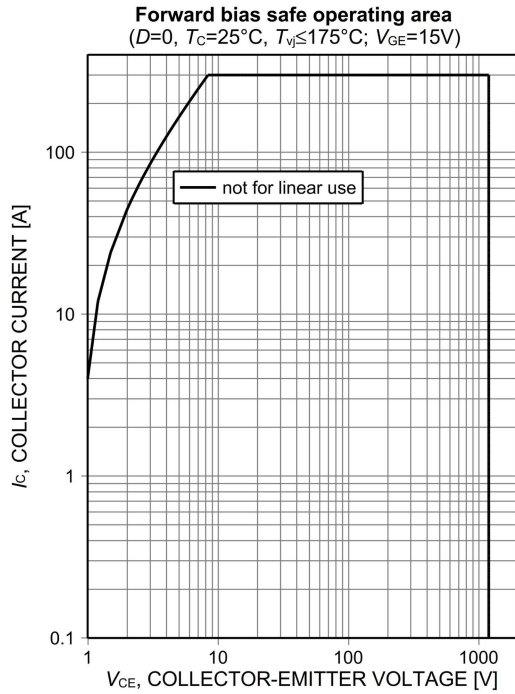
## Thermal Characteristic

Parameter	Symbol	Max	Unit
Thermal Resistance, Junction to Case (IGBT)	R <sub>th(j-c)</sub>	0.2	°C/W
Thermal Resistance, Junction to Case (Diode)	R <sub>th(j-c)</sub>	0.4	°C/W
Thermal Resistance, Junction to Ambient	R <sub>th(j-A)</sub>	25	°C/W

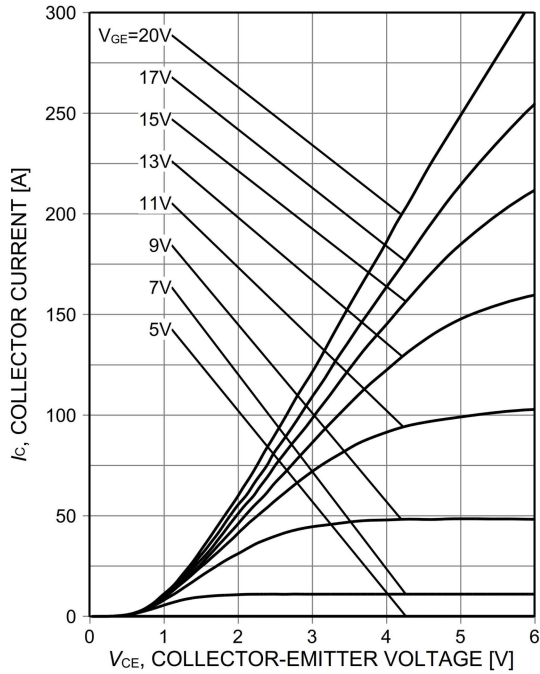
### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature

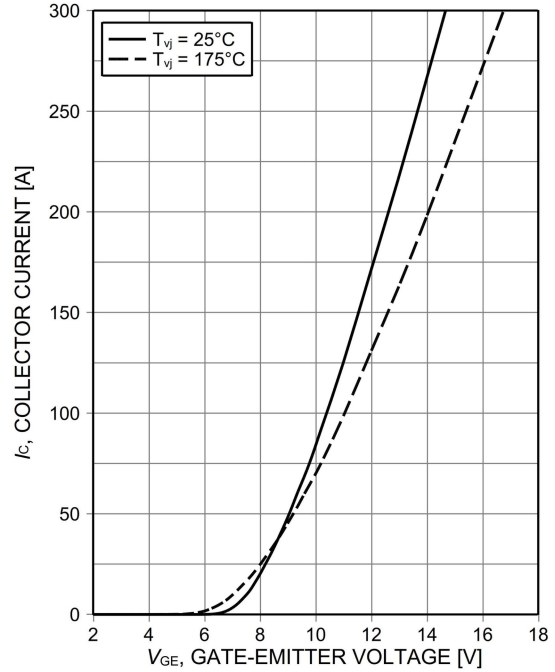
### Electrical Characteristics(curves)



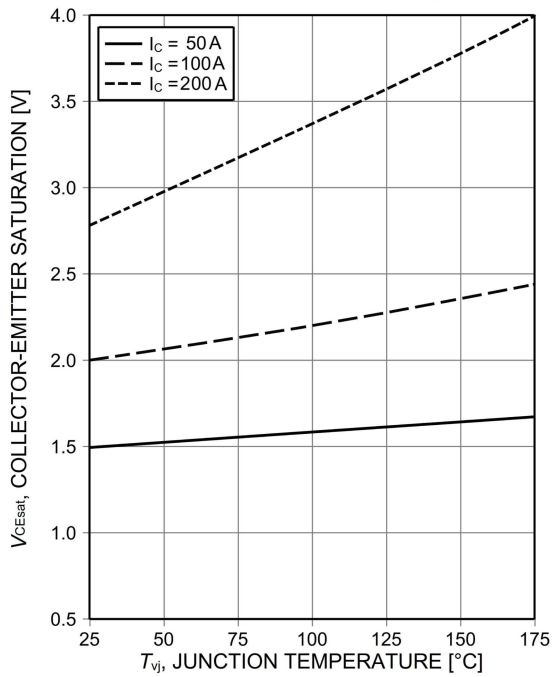
**Typical output characteristic**  
( $T_{vj}=175^{\circ}\text{C}$ )



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

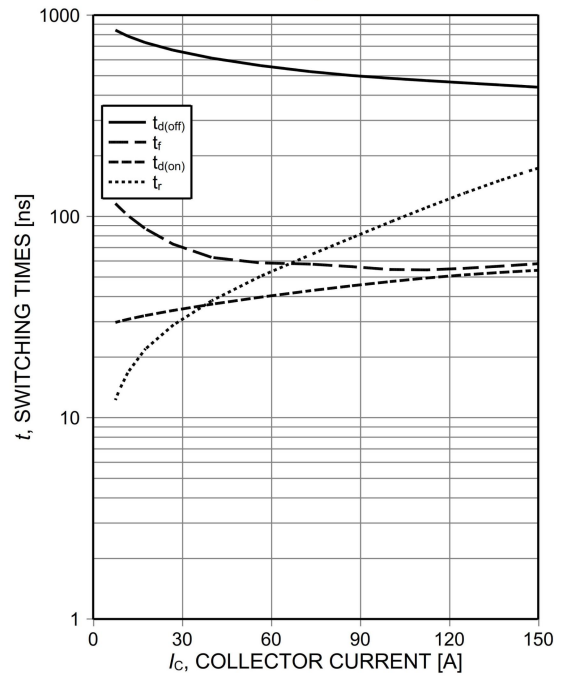


**Typical collector-emitter saturation voltage as a function of junction temperature**  
( $V_{GE}=15\text{V}$ )

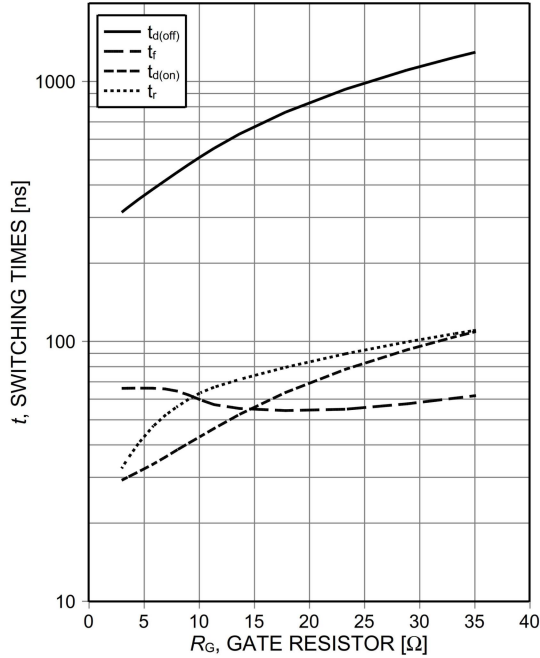


**Typical switching times as a function of collector current**

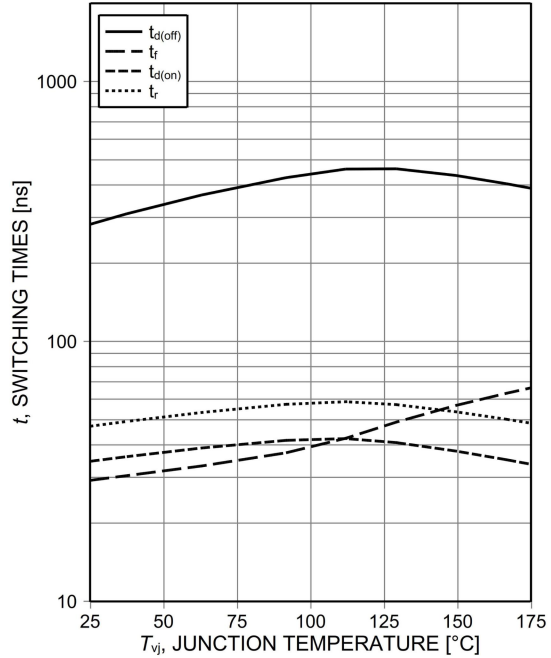
(inductive load,  $T_{vj}=175^{\circ}\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $R_G=6\Omega$ , Dynamic test circuit in)



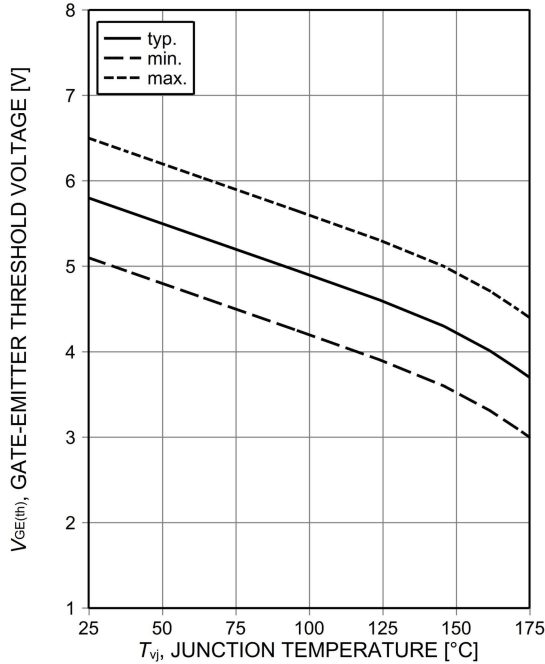
**Typical switching times as a function of gate resistor**  
 (inductive load,  $T_{vj}=175^{\circ}\text{C}$ ,  $V_{CE}=600\text{V}$ ,  
 $V_{GE}=0/15\text{V}$ ,  $I_C=100\text{A}$ , Dynamic test circuit in )



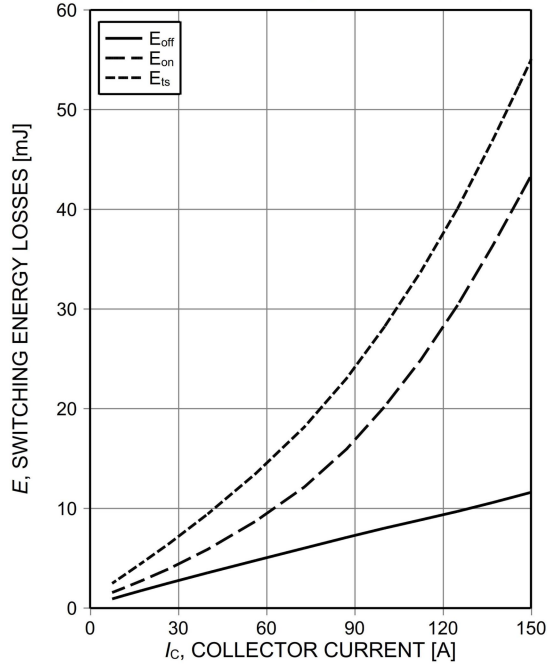
**Typical switching times as a function of junction temperature**  
 (inductive load,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  
 $I_C=100\text{A}$ ,  $R_G=6\Omega$ , Dynamic test circuit in)



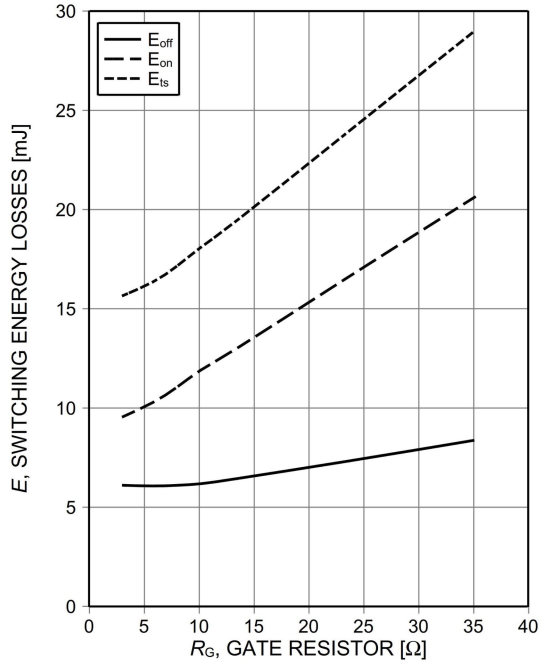
**Gate-emitter threshold voltage as a function of junction temperature**  
 ( $I_C=2.6\text{ mA}$ )



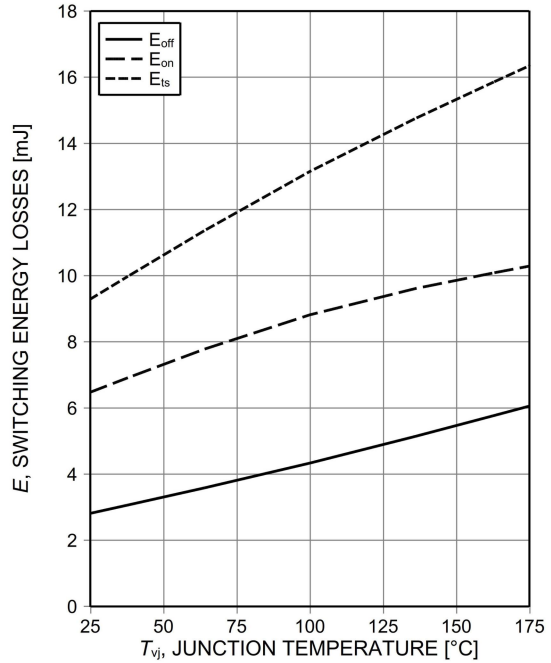
**Typical switching energy losses as a function of collector current**  
 (inductive load,  $T_{vj}=175^{\circ}\text{C}$ ,  $V_{CE}=600\text{V}$ ,  
 $V_{GE}=0/15\text{V}$ ,  $R_G=6\Omega$ , Dynamic test circuit in)



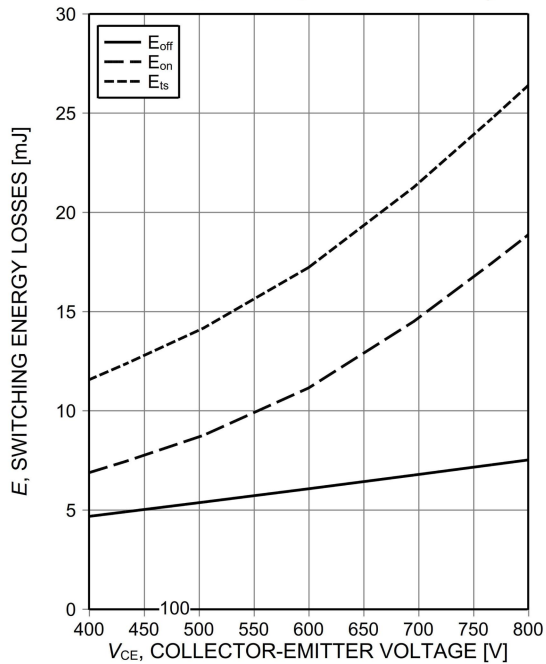
**Typical switching energy losses as a function of gate resistor**  
 (inductive load,  $T_{vj}=175^{\circ}\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=100\text{A}$ , Dynamic test circuit in)



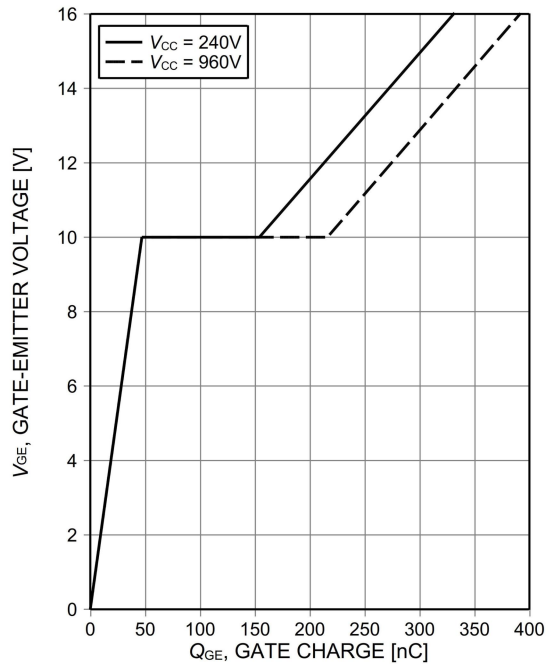
**Typical switching energy losses as a function of junction temperature**  
 (inductive load,  $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=100\text{A}$ ,  $R_G=6\Omega$ , Dynamic test circuit in)



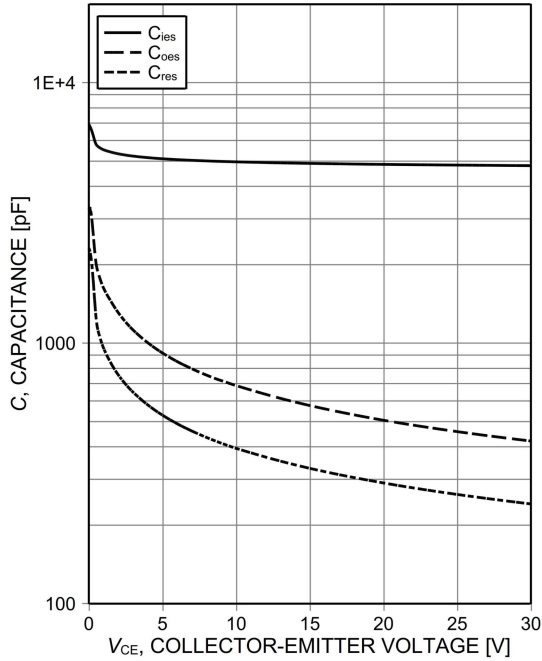
**Typical switching energy losses as a function of collector emitter voltage**  
 (inductive load,  $T_{vj}=175^{\circ}\text{C}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=100\text{A}$ ,  $R_G=6\Omega$ , Dynamic test circuit in)



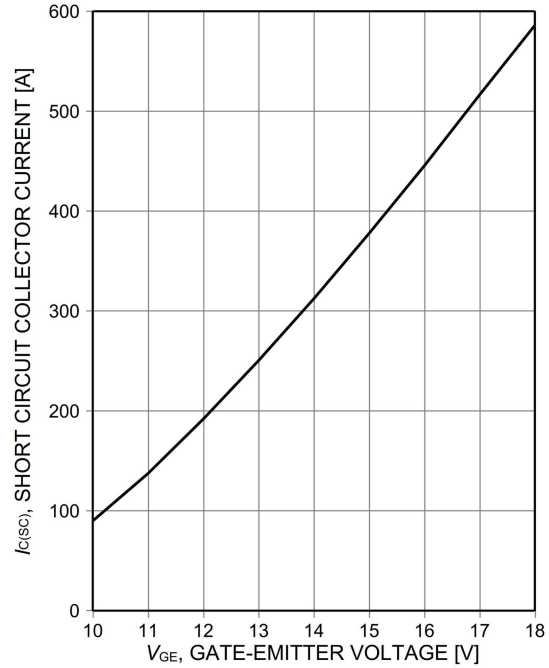
**Typical gate charge (I<sub>C</sub>=100A)**



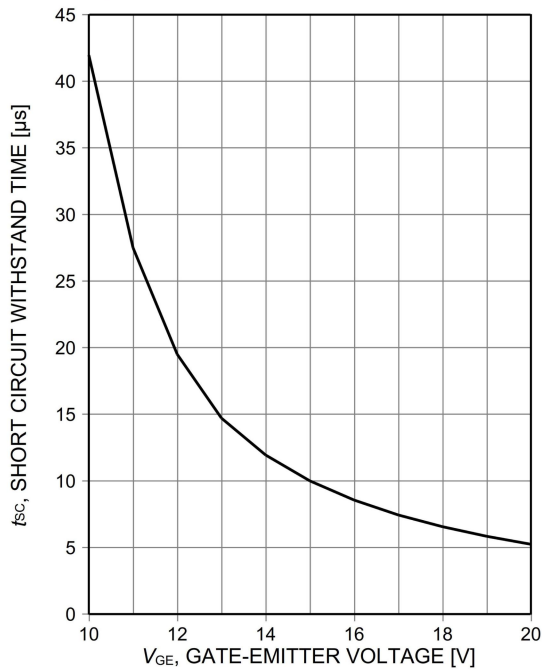
**Typical capacitance as a function of collector-emitter voltage**  
( $V_{GE}=0V$ ,  $f=1MHz$ )



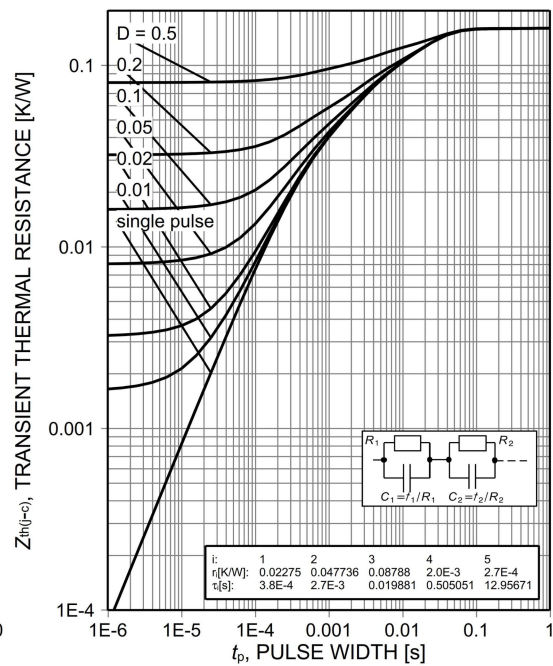
**Typical short circuit collector current as a function of gate-emitter voltage**  
( $V_{CE}\leq 600V$ ,  $T_{vj}\leq 175^\circ C$ )



**Short circuit withstand time as a function of gate-emitter voltage**  
( $V_{CE}\leq 600V$ , start at  $T_{vj}\leq 175^\circ C$ )

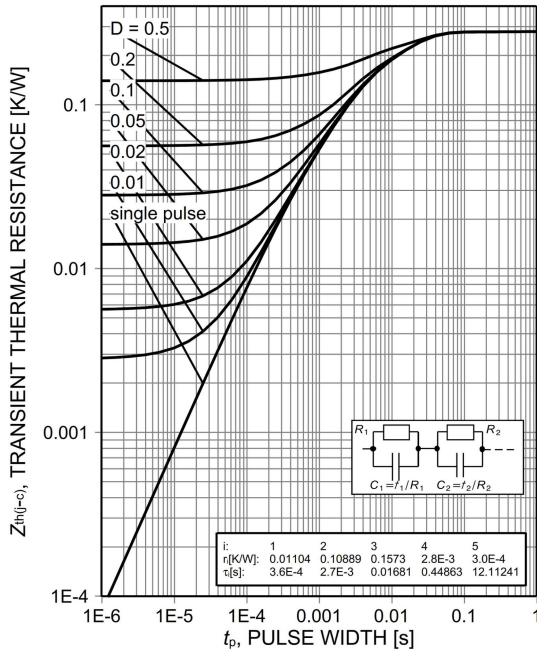


**IGBT transient thermal resistance**  
( $D=t_p/T$ )

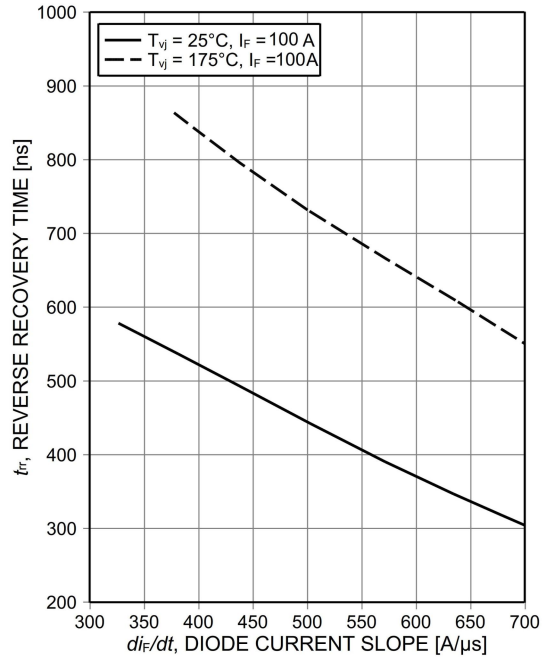




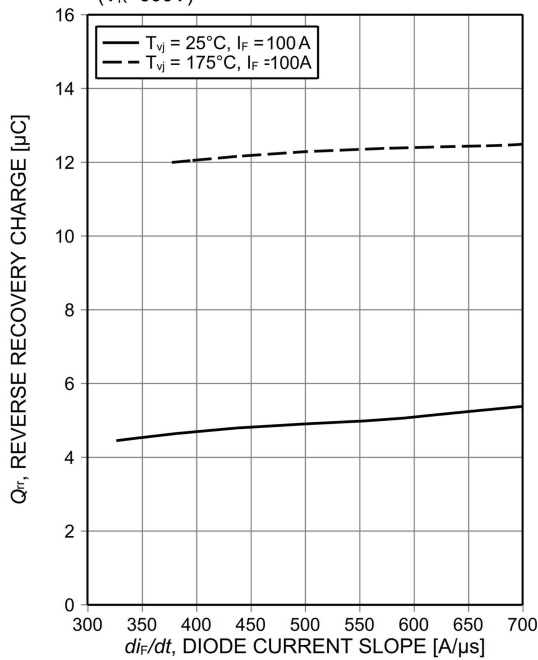
**Diode transient thermal impedance as a function of pulse width**  
( $D=t_p/T$ )



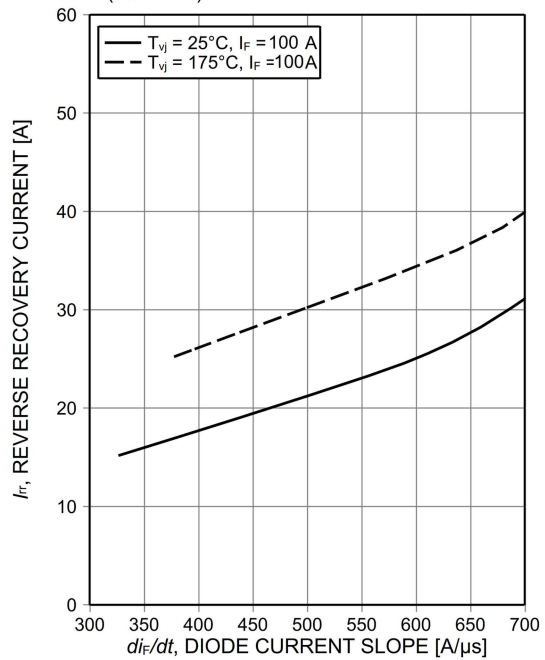
**Typical reverse recovery time as a function of diode current slope**  
( $V_R=600V$ )



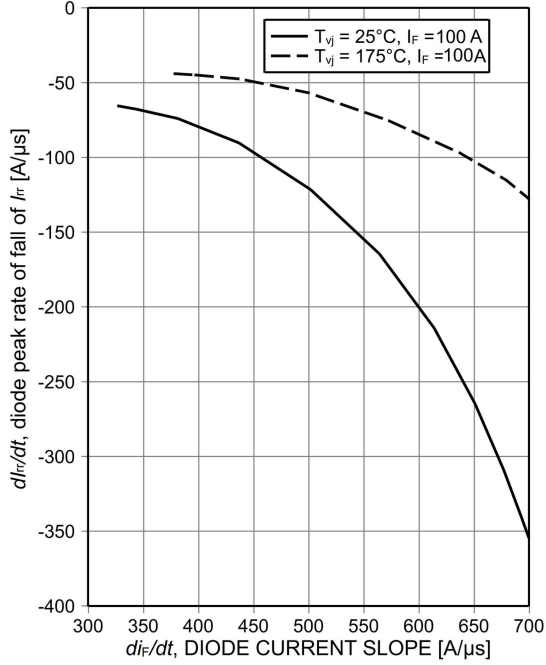
**Typical reverse recovery charge as a function of diode current slope**  
( $V_R=600V$ )



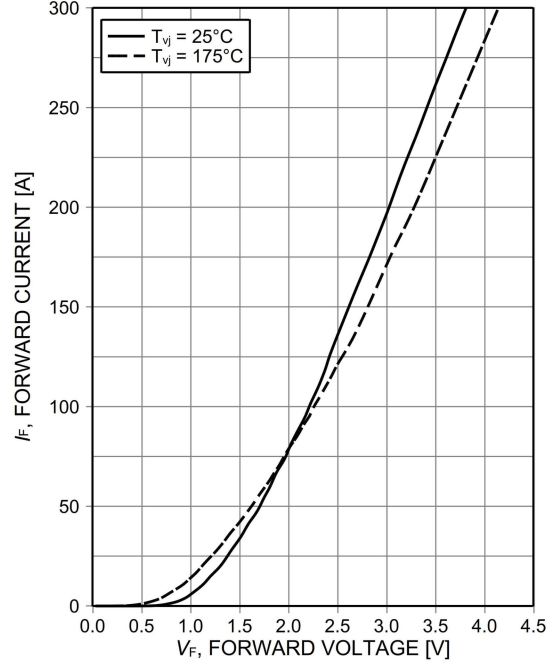
**Typical reverse recovery current as a function of diode current slope**  
( $V_R=600V$ )



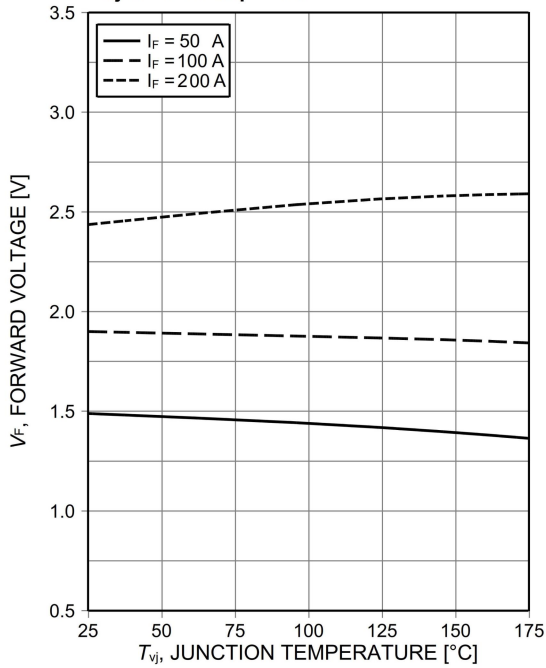
**Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**  
( $V_R=600V$ )



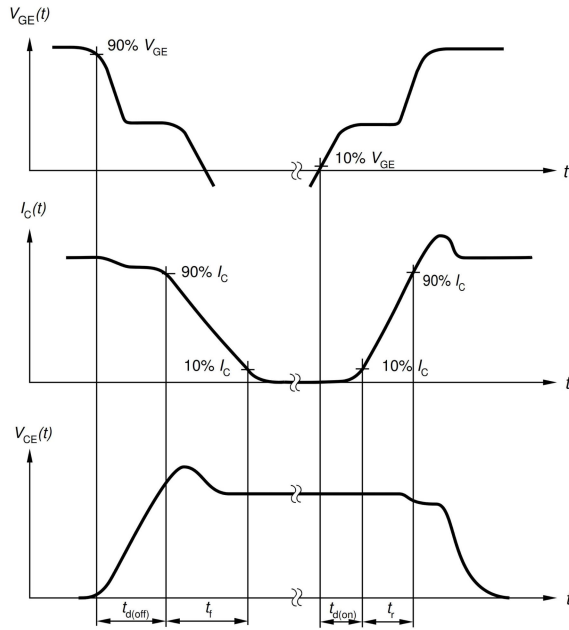
**Typical diode forward current as a function of forward voltage**



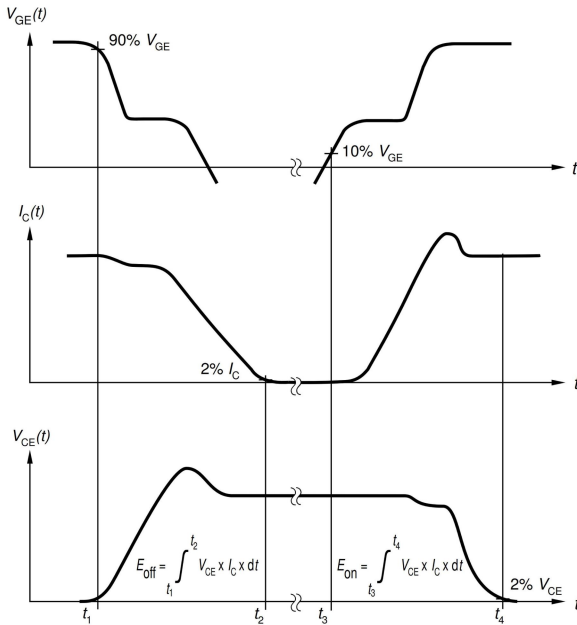
**Typical diode forward voltage as a function of junction temperature**



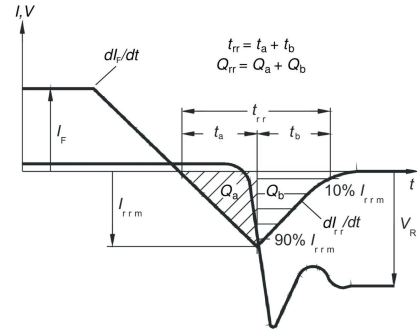
### Testing Conditions



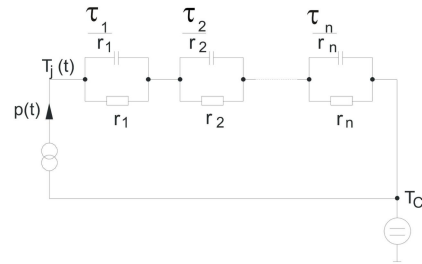
Definition of switching times



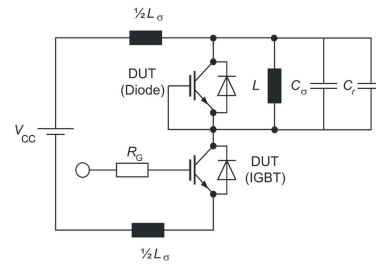
Definition of switching losses



Definition of diode switching characteristics



Thermal equivalent circuit



Dynamic test circuit  
Parasitic inductance  $L_{\sigma}$ ,  
parasitic capacitor  $C_{\sigma}$ ,  
relief capacitor  $C_r$ ,  
(only for ZVT switching)

### Package Mechanical DATA

