

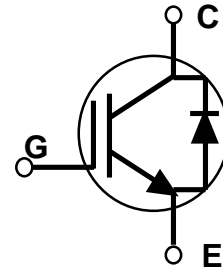
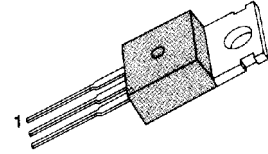
## FEATURES

- \* Short Circuit rated 10 $\mu$ s @T<sub>C</sub>=100°C
- \* High Speed Switching
- \* Low Saturation Voltage  
: V<sub>CE(sat)</sub> = 2.0 V @ I<sub>C</sub>=5A
- \* High Input Impedance
- \* CO-PAK, IGBT with FRD  
: T<sub>rr</sub> = 37ns (Typ.)

## APPLICATIONS

- \* AC & DC Motor controls
- \* General Purpose Inverters
- \* Robotics , Servo Controls
- \* Power Supply
- \* Lamp Ballast

TO-220



## ABSOLUTE MAXIMUM RATINGS

Symbol	Characteristics	Rating	Units
V <sub>CES</sub>	Collector-Emitter Voltage	600	V
V <sub>GES</sub>	Gate-Emitter Voltage	±20	V
I <sub>C</sub>	Collector Current @ T <sub>C</sub> = 25°C	8	A
	Collector Current @ T <sub>C</sub> = 100°C	5	A
I <sub>CM(1)</sub>	Pulsed Collector Current	15	A
I <sub>F</sub>	Diode Continuous Forward Current @ T <sub>C</sub> = 100°C	8	A
I <sub>FM</sub>	Diode Maximum Forward Current	56	A
P <sub>D</sub>	Maximum Power Dissipation @T <sub>C</sub> = 25°C	60	W
	Maximum Power Dissipation @T <sub>C</sub> = 100°C	25	W
T <sub>SC</sub>	Short Circuit Withstand Time	10	μs
T <sub>J</sub>	Operating Junction Temperature	-55 ~ 150	°C
T <sub>STG</sub>	Storage Temperature Range	-55 ~ 150	°C
T <sub>L</sub>	Maximum Lead Temp. For Soldering	300	°C
	Purposes, 1/8" from case for 5 seconds		

**Notes:** (1) Repetitive rating : Pulse width limited by max. junction temperature

## ELECTRICAL CHARACTERISTICS (IGBT PART)

(T<sub>C</sub>=25°C, Unless Otherwise Specified)

Symbol	Characteristics	Test Conditions	Min	Typ	Max	Units
BV <sub>CES</sub>	C - E Breakdown Voltage	V <sub>GE</sub> = 0V , I <sub>C</sub> = 250μA	600	-	-	V
ΔV <sub>CES</sub> / ΔT <sub>J</sub>	Temperature Coeff. of Breakdown Voltage	V <sub>GE</sub> = 0V , I <sub>C</sub> = 1mA	-	0.6	-	V/°C
V <sub>GE(th)</sub>	G - E threshold voltage	I <sub>C</sub> = 5mA , V <sub>CE</sub> = V <sub>GE</sub>	5.0	6.0	8.0	V
I <sub>CES</sub>	Collector cutoff Current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	-	-	250	μA
I <sub>GES</sub>	G - E leakage Current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V	-	-	100	nA
V <sub>CE(sat)</sub>	Collector to Emitter saturation voltage	I <sub>C</sub> =5A, V <sub>GE</sub> = 15V	-	2.0	2.7	V
		I <sub>C</sub> =8A, V <sub>GE</sub> = 15V	-	2.5	-	V
Cies	Input capacitance	V <sub>GE</sub> = 0V , f = 1MHz V <sub>CE</sub> = 30V	-	337	-	pF
Co <sub>es</sub>	Output capacitance		-	60	-	pF
Cr <sub>es</sub>	Reverse transfer capacitance		-	13	-	pF
td(on)	Turn on delay time	V <sub>CC</sub> = 300V , I <sub>C</sub> = 5A V <sub>GE</sub> = 15V R <sub>G</sub> = 40Ω Inductive Load	-	9	-	ns
tr	Turn on rise time		-	18	-	ns
td(off)	Turn off delay time		-	46	75	ns
tf	Turn off fall time		-	140	280	ns
E <sub>on</sub>	Turn on Switching Loss		-	80	-	μJ
E <sub>off</sub>	Turn off Switching Loss		-	100	-	μJ
E <sub>ts</sub>	Total Switching Loss		-	180	270	μJ
T <sub>sc</sub>	Short Circuit withstand Time	V <sub>CC</sub> = 300V, V <sub>GE</sub> = 15V @T <sub>C</sub> = 100°C	10	-	-	μs
Q <sub>g</sub>	Total Gate Charge	V <sub>CC</sub> = 300V V <sub>GE</sub> = 15V I <sub>C</sub> = 5A	-	24	36	nC
Q <sub>ge</sub>	Gate-Emitter Charge		-	7	10	nC
Q <sub>gc</sub>	Gate-Collector Charge		-	8	12	nC

## ELECTRICAL CHARACTERISTICS (DIODE PART)

(T<sub>C</sub>=25°C, Unless Otherwise Specified)

Symbol	Characteristics	Test Conditions		Min	Typ	Max	Units
V <sub>FM</sub>	Diode Forward Voltage	I <sub>F</sub> =8.0A	T <sub>C</sub> =25°C	-	1.4	1.7	V
			T <sub>C</sub> =100°C	-	1.3	-	
T <sub>rr</sub>	Diode Reverse		T <sub>C</sub> =25°C	-	37	55	ns
	Recovery Time		T <sub>C</sub> =100°C	-	55	-	
I <sub>rr</sub>	Diode Peak Reverse	I <sub>F</sub> =8.0A, V <sub>R</sub> =200V -di/dt=200A/μs	T <sub>C</sub> =25°C	-	3.5	5.0	A
	Recovery Current		T <sub>C</sub> =100°C	-	4.5	-	
Q <sub>rr</sub>	Diode Reverse		T <sub>C</sub> =25°C	-	65	138	nC
	Recovery Charge		T <sub>C</sub> =100°C	-	124	-	

## THERMAL RESISTANCE

Symbol	Characteristics	Min	Typ	Max	Units
R <sub>θJC</sub>	Junction-to-Case (IGBT)	-	-	2.0	°C/W
R <sub>θJC</sub>	Junction-to-Case (DIODE)	-	-	3.5	°C/W
R <sub>θJA</sub>	Junction-to-Ambient	-	-	80	°C/W
R <sub>θCS</sub>	Case-to-Sink	-	0.5	-	°C/W

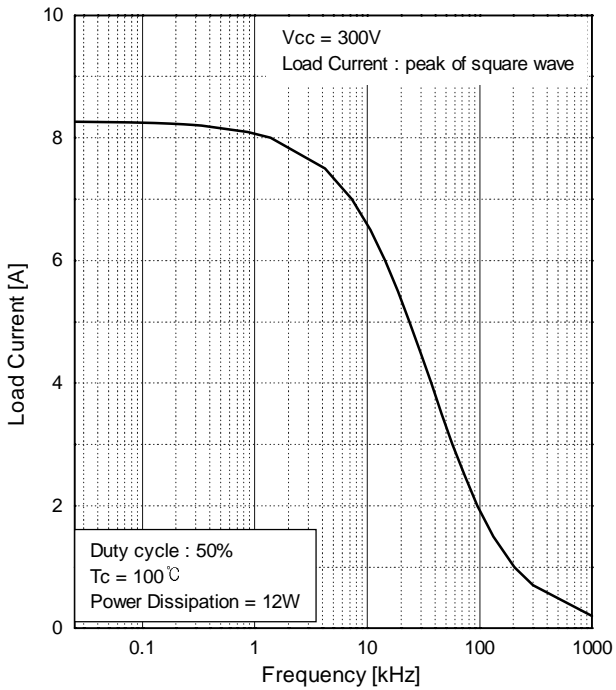


Fig.1 Typical Load Current vs. Frequency

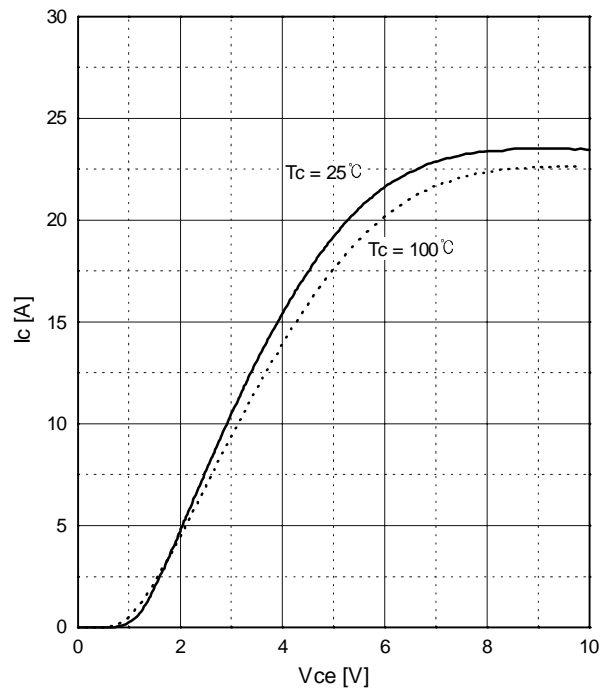


Fig.2 Typical Output Characteristics

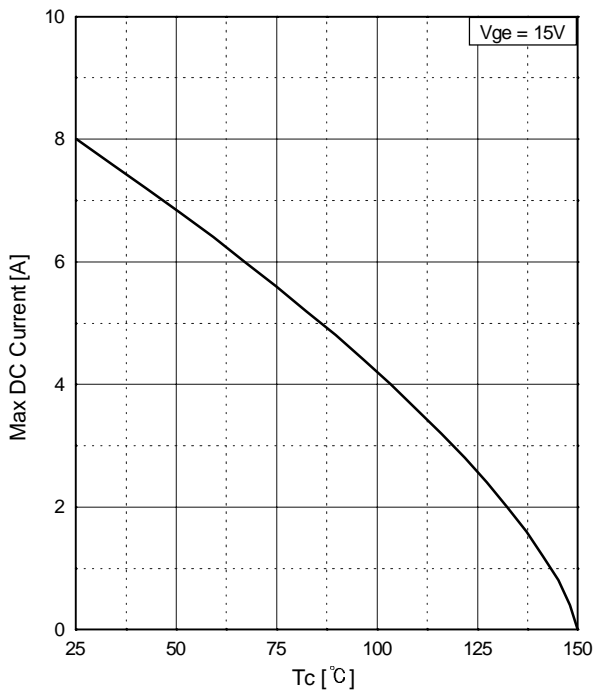


Fig.3 Maximum Collector Current vs. Case Temperature

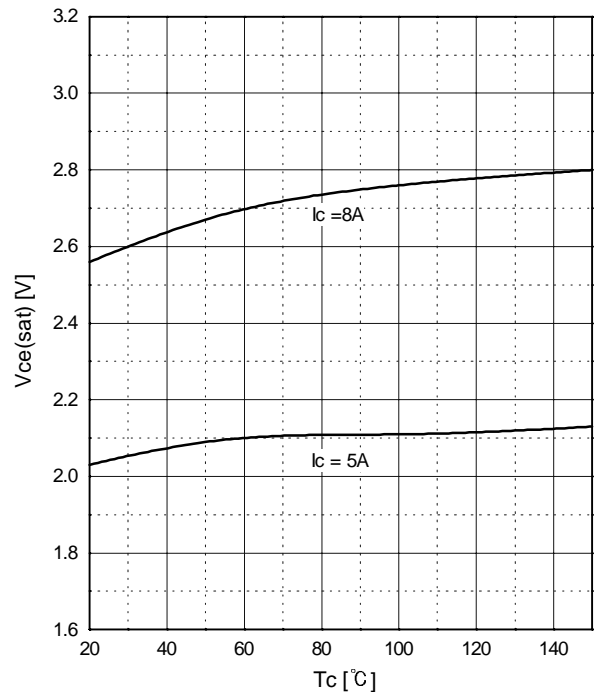


Fig.4 Collector to Emitter Voltage vs. Case Temperature

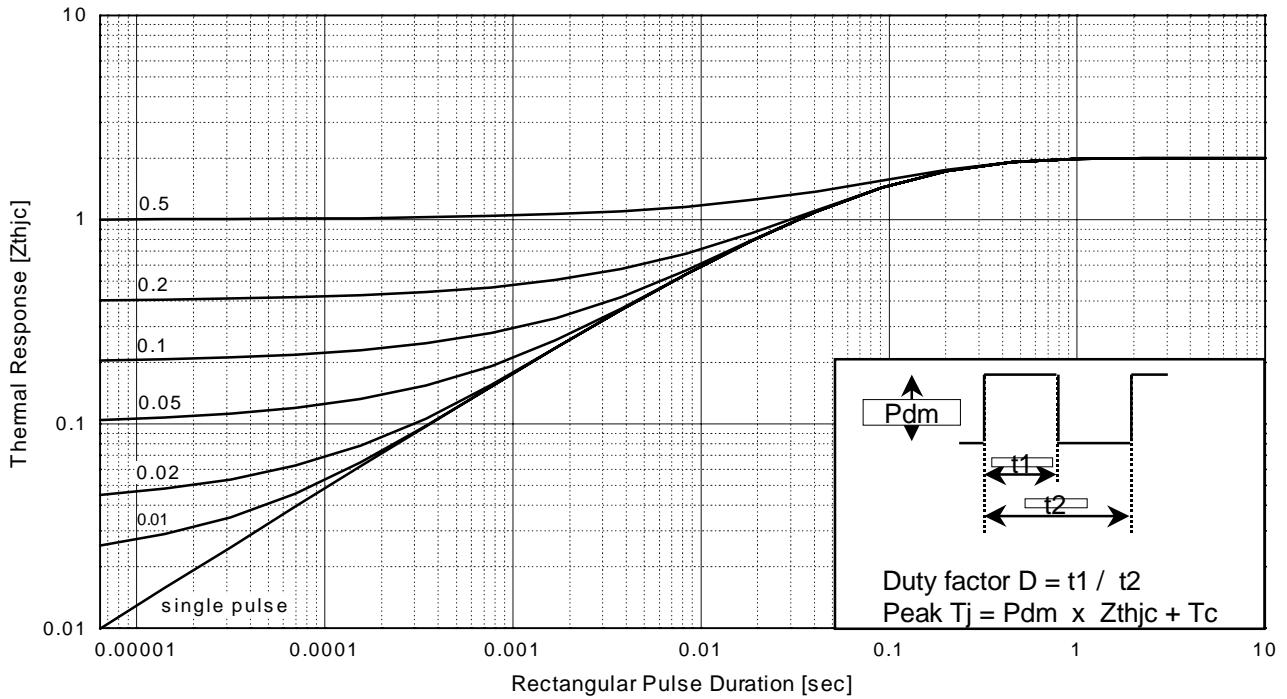


Fig.5 Maximum Effective Transient Thermal Impedance, Junction to Case

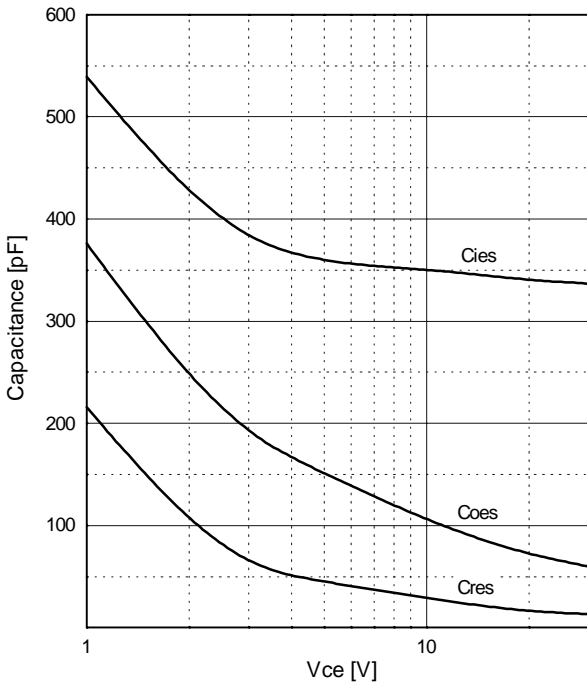


Fig.6 Typical Capacitance vs. Collector to Emitter Voltage

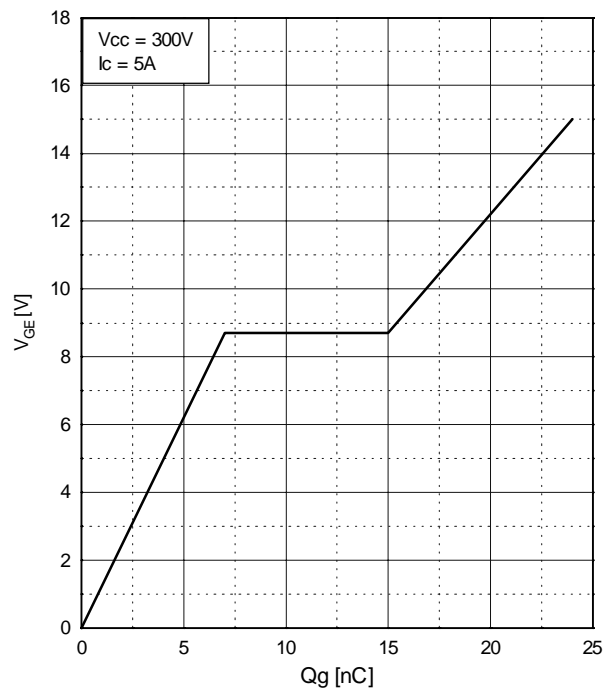


Fig.7 Typical Gate Charge vs. Gate to Emitter Voltage

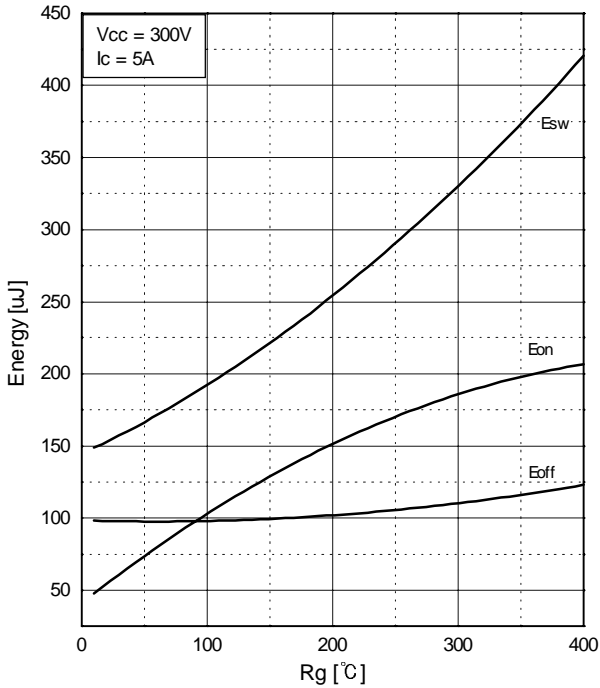


Fig.8 Typical Switching Loss vs. Gate Resistance

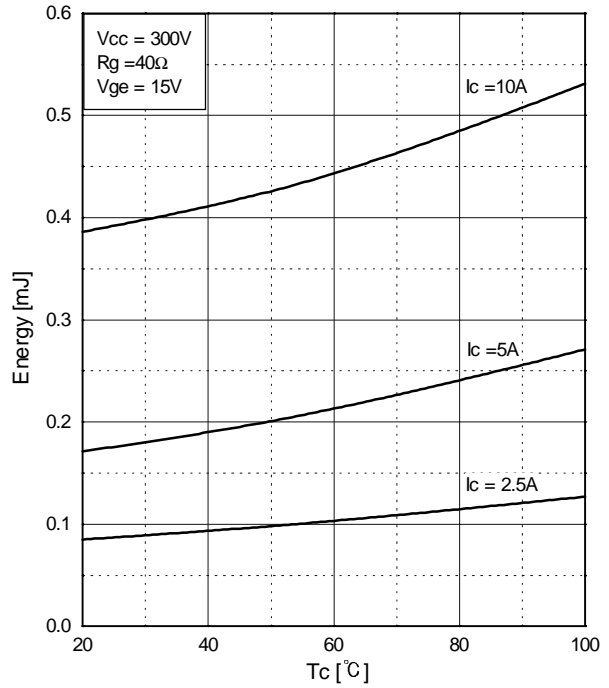


Fig.9 Typical Switching Loss vs. Case Temperature

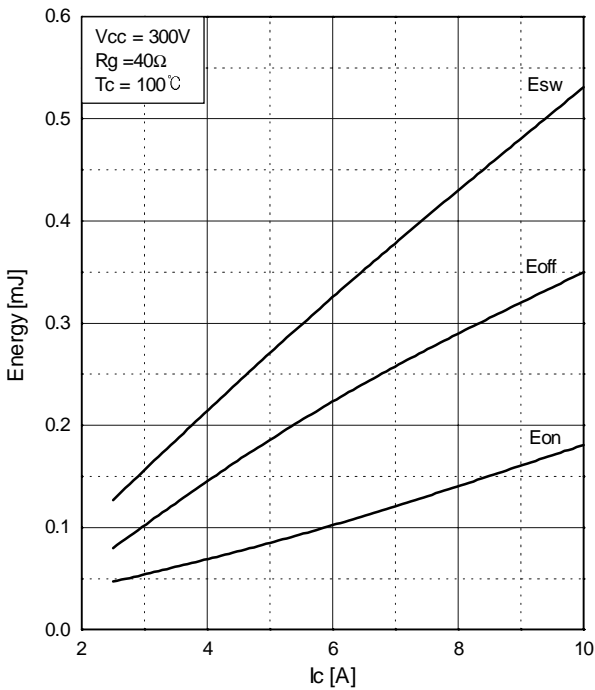


Fig.10 Typical Switching loss vs. Collector to Emitter Current

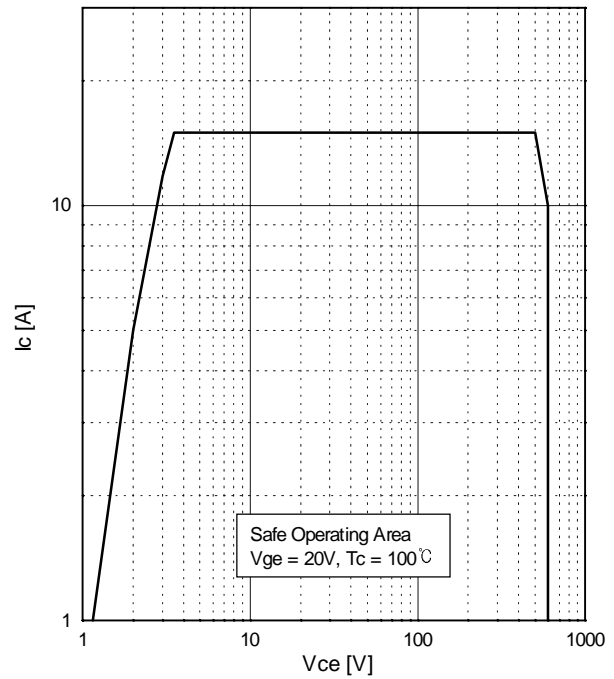


Fig.11 Turn-off SOA

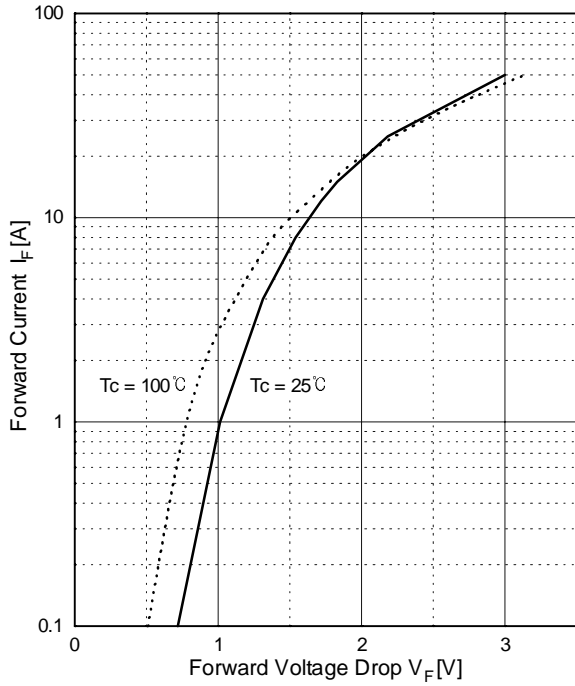


Fig.12 Typical Forward Voltage Drop vs. Forward Current

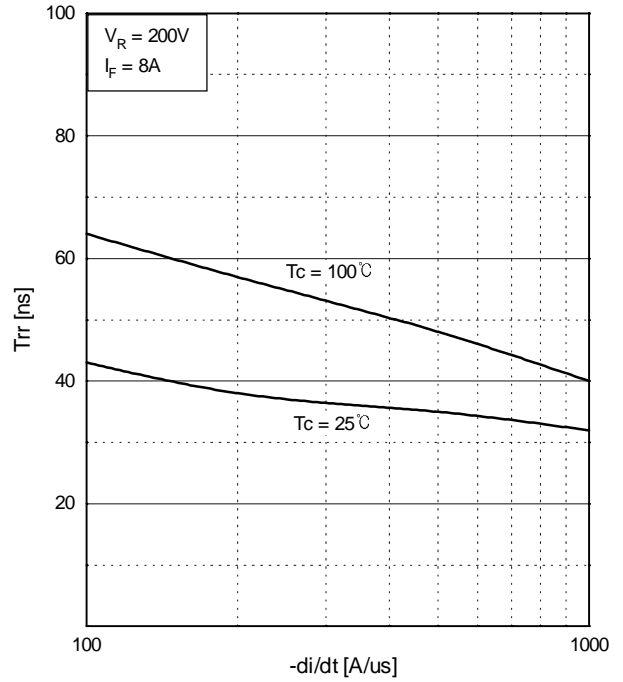


Fig.13 Typical Reverse Recovery Time vs.  $di/dt$

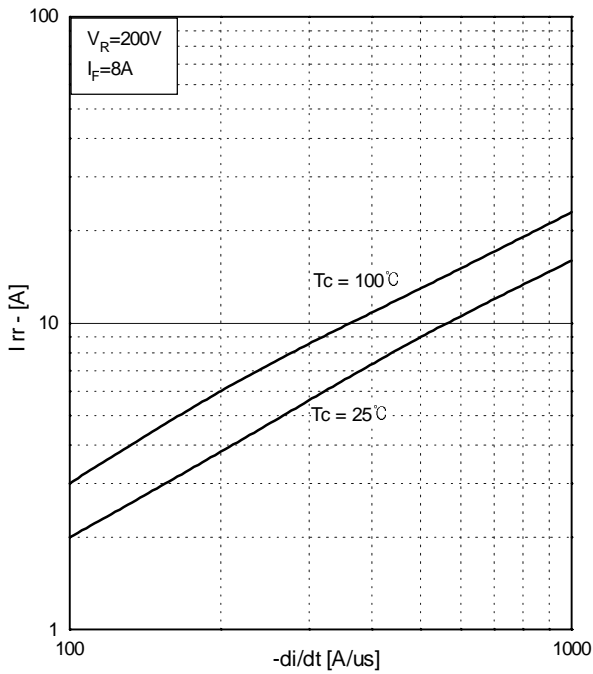


Fig.14 Typical Reverse Recovery Current vs.  $di/dt$

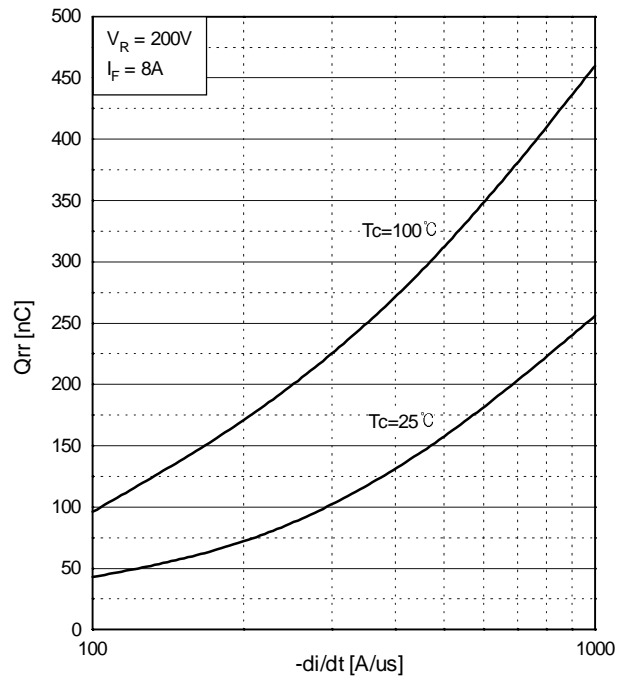


Fig.15 Typical Stored Charge vs.  $di/dt$

## TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEX™  
CoolFET™  
CROSSVOLT™  
E2CMOS™  
FACT™  
FACT Quiet Series™  
FAST®  
FASTr™  
GTO™  
HiSeC™

ISOPLANAR™  
MICROWIRE™  
POP™  
PowerTrench™  
QS™  
QuietSeries™  
SuperSOT™.3  
SuperSOT™.6  
SuperSOT™.8  
TinyLogic™

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or © whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## LIFE SUPPORT POLICY

### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notices in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.