

# 6MBP100RA120

## IGBT-IPM R series

1200V / 100A 6 in one-package

### Features

- Temperature protection provided by directly detecting the junction temperature of the IGBTs
- Low power loss and soft switching
- High performance and high reliability IGBT with overheating protection
- Higher reliability because of a big decrease in number of parts in built-in control circuit



### Maximum ratings and characteristics

● Absolute maximum ratings(at Tc=25°C unless otherwise specified)

Item			Symbol	Rating		Unit
				Min.	Max.	
DC bus voltage			V <sub>DC</sub>	0	900	V
DC bus voltage (surge)			V <sub>DC(surge)</sub>	0	1000	V
DC bus voltage (short operating)			V <sub>SC</sub>	200	800	V
Collector-Emitter voltage			V <sub>CES</sub>	0	1200	V
INV	Collector current	DC	I <sub>C</sub>	-	100	A
		1ms	I <sub>CP</sub>	-	200	A
		DC	-I <sub>C</sub>	-	100	A
	Collector power dissipation	One transistor	P <sub>C</sub>	-	735	W
Junction temperature			T <sub>j</sub>	-	150	°C
Input voltage of power supply for Pre-Driver			V <sub>CC</sub> *1	0	20	V
Input signal voltage			V <sub>in</sub> *2	0	V <sub>Z</sub>	V
Input signal current			I <sub>in</sub>	-	1	mA
Alarm signal voltage			V <sub>ALM</sub> *3	0	V <sub>CC</sub>	V
Alarm signal current			I <sub>ALM</sub> *4	-	15	mA
Storage temperature			T <sub>stg</sub>	-40	125	°C
Operating case temperature			T <sub>op</sub>	-20	100	°C
Isolating voltage (Case-Terminal)			V <sub>iso</sub> *5	-	AC2.5	kV
Screw torque		Mounting (M5)		-	3.5 *6	N·m
		Terminal (M5)		-	3.5 *6	N·m

\*1 Apply V<sub>CC</sub> between terminal No. 3 and 1, 6 and 4, 9 and 7, 11 and 10.  
\*2 Apply V<sub>in</sub> between terminal No. 2 and 1, 5 and 4, 8 and 7, 13,14,15 and 10.  
\*3 Apply V<sub>ALM</sub> between terminal No. 16 and 10.  
\*4 Apply I<sub>ALM</sub> to terminal No. 16.  
\*5 50Hz/60Hz sine wave 1 minute.  
\*6 Recommendable Value : 2.5 to 3.0 N·m

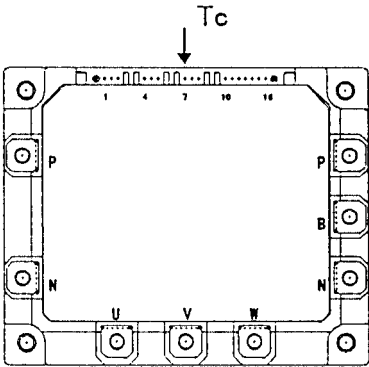


Fig.1 Measurement of case temperature

● Electrical characteristics of power circuit (at T<sub>c</sub>=T<sub>j</sub>=25°C, V<sub>CC</sub>=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
INV	Collector current at off signal input	V <sub>CE</sub> =1200V input terminal open	—	—	1.0	mA
	Collector-Emitter saturation voltage	I <sub>c</sub> =100A	—	—	2.6	V
	Forward voltage of FWD	-I <sub>c</sub> =100A	—	—	3.0	V

● **Electrical characteristics of control circuit**(at  $T_c=T_j=25^\circ\text{C}$ ,  $V_{cc}=15\text{V}$ )

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply current of P-line side Pre-driver(one unit)	$I_{ccp}$	$f_{sw}=0$ to $15\text{kHz}$ $T_c=-20$ to $100^\circ\text{C}$ *7	3	-	18	mA
Power supply current of N-line side three Pre-driver	$I_{ccn}$	$f_{sw}=0$ to $15\text{kHz}$ $T_c=-20$ to $100^\circ\text{C}$ *7	10	-	65	mA
Input signal threshold voltage (on/off)	$V_{in(th)}$	ON	1.00	1.35	1.70	V
		OFF	1.70	2.05	2.40	V
Input zener voltage	$V_z$	$R_{in}=20\text{k ohm}$	-	8.0	-	V
Over heating protection temperature level	$T_{COH}$	$V_{DC}=0\text{V}$ , $I_c=0\text{A}$ , Case temperature	110	-	125	$^\circ\text{C}$
Hysteresis	$T_{CH}$		-	20	-	$^\circ\text{C}$
IGBT chips over heating protection temperature level	$T_{jOH}$	surface of IGBT chips	150	-	-	$^\circ\text{C}$
Hysteresis	$T_{jH}$		-	20	-	$^\circ\text{C}$
Collector current protection level	INV $I_{OC}$	$T_j=125^\circ\text{C}$	150	-	-	A
Over current protection delay time (Fig.2)	$t_{DOC}$	$T_j=25^\circ\text{C}$ Fig.2	-	10	-	$\mu\text{s}$
Under voltage protection level	$V_{UV}$		11.0	-	12.5	V
Hysteresis	$V_H$		0.2	-	-	V
Alarm signal hold time	$t_{ALM}$		1.5	2	-	ms
SC protection delay time	$t_{SC}$	$T_j=25^\circ\text{C}$ Fig.3	-	-	12	$\mu\text{s}$
Limiting resistor for alarm	$R_{ALM}$		1425	1500	1575	ohm

\*7 Switching frequency of IGBT

● **Dynamic characteristics**(at  $T_c=T_j=125^\circ\text{C}$ ,  $V_{cc}=15\text{V}$ )

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Switching time (IGBT)	$t_{on}$	$I_C=100\text{A}$ , $V_{DC}=600\text{V}$	0.3	-	-	$\mu\text{s}$
	$t_{off}$		-	-	3.6	$\mu\text{s}$
Switching time (FWD)	$t_{rr}$	$I_F=100\text{A}$ , $V_{DC}=600\text{V}$	-	-	0.4	$\mu\text{s}$

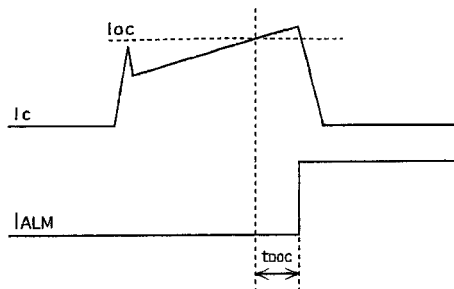


Fig.2 Definition of OC delay time

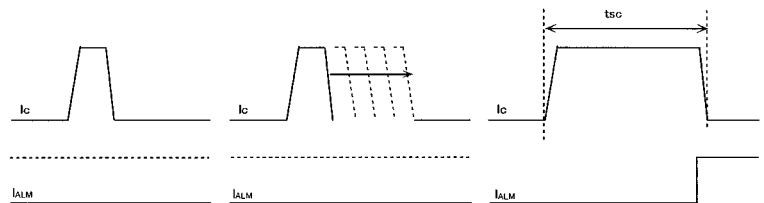


Fig.3 Definition of  $t_{sc}$

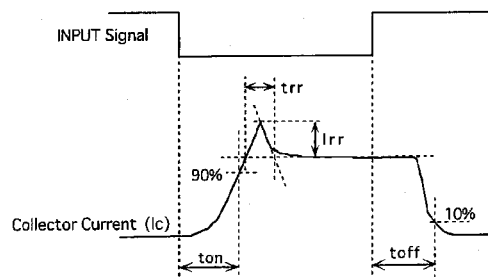


Fig.4 Definition of switching time

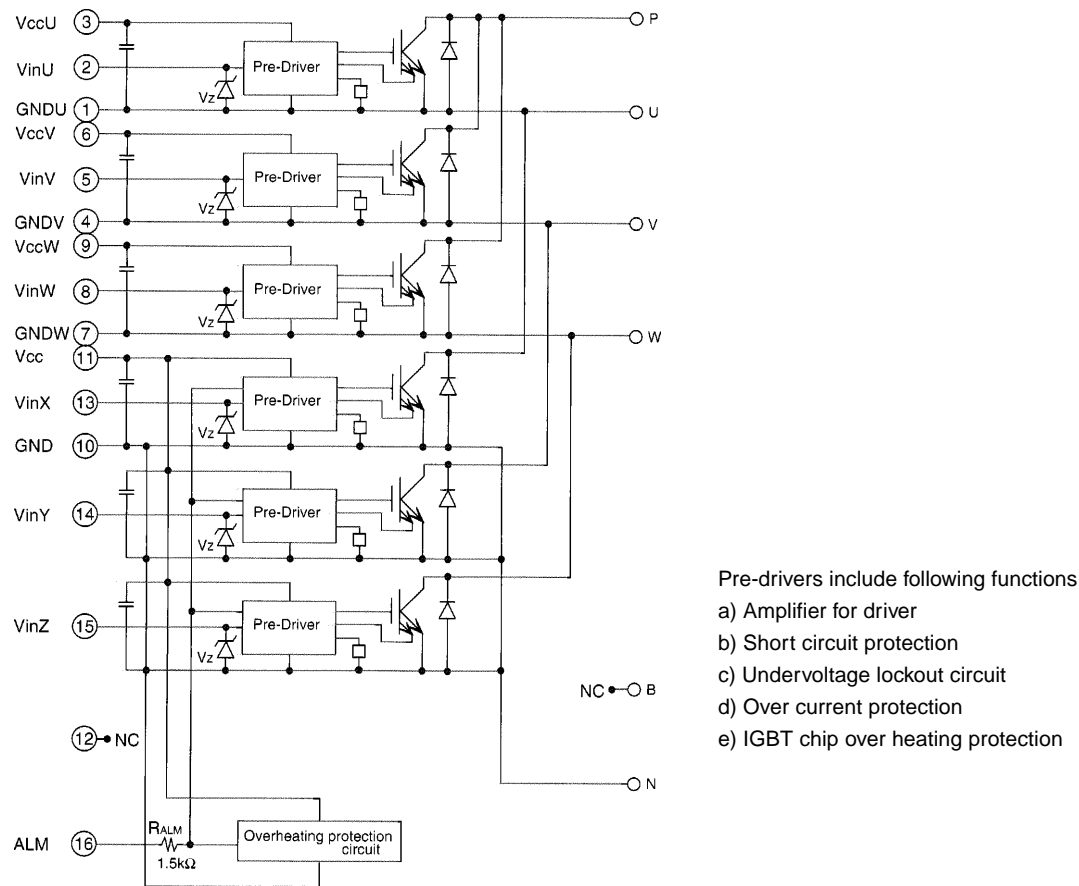
● **Thermal characteristics**( $T_c=25^\circ\text{C}$ )

Item			Symbol	Typ.	Max.	Unit
Junction to Case thermal resistance	INV	IGBT	$R_{th(j-c)}$	-	0.17	$^\circ\text{C/W}$
		FWD	$R_{th(j-c)}$	-	0.36	$^\circ\text{C/W}$
Case to fin thermal resistance with compound			$R_{th(c-f)}$	0.05	-	$^\circ\text{C/W}$

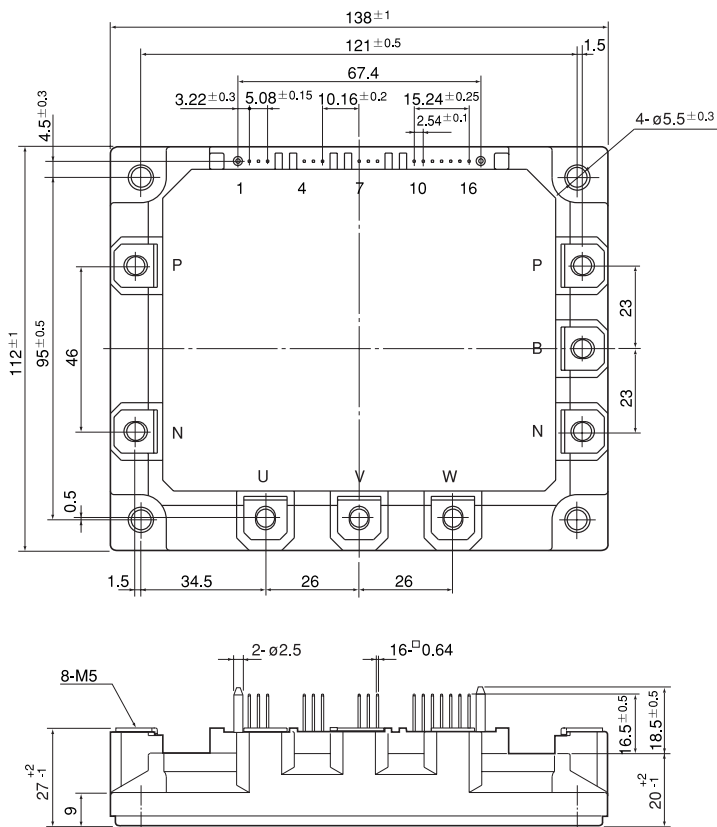
● **Recommendable value**

Item		Symbol	Min.	Typ.	Max.	Unit
DC bus voltage		$V_{DC}$	200	-	800	V
Operating power supply voltage range of Pre-driver		$V_{CC}$	13.5	15	16.5	V
Switching frequency of IPM		$f_{sw}$	1	-	20	kHz
Screw torque	Mounting (M5)	-	2.5	-	3.0	N·m
	Terminal (M5)	-	2.5	-	3.0	N·m

Block diagram



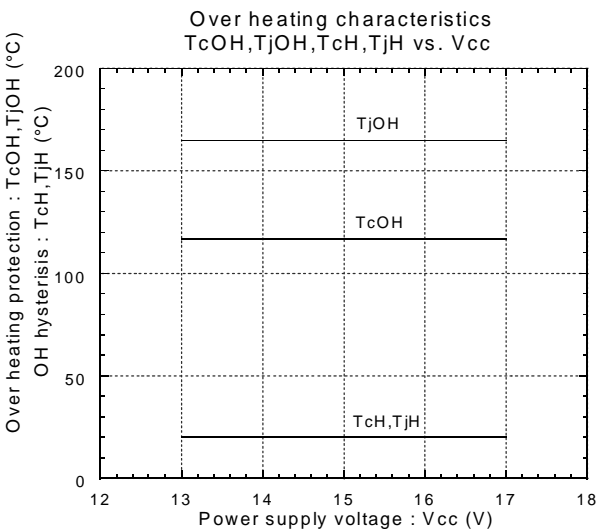
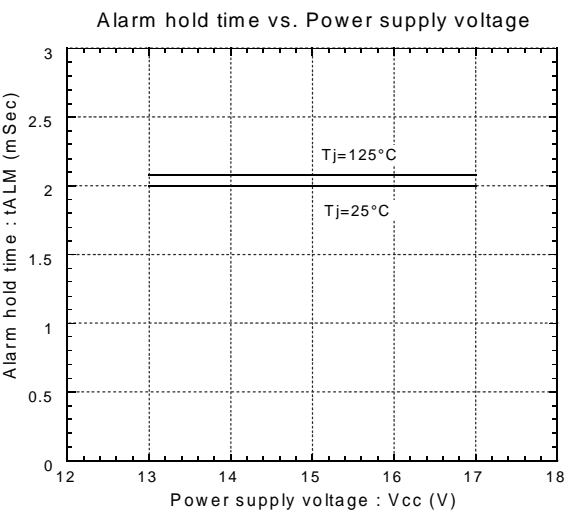
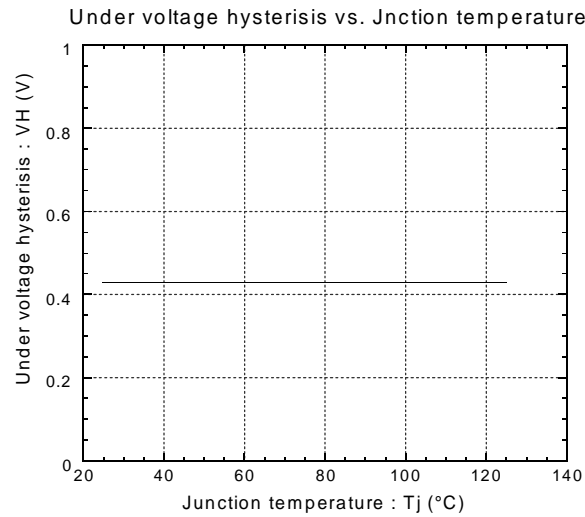
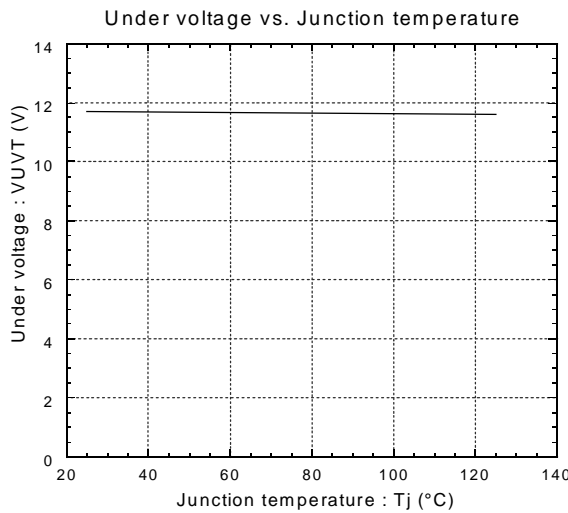
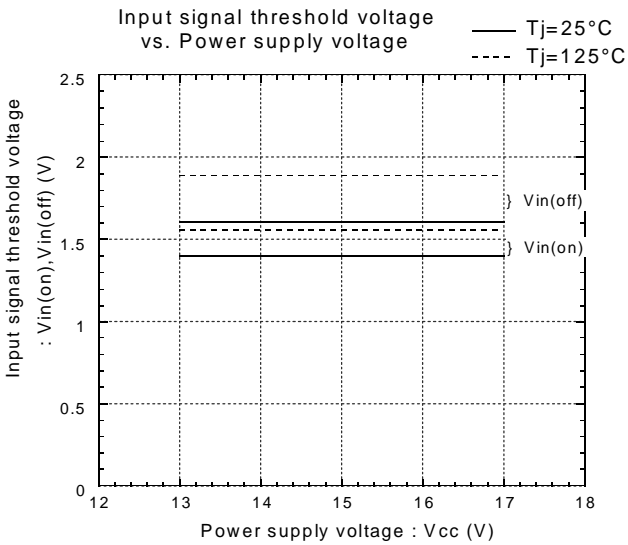
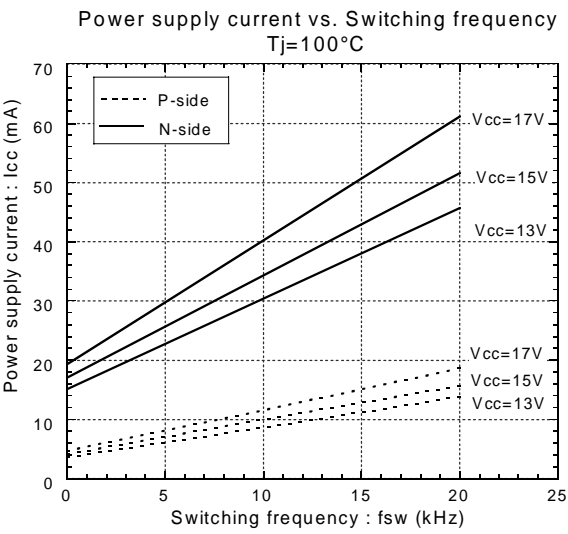
Outline drawings, mm



Mass : 920g

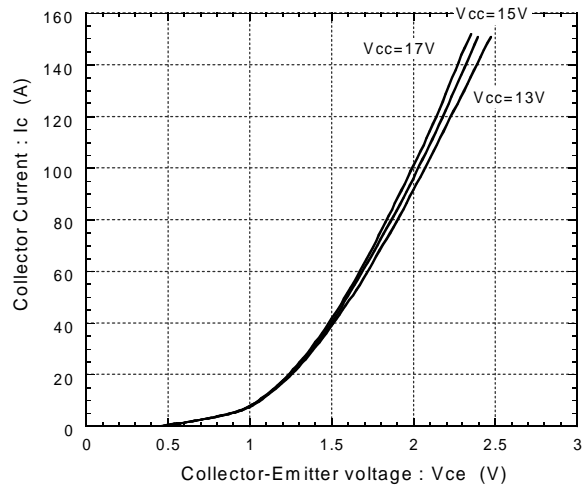
Characteristics (Representative)

Control Circuit

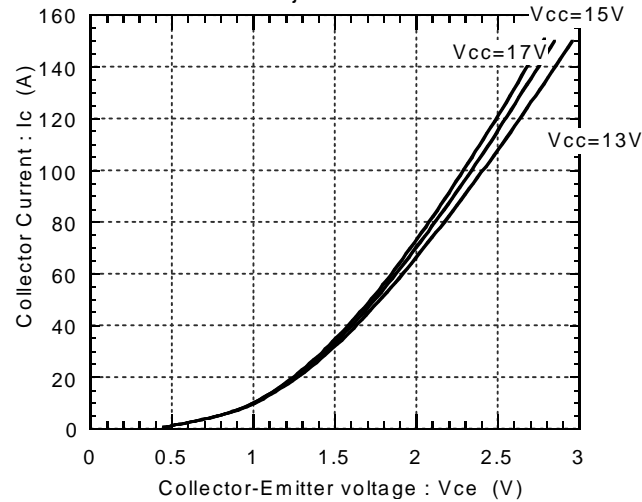


● Inverter

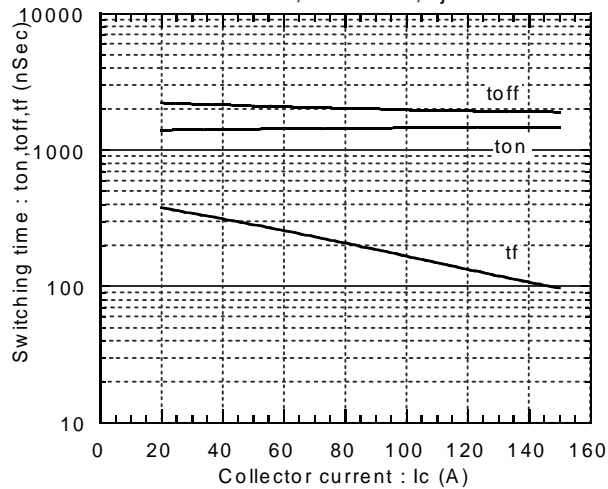
Collector current vs. Collector-Emitter voltage  
 $T_j=25^{\circ}\text{C}$



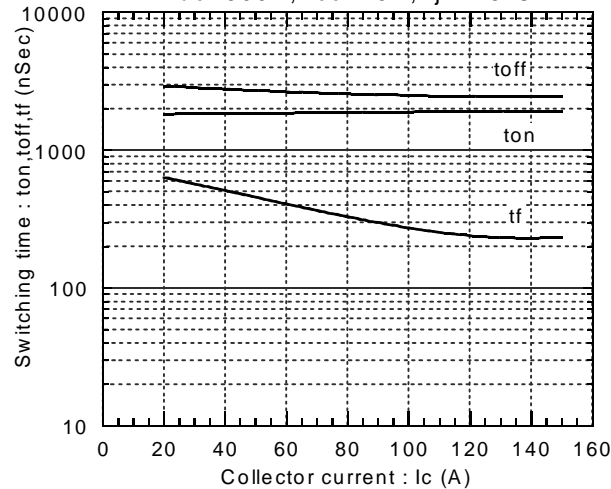
Collector current vs. Collector-Emitter voltage  
 $T_j=125^{\circ}\text{C}$



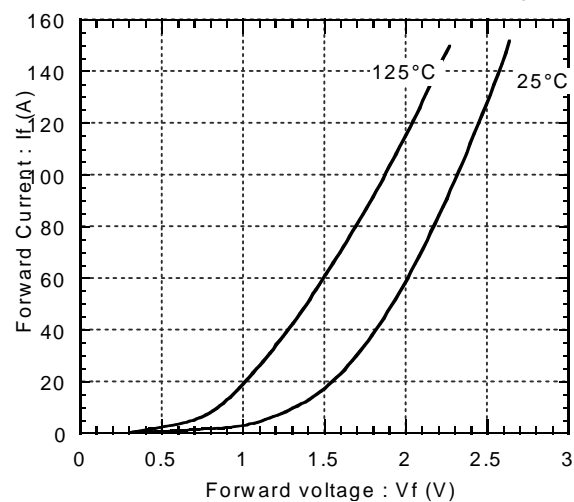
Switching time vs. Collector current  
 $E_{dc}=600\text{V}, V_{cc}=15\text{V}, T_j=25^{\circ}\text{C}$



Switching time vs. Collector current  
 $E_{dc}=600\text{V}, V_{cc}=15\text{V}, T_j=125^{\circ}\text{C}$



Forward current vs. Forward voltage



Reverse recovery characteristics  
 $t_{rr}, I_{rr}$  vs.  $I_F$

