

# 1MBK50D-060S

Molded IGBT

## 600V / 50A Molded Package

### ■ Features

- Small molded package
- Low power loss
- Soft switching with low switching surge and noise
- High reliability, high ruggedness (RBSOA, SCSOA etc.)
- Comprehensive line-up

### ■ Applications

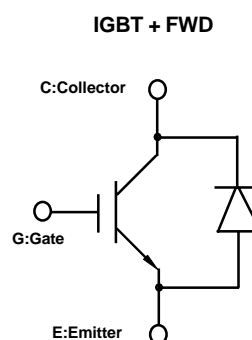
- Inverter for Motor drive
- AC and DC Servo drive amplifier
- Uninterruptible power supply

### ■ Maximum ratings and characteristics

#### ● Absolute maximum ratings (Tc=25°C)

Item	Symbol	Rating	Unit
Collector-Emitter voltage	V <sub>CES</sub>	600	V
Gate-Emitter voltage	V <sub>GES</sub>	±20	V
Collector current	DC	Tc=25°C	I <sub>C25</sub> 65 A
		Tc=100°C	I <sub>C100</sub> 50 A
	1ms	Tc=25°C	I <sub>CP</sub> 150 A
Max. power dissipation (IGBT)	P <sub>C</sub>	200	W
Max. power dissipation (FWD)	P <sub>C</sub>	130	W
Operating temperature	T <sub>j</sub>	+150	°C
Storage temperature	T <sub>stg</sub>	-40 to +150	°C
Screw torque	-	39.2 to 58.8	N·m

### ■ Equivalent Circuit Schematic



#### ● Electrical characteristics (at Tc=25°C unless otherwise specified)

Item	Symbol	Characteristics			Conditions	Unit	
		Min.	Typ.	Max.			
Zero gate voltage collector current	I <sub>CES</sub>	-	-	1.0	V <sub>GE</sub> =0V, V <sub>CES</sub> =600V	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	-	-	10	V <sub>CES</sub> =0V, V <sub>GES</sub> =±20V	μA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	4.0	5.0	6.0	V <sub>CES</sub> =20V, I <sub>C</sub> =50mA	V	
Collector-Emitter saturation voltage	V <sub>CES(sat)</sub>	-	2.4	2.9	V <sub>GE</sub> =15V, I <sub>C</sub> =50A	V	
Input capacitance	C <sub>ies</sub>	-	2500	-	V <sub>GE</sub> =0V	pF	
Output capacitance	C <sub>oes</sub>	-	240	-	V <sub>CES</sub> =25V		
Reverse transfer capacitance	C <sub>res</sub>	-	130	-	f=1MHz		
Switching Time	Turn-on time	t <sub>on</sub> *	-	0.15	-	V <sub>CC</sub> =300V, I <sub>C</sub> =50A	μs
		t <sub>r</sub> *	-	0.09	-	V <sub>GE</sub> =±15V	
		t <sub>rr2</sub>	-	0.03	-	R <sub>G</sub> =33 ohm	
	Turn-off time	t <sub>off</sub>	-	0.50	0.62	(Half Bridge)	μs
		t <sub>f</sub>	-	0.10	0.17	Inductance Load	
		t <sub>on</sub> *	-	0.15	-	V <sub>CC</sub> =300V, I <sub>C</sub> =50A	
	Turn-off time	t <sub>r</sub> *	-	0.09	-	V <sub>GE</sub> =+15V	μs
		t <sub>rr2</sub>	-	0.03	-	R <sub>G</sub> =8 ohm	
t <sub>off</sub>		-	0.50	0.62	(Half Bridge)		
FWD forward on voltage	V <sub>F</sub>	-	2.0	2.5	I <sub>F</sub> =50A, V <sub>GE</sub> =0V	V	
Reverse recovery time	t <sub>rr</sub>	-	0.06	0.10	I <sub>F</sub> =50A, V <sub>GE</sub> =-10V, V <sub>R</sub> =300V, di/dt=100A/μs	μs	

\*Turn-on characteristics include t<sub>rr2</sub>. See a figure in next page.

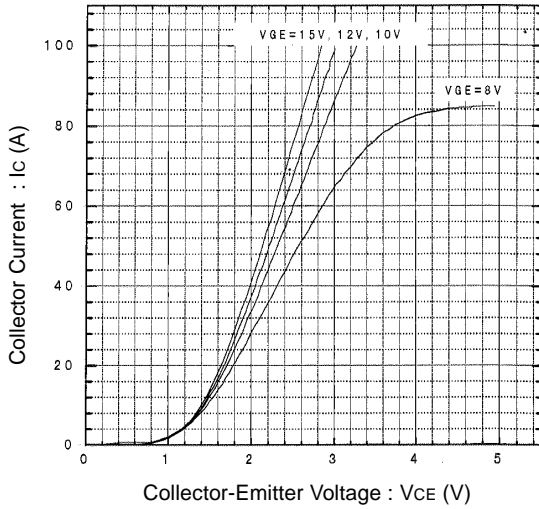
#### ● Thermal resistance characteristics

Item	Symbol	Characteristics			Conditions	Unit
		Min.	Typ.	Max.		
Thermal resistance	R <sub>th(j-c)</sub>	-	-	0.63	IGBT	°C/W
	R <sub>th(j-c)</sub>	-	-	0.96	FWD	°C/W

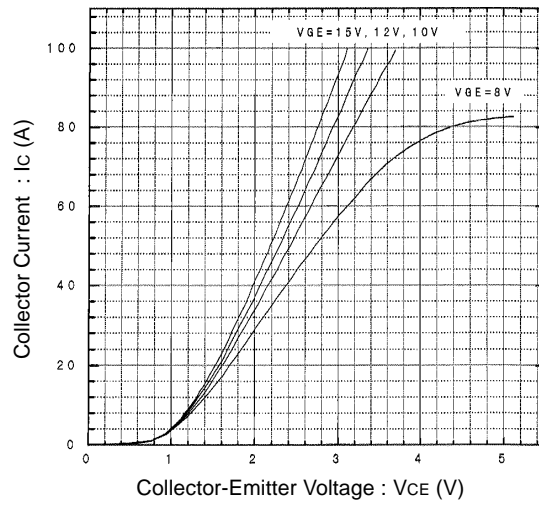


Characteristics

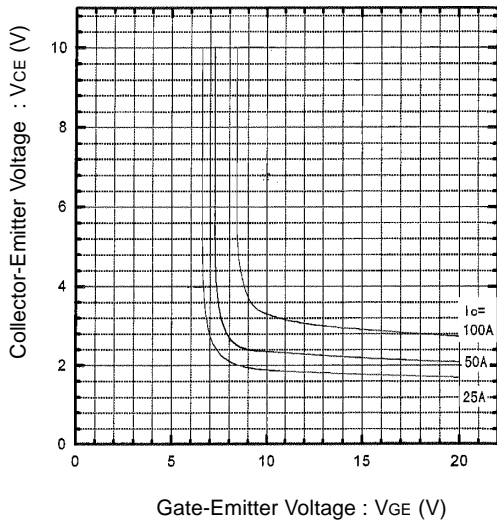
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>=25°C



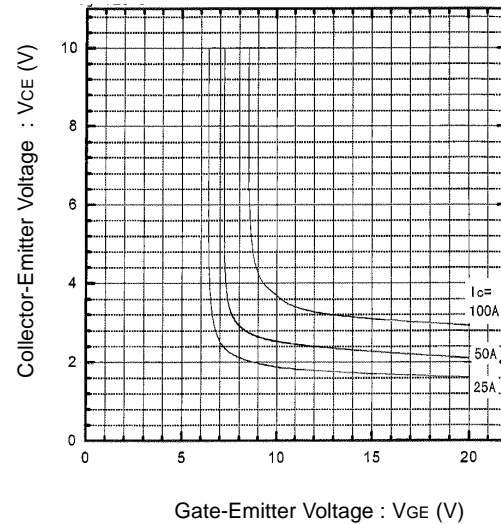
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>=125°C



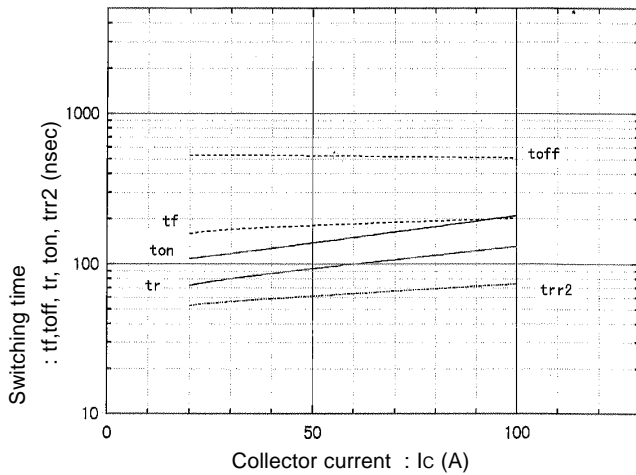
Collector-Emitter voltage vs. Gate-Emitter voltage  
T<sub>j</sub>=25°C



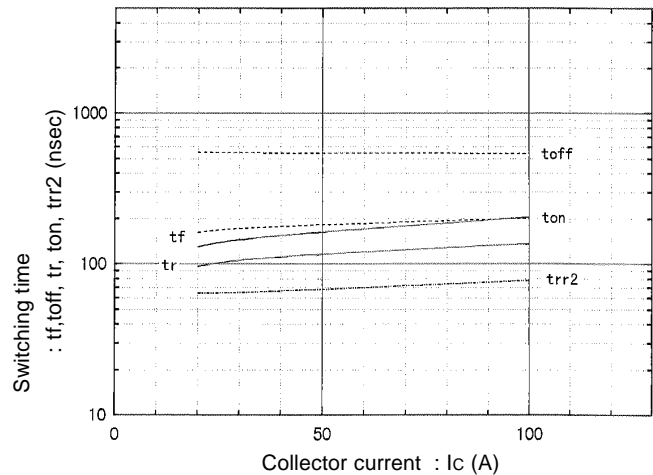
Collector-Emitter voltage vs. Gate-Emitter voltage  
T<sub>j</sub>=125°C



Switching time vs. Collector current  
V<sub>CC</sub>=300V, R<sub>G</sub>=8Ω, V<sub>GE</sub>=+15V, T<sub>j</sub>=125°C



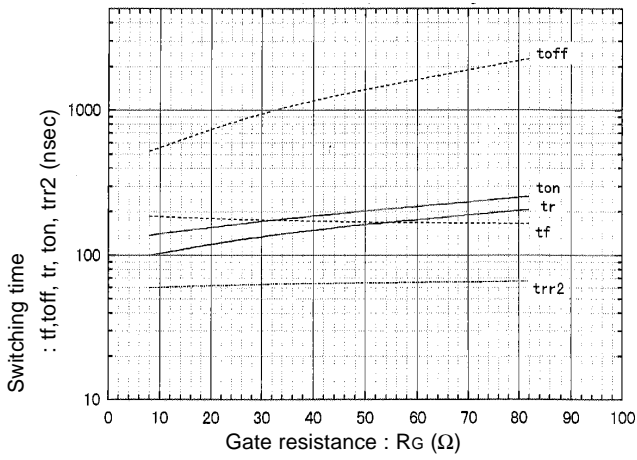
Switching time vs. Collector current  
V<sub>CC</sub>=300V, R<sub>G</sub>=33Ω, V<sub>GE</sub>=±15V, T<sub>j</sub>=125°C



Characteristics

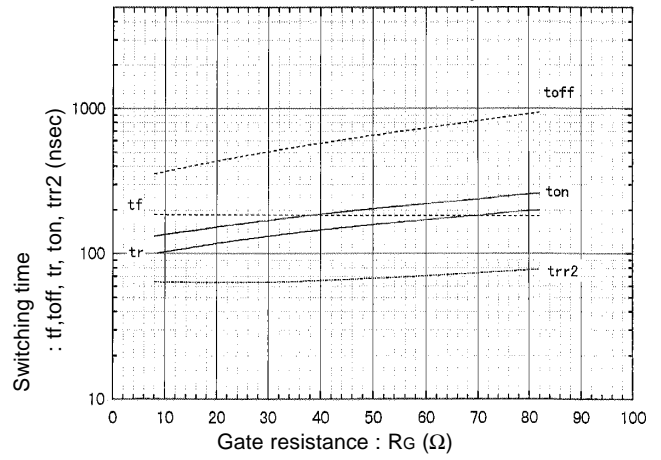
Switching time vs.  $R_G$

$V_{CC}=300V, I_C=50A, V_{GE}=+15V, T_J=125^\circ C$



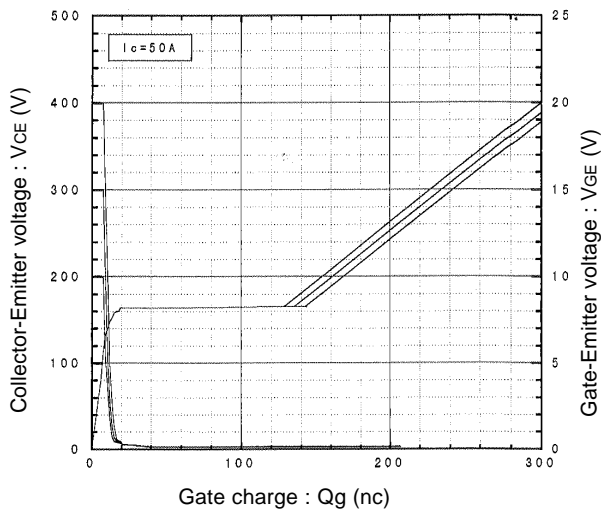
Switching time vs.  $R_G$

$V_{CC}=300V, I_C=50A, V_{GE}=\pm 15V, T_J=125^\circ C$



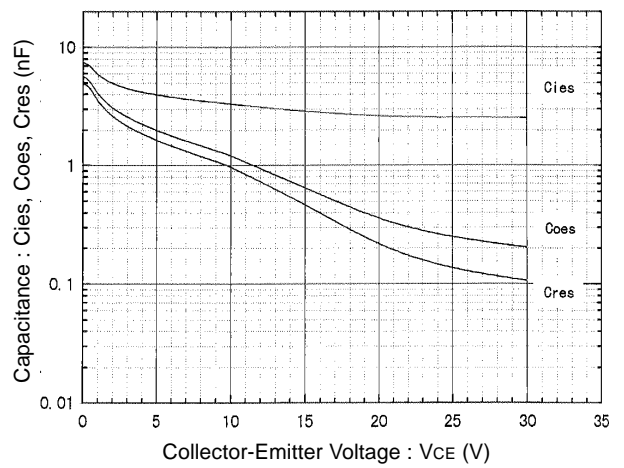
Dynamic input characteristics

$T_J=25^\circ C$



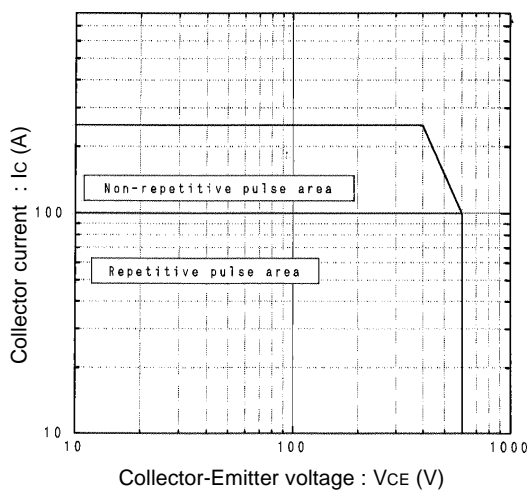
Capacitance vs. Collector-Emitter voltage

$T_J=25^\circ C$

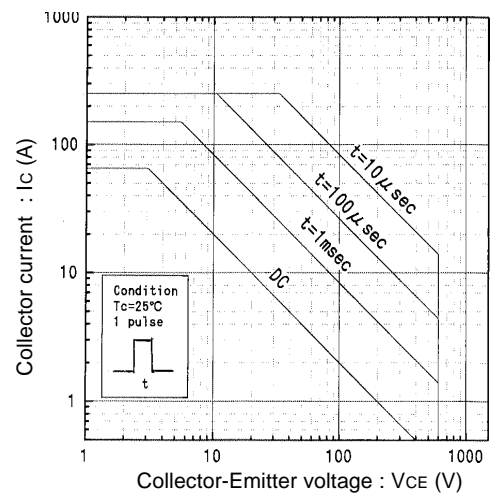


Reverse Biased Safe Operating Area

$R_G=8\Omega, +V_{GE} \leq 20V, -V_{GE}=15V, T_J \leq 125^\circ C$

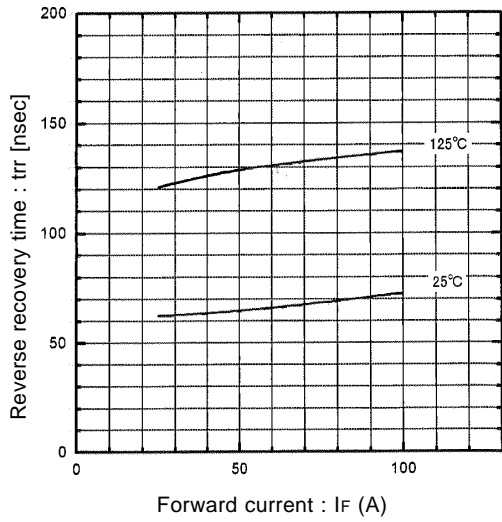


Forward Bias Safe Operating Area

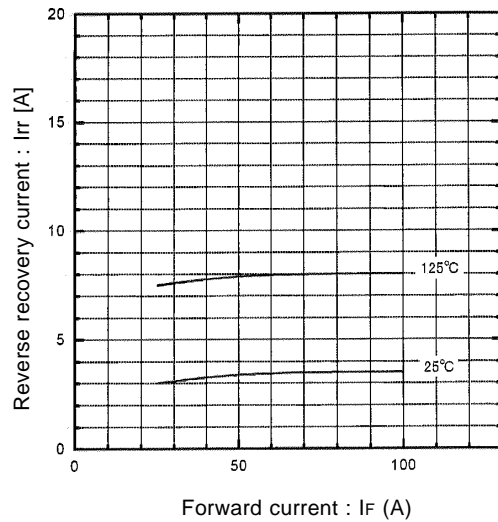


■ Characteristics

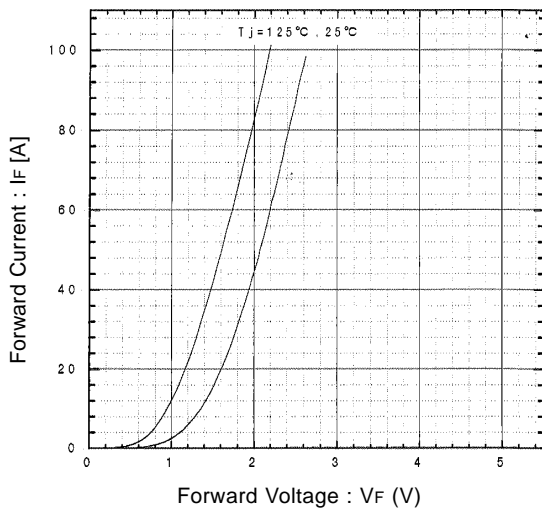
Reverse recovery time vs. Forward current  
VR=300V, -di/dt=100A/μsec



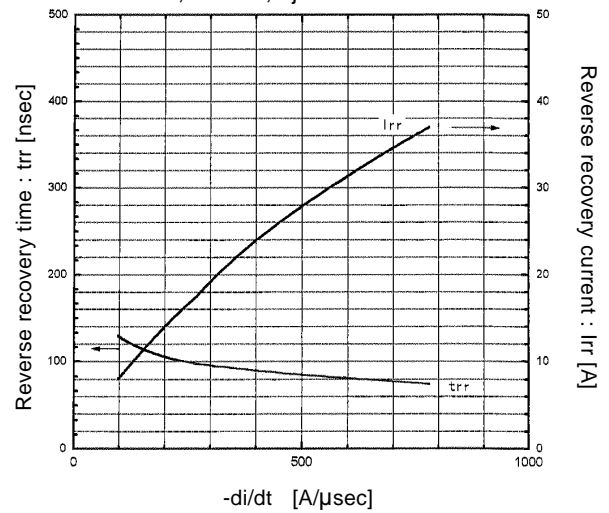
Reverse recovery current vs. Forward current  
VR=300V, -di/dt=100A/μsec



Forward voltage vs. Forward current



Reverse recovery characteristics vs. -di/dt  
VR=300V, IF=50A, Tj=125°C



Transient thermal resistance

