

# 1MBK30D-060S

Molded IGBT

## 600V / 30A 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

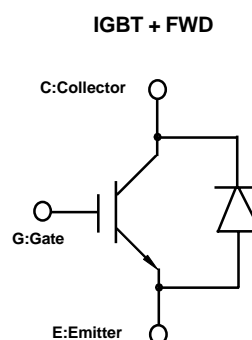
- Inverter for Motor drive
- AC and DC Servo drive amplifier
- Uninterruptible power supply

### ■ 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	T <sub>c</sub> =25°C	I <sub>C25</sub>	50	A
		T <sub>c</sub> =100°C	I <sub>C100</sub>	30	A
	1ms	T <sub>c</sub> =25°C	I <sub>cp</sub>	90	A
Max. power dissipation (IGBT)	P <sub>c</sub>	150	W		
Max. power dissipation (FWD)	P <sub>c</sub>	80	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>CE</sub> =600V	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	–	–	10	V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V	µA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	4.0	5.0	6.0	V <sub>CE</sub> =20V, I <sub>c</sub> =30mA	V	
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub>	–	2.4	2.9	V <sub>GE</sub> =15V, I <sub>c</sub> =30A	V	
Input capacitance	C <sub>ies</sub>	–	1960	–	V <sub>GE</sub> =0V	pF	
Output capacitance	C <sub>oes</sub>	–	222	–	V <sub>CE</sub> =25V		
Reverse transfer capacitance	C <sub>res</sub>	–	101	–	f=1MHz		
Switching Time	Turn-on time	t <sub>on</sub> *	–	0.15	–	V <sub>CC</sub> =300V, I <sub>c</sub> =30A	µs
		t <sub>r</sub> *	–	0.09	–	V <sub>GE</sub> =±15V	
		t <sub>rr2</sub>	–	0.03	–	R <sub>G</sub> =36 ohm	
	Turn-off time	t <sub>off</sub>	–	0.50	0.62	(Half Bridge)	
		t <sub>f</sub>	–	0.10	0.17	Inductance Load	
		Turn-on time	t <sub>on</sub> *	–	0.15	–	
	t <sub>r</sub> *		–	0.09	–	V <sub>GE</sub> =+15V	
	t <sub>rr2</sub>		–	0.03	–	R <sub>G</sub> =10 ohm	
Turn-off time	t <sub>off</sub>	–	0.50	0.62	(Half Bridge)		
	t <sub>f</sub>	–	0.10	0.17	Inductance Load		
	FWD forward on voltage	V <sub>F</sub>	–	2.0	2.5	I <sub>F</sub> =30A, V <sub>GE</sub> =0V	V
Reverse recovery time	t <sub>rr</sub>	–	0.06	0.10	I <sub>F</sub> =30A, V <sub>GE</sub> =-10V, V <sub>R</sub> =300V, di/dt=100A/µs	µs	

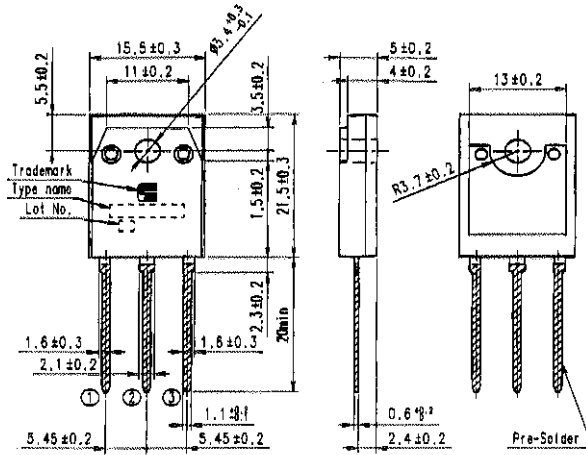
\*Turn-on characteristics include t<sub>rr2</sub>. See a figure in next page.

#### ● Thermal resistance characteristics

Item	Symbol	Characteristics			Conditions	Unit
		Min.	Typ.	Max.		
Thermal resistance	R <sub>th(j-c)</sub>	–	–	0.83	IGBT	°C/W
	R <sub>th(j-c)</sub>	–	–	1.56	FWD	°C/W

Outline drawings, mm

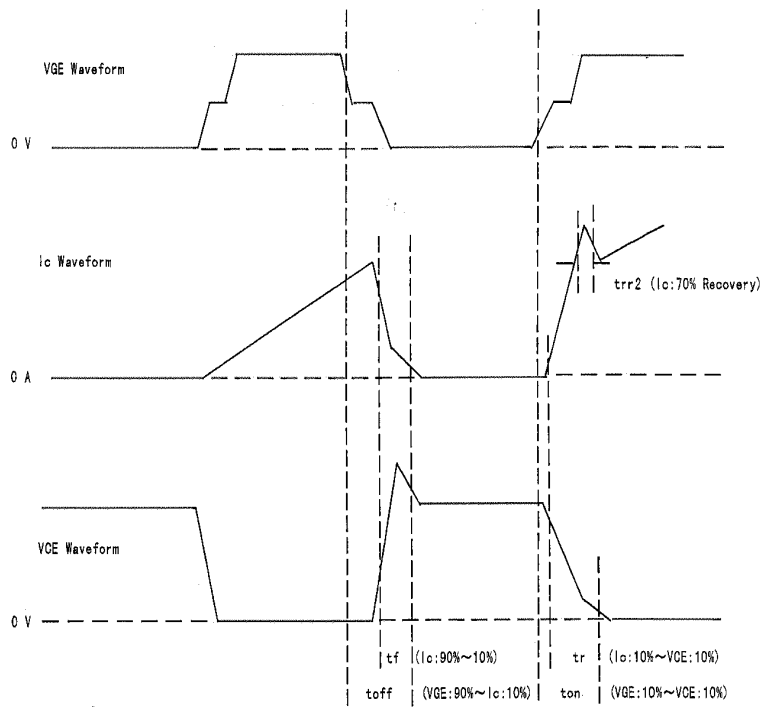
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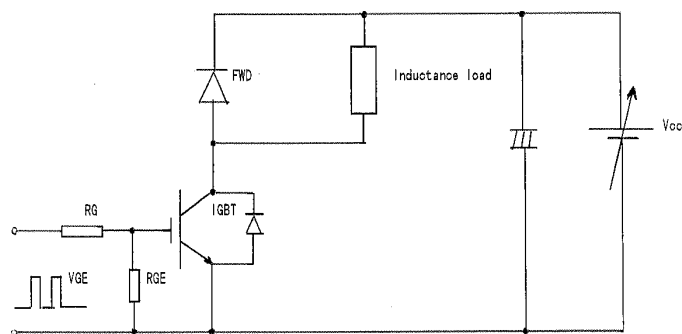
CONNECTION

- ① Gate
- ② Collector
- ③ Emitter

Switching waveform (Inductance load)

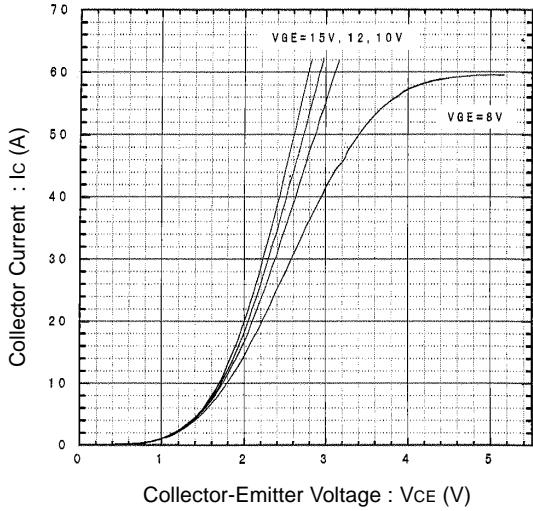


Mesurement circuit

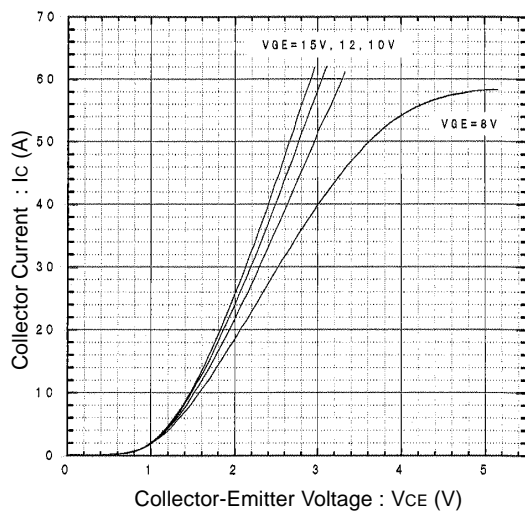


Characteristics

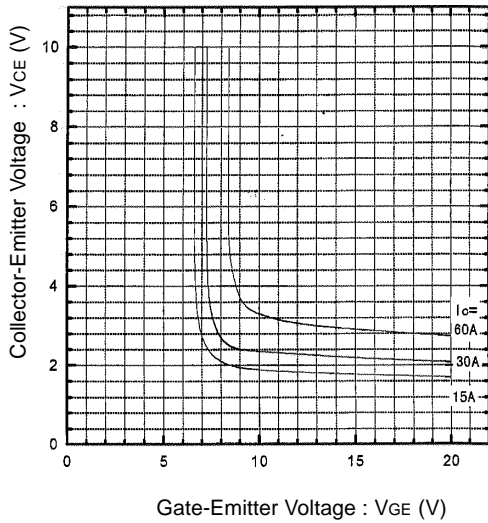
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>=25°C



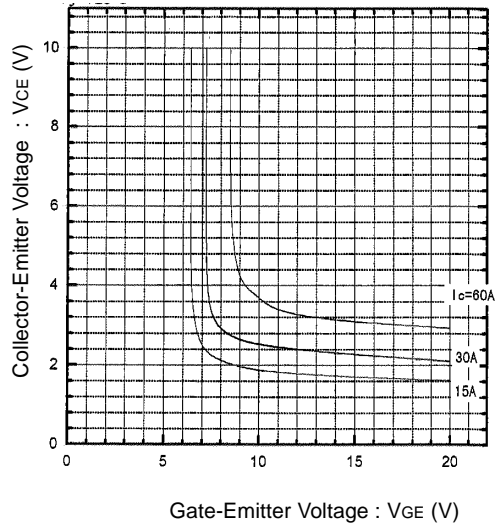
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>=125°C



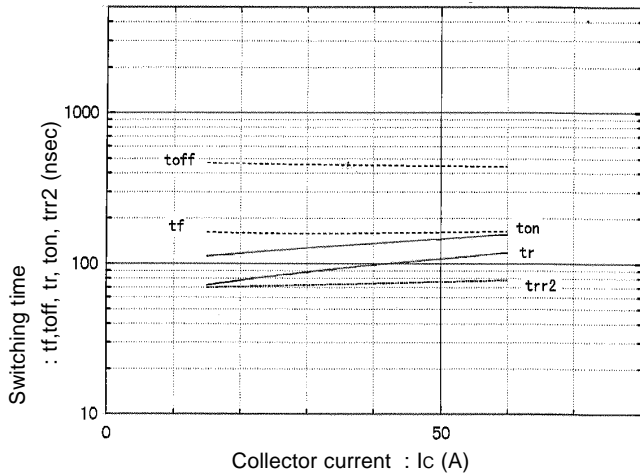
Collector-Emitter voltage vs. Gate-Emitter voltage  
T<sub>j</sub>=25°C



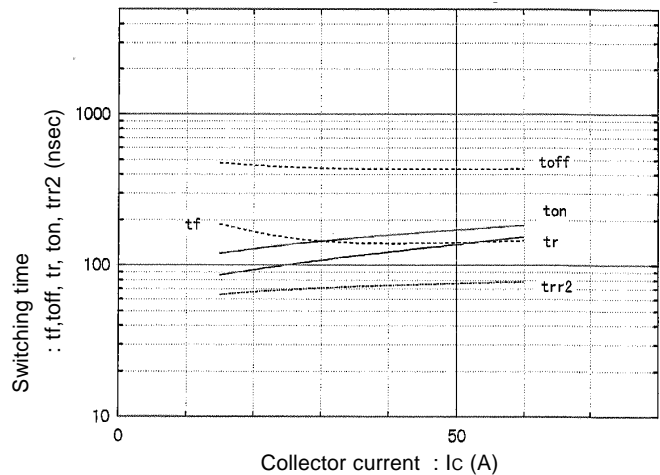
Collector-Emitter voltage vs. Gate-Emitter voltage  
T<sub>j</sub>=125°C



Switching time vs. Collector current  
V<sub>CC</sub>=300V, R<sub>G</sub>=10Ω, V<sub>GE</sub>=+15V, T<sub>j</sub>=125°C



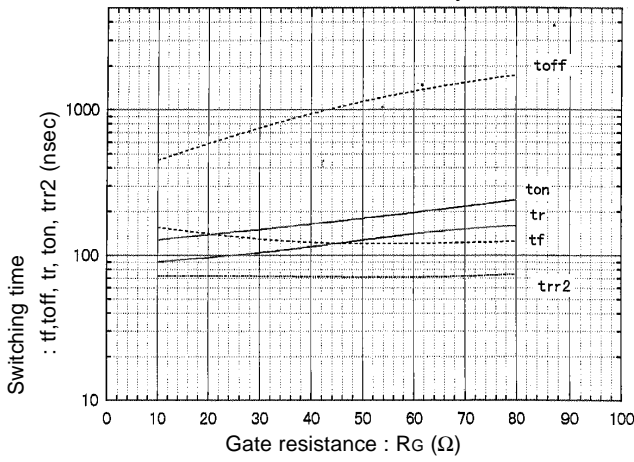
Switching time vs. Collector current  
V<sub>CC</sub>=300V, R<sub>G</sub>=36Ω, V<sub>GE</sub>=±15V, T<sub>j</sub>=125°C



Characteristics

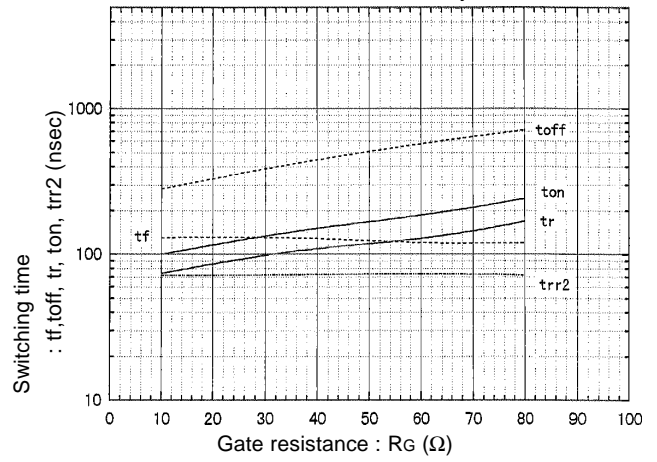
Switching time vs.  $R_G$

$V_{CC}=300V, I_C=30A, V_{GE}=+15V, T_j=125^\circ C$



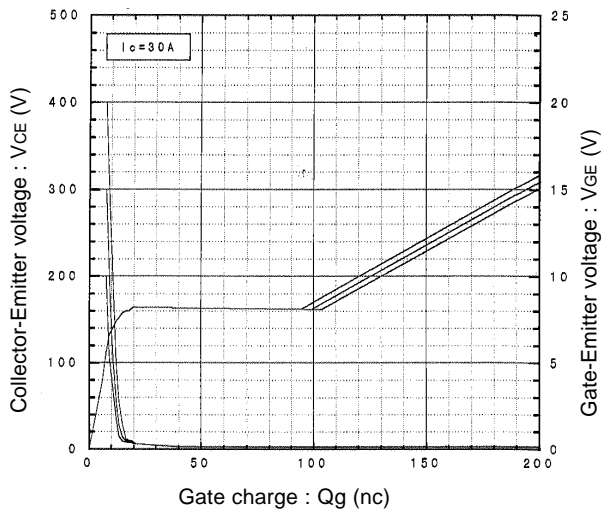
Switching time vs.  $R_G$

$V_{CC}=300V, I_C=30A, V_{GE}=\pm 15V, T_j=125^\circ C$



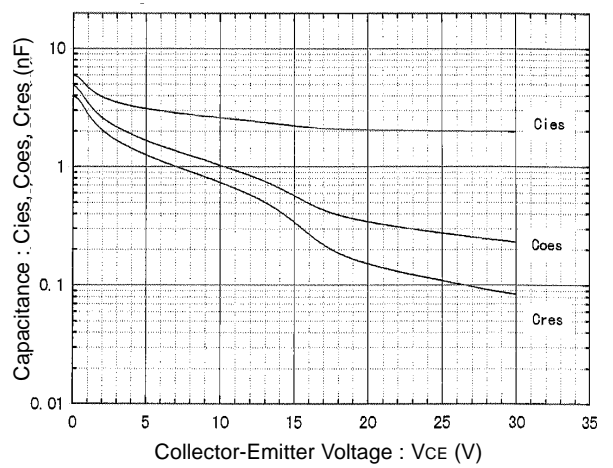
Dynamic input characteristics

$T_j=25^\circ C$



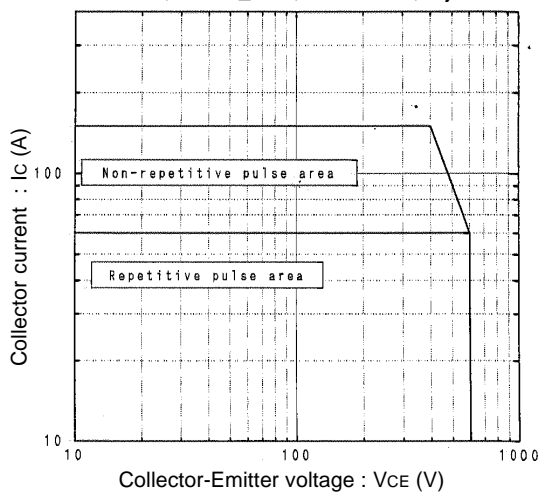
Capacitance vs. Collector-Emitter voltage

$T_j=25^\circ C$

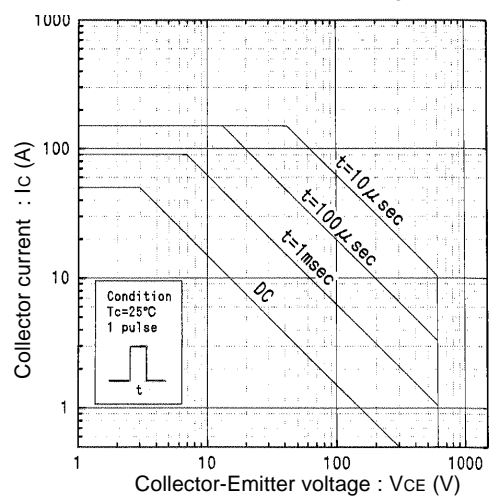


Reverse Biased Safe Operating Area

$R_G=10\Omega, +V_{GE}\leq 20V, -V_{GE}=15V, T_j\leq 125^\circ C$

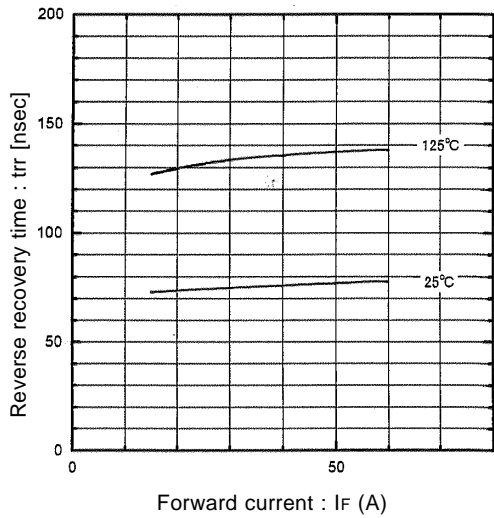


Forward Bias Safe Operating Area

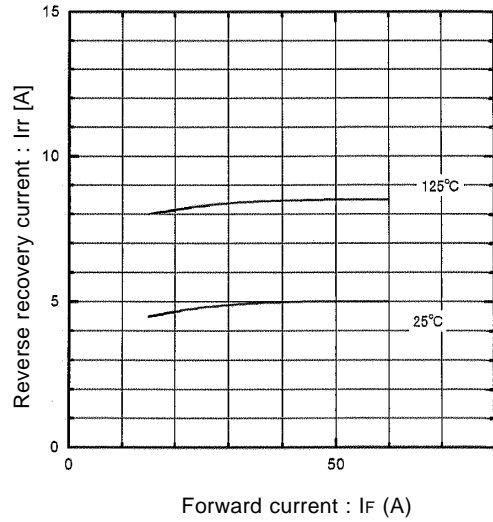


■ Characteristics

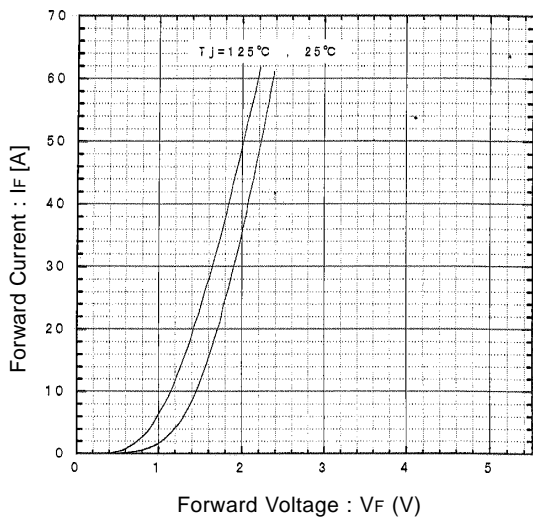
Reverse recovery time vs. Forward Current  
VR=300V, -di/dt=100A/μsec



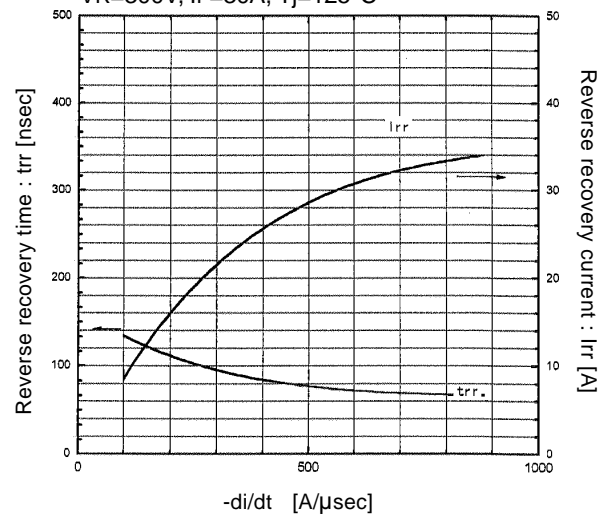
Reverse recovery current vs. Forward current  
VR=300V, -di/dt=100A/μsec



Forward Voltage vs. Forward current



Reverse recovery characteristics vs. -di/dt  
VR=300V, IF=30A, Tj=125°C



Transient thermal resistance

