

ESK300SH60FA

High Power IGBT Module(FST)

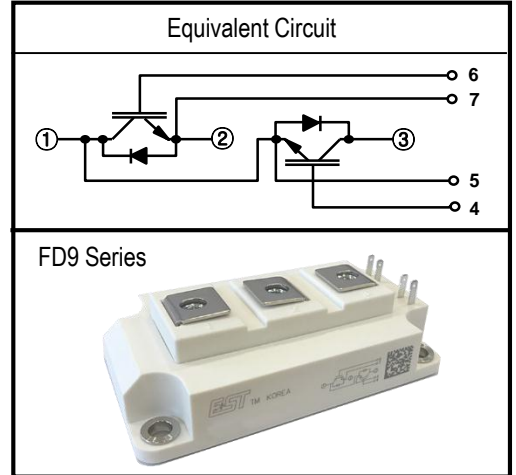
Features

- High Speed Switching
- $BV_{CES} = 650V$
- Low Conduction Loss : $V_{CE(sat)} = 1.65V$ (typ.)
- Fast & Soft Anti-Parallel FWD
- Short circuit rated : Min. 10uS at $T_C=100^\circ C$
- Reduced EMI and RFI
- Isolation Type Package

Applications

- Welding Machine
- Induction Heating
- UPS

Equivalent Circuit and Package



Please see the package out line information

Absolute Maximum Ratings @ $T_J=25^\circ C$ (Per Leg)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage	-	650	V
V_{GES}	Gate-emitter peak voltage	-	± 20	V
I_C	DC-collector current	$T_C = 25^\circ C$	600	A
		$T_C = 80^\circ C$	300	A
$I_{CM}^{(1)}$	Repetitive peak collector current	1ms	600	A
I_F	Diode continuous forward current	$T_C = 80^\circ C$	300	A
I_{FM}	Diode repetitive peak forward current	-	600	A
$T_J^{(2)}$	Operating junction temperature	-	-40 ~ 125	$^\circ C$
T_{stg}	Storage temperature range	-	-40 ~ 125	$^\circ C$
V_{ISO}	Insulation test voltage	60Hz, t=1min $I_{ISOL}=1mA$	2.5	kV
M_t	Mounting terminals screw torque	M6	3.0 ~ 6.0	N.m

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

(Note *2) The maximum junction temperature of chip is $150^\circ C$

Electrical Characteristics of IGBT @ $T_j=25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
BV_{CES}	C - E Breakdown Voltage	$V_{GE} = 0V, I_C = 1mA$	650	-	-	V	
$V_{GE(th)}$	G-E threshold voltage	$I_C = 250\mu A, V_{CE} = V_{GE}$	5.0	-	7.0	V	
I_{CES}	Zero gate voltage collector current	$V_{GE} = 0V, V_{CE} = 600V$	-	-	100	μA	
I_{GES}	G-E leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$	-	-	± 0.2	μA	
R_{int}	Internal Gate resister	-	-	0.6	-	Ω	
$V_{CE(Sat)}$	C-E saturation voltage	$I_C = 300A, V_{GE} = 15V, T_j = 25^\circ\text{C}$	-	1.65	2.0	V	
		$I_C = 300A, V_{GE} = 15V, T_j = 125^\circ\text{C}$	-	1.95	-	V	
C_{ies}	Input capacitance	$V_{GE} = 0V, f = 1MHz, V_{CE} = 25V$	-	15000	-	pF	
C_{oes}	Output capacitance		-	1290	-		
C_{res}	Reverse transfer capacitance		-	263	-		
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 300V, I_C = 300A,$ $V_{GE} = \pm 15V, R_G = 5.1\Omega,$ $T_j = 25^\circ\text{C},$ Inductive load	-	220	-	ns	
t_r	Turn-on rise time		-	170	-		
$t_{d(off)}$	Turn-off delay time		-	380	-		
t_f	Turn-off fall time		-	110	-		
E_{on}	Turn-on Energy loss		-	1.3	-		mJ
E_{off}	Turn-off Energy loss		-	17.8	-		
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 300V, I_C = 300A,$ $V_{GE} = \pm 15V, R_G = 5.1\Omega,$ $T_j = 125^\circ\text{C},$ Inductive load	-	220	-	ns	
t_r	Turn-on rise time		-	170	-		
$t_{d(off)}$	Turn-off delay time		-	410	-		
t_f	Turn-off fall time		-	120	-		
E_{on}	Turn-on Energy loss		-	1.6	-		mJ
E_{off}	Turn-off Energy loss		-	18.0	-		
T_{sc}	Short Circuit Withstand Time	$V_{cc} = 300V, V_{GE} = 15V, @T_j = 100^\circ\text{C}$	10	-	-	μS	
Q_g	Total gate charge	$V_{GE} = \pm 15V, V_{CE} = 300V, I_C = 300A$	-	790	-	nC	

Electrical Characteristics of FRD @ $T_j=25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
V_{FM}	Diode Forward Voltage	$I_F=300\text{A}$	$T_j=25^\circ\text{C}$	-	2.5	2.9	V
			$T_j=125^\circ\text{C}$	-	2.6	-	
t_{rr}	Diode Reverse Recovery Time		$T_j=25^\circ\text{C}$	-	100	-	nS
			$T_j=125^\circ\text{C}$	-	130	-	
I_{rr}	Diode Peak Reverse Recovery Current	$I_F=300\text{A}, V_R=300\text{V}$ $di/dt=-1500\text{A}/\mu\text{S}$	$T_j=25^\circ\text{C}$	-	85	-	A
			$T_j=125^\circ\text{C}$	-	100	-	
Q_{rr}	G-E leakage current		$T_j=25^\circ\text{C}$	-	4250	-	nC
			$T_j=125^\circ\text{C}$	-	6500	-	

Thermal Characteristics and Weight

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Junction-to-Case	per IGBT	-	-	0.17	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Junction-to-Case	per DIODE	-	-	0.40	$^\circ\text{C}/\text{W}$
$R_{\theta CK}$	Case-to-Heatsink (Conductive grease applied)	per IGBT	0.05	-	-	$^\circ\text{C}/\text{W}$
Weight	Weight of Module		-	-	300	g

Performance Curves

Fig. 1 Typical IGBT output characteristics ($T_j = 25^\circ\text{C}$)

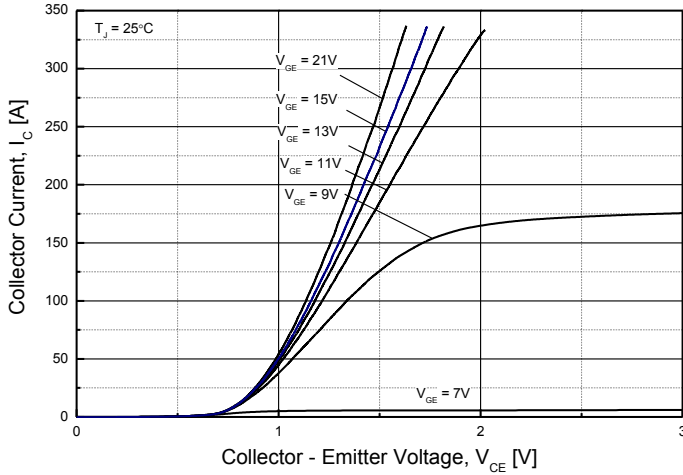


Fig. 2 Typical IGBT output characteristics ($T_j = 125^\circ\text{C}$)

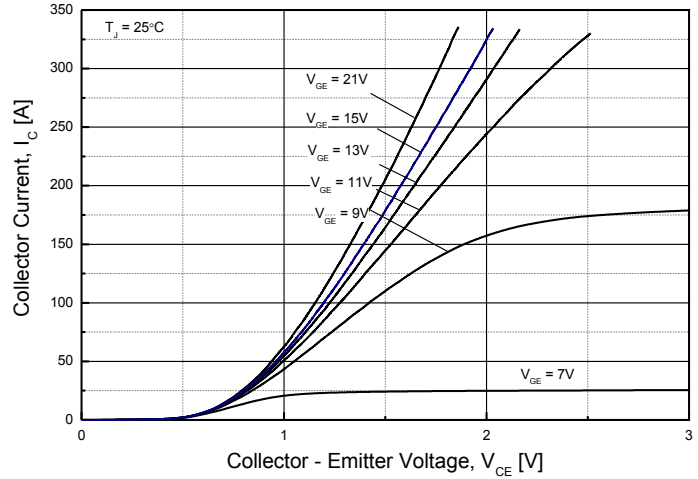


Fig. 3 Typical IGBT output characteristics

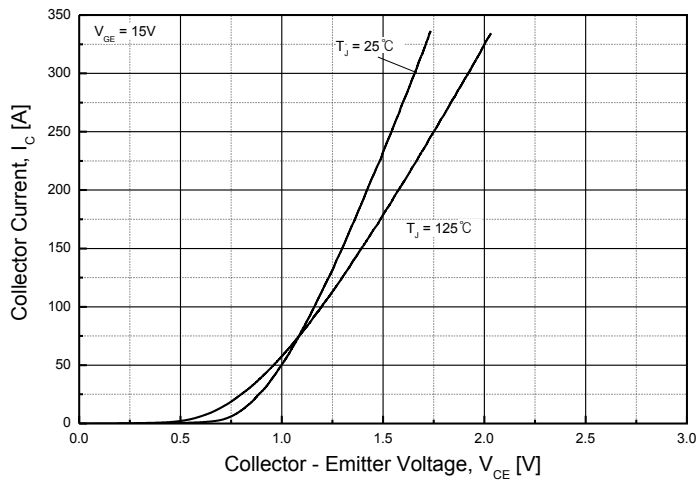


Fig. 4 Typical diode forward characteristics

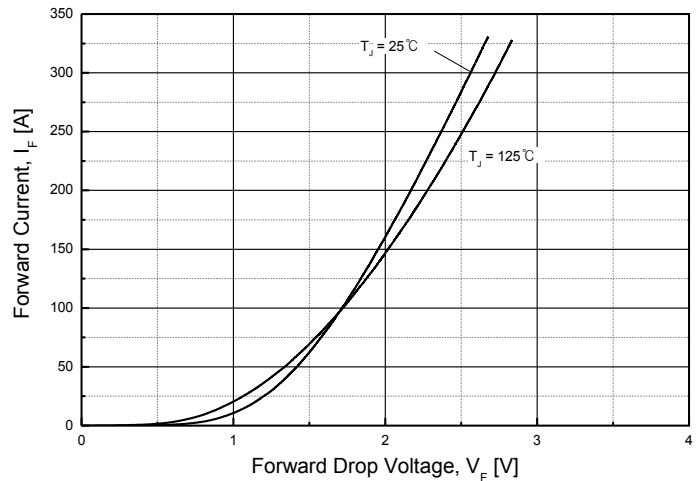


Fig. 5 Typical Switching Energy Loss = $f(R_G)$
 $V_{GE} = \pm 15\text{V}$, $I_C = 300\text{A}$, $V_{CE} = 300\text{V}$, $T_j = 25^\circ\text{C}$

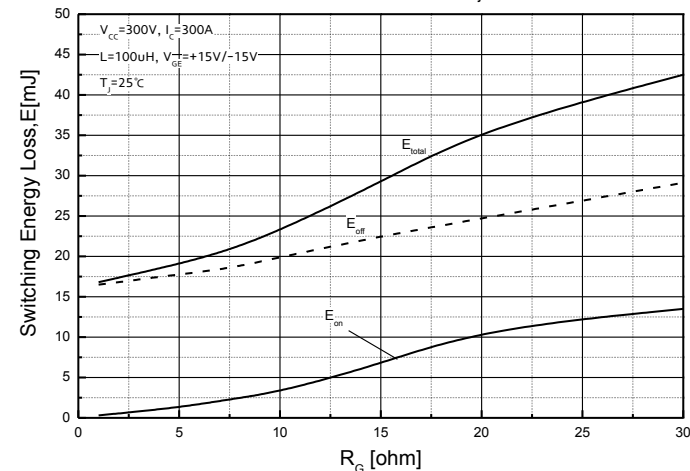
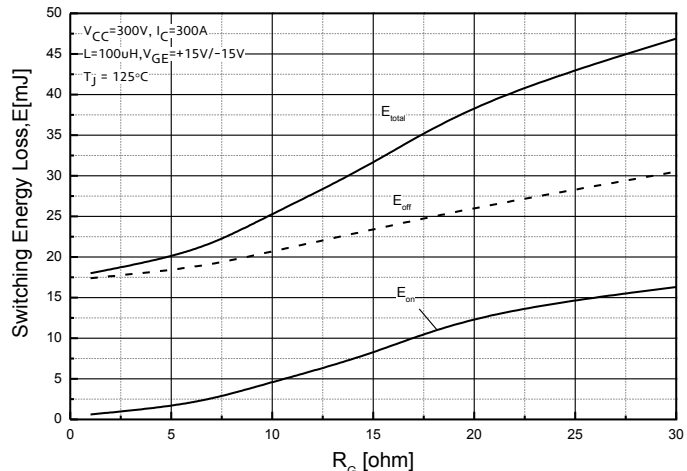


Fig. 6 Typical Switching Energy Loss = $f(R_G)$
 $V_{GE} = \pm 15\text{V}$, $I_C = 300\text{A}$, $V_{CE} = 300\text{V}$, $T_j = 125^\circ\text{C}$



Performance Curves

Fig. 7 Typical Switching Energy Loss =f(I_c)
 $V_{GE} = \pm 15V, R_G = 5.1\Omega, V_{CE} = 300V, T_J = 25^\circ C$

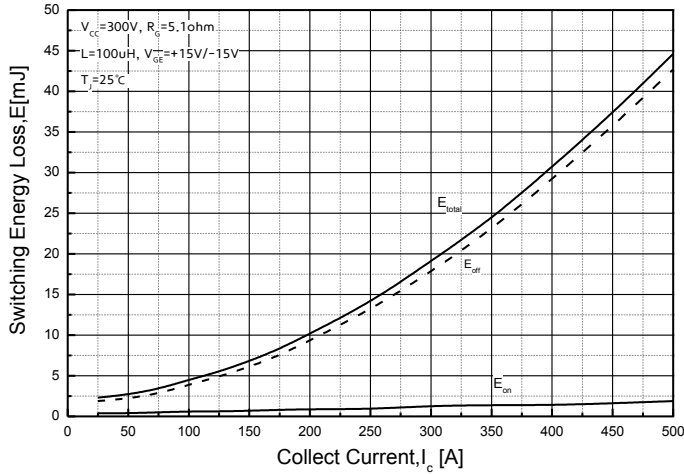


Fig. 8 Typical Switching Energy Loss =f(I_c)
 $V_{GE} = \pm 15V, R_G = 5.1\Omega, V_{CE} = 300V, T_J = 125^\circ C$

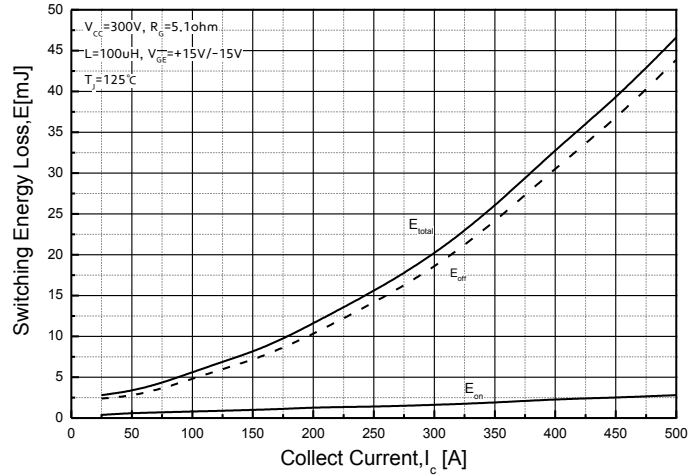


Fig. 9 Gate Charge Characteristics

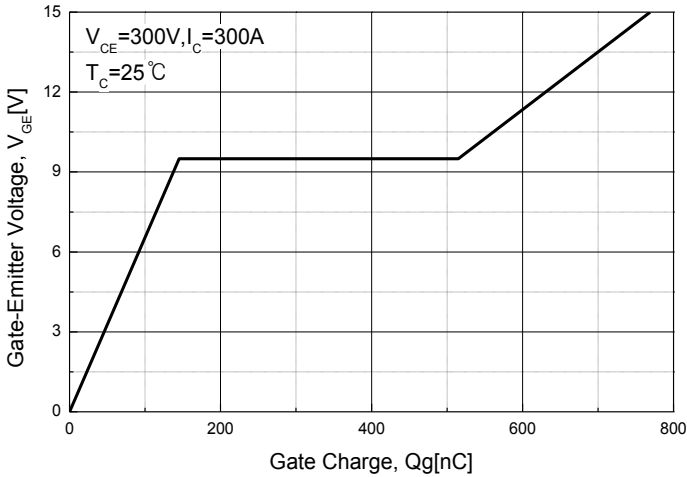
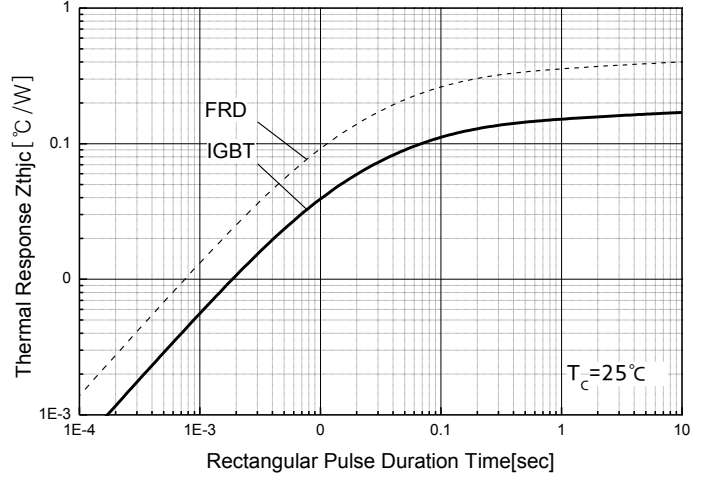
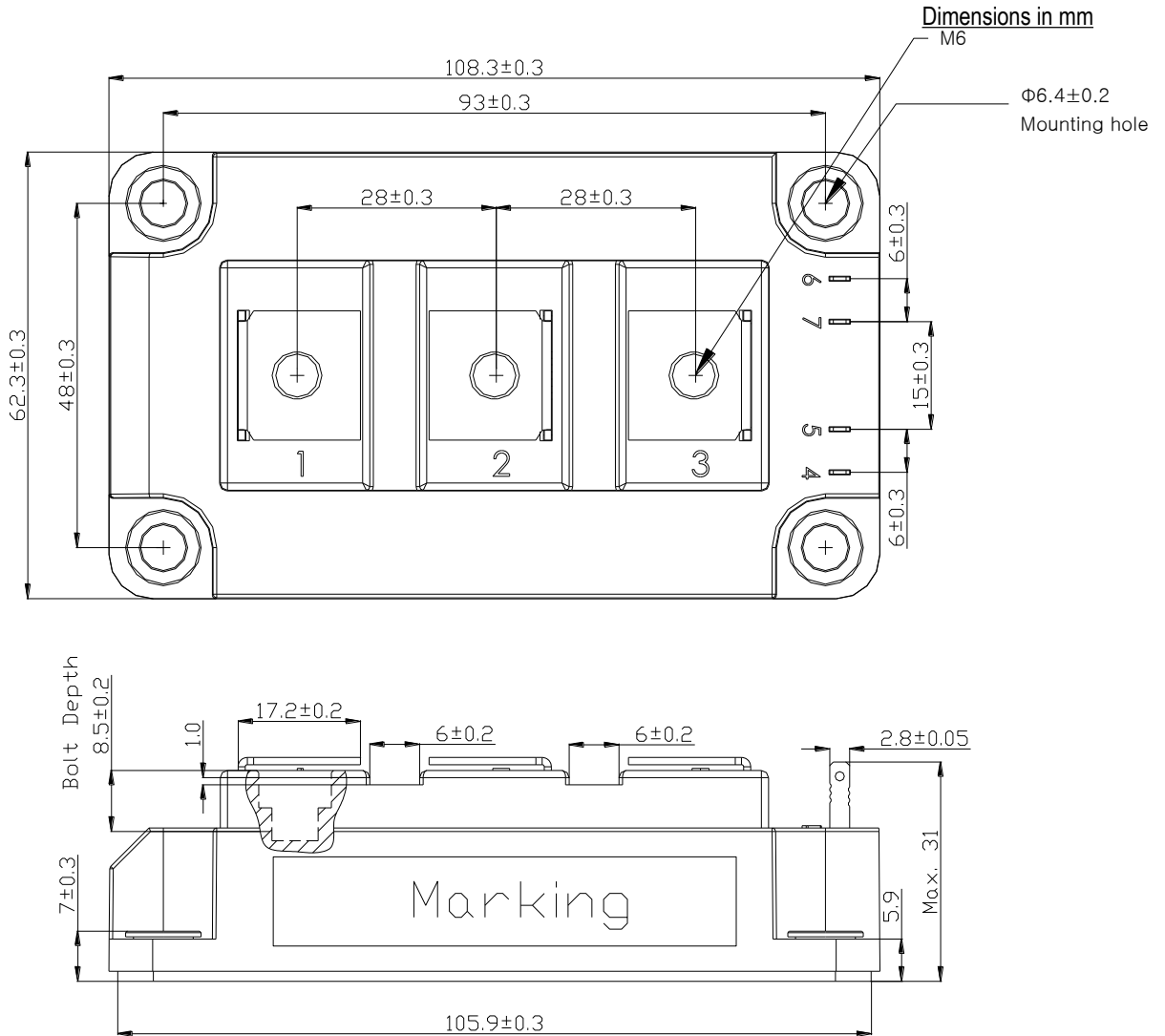


Fig. 10 Transient Thermal Resistor



■ Package Out Line Information

FD9 Package



■ Internal Circuit

