

## FEATURES

- High short circuit capability, self limiting short circuit current
- IGBT CHIP(T4 Fast Trench+Field Stop technology)
- $V_{CE(sat)}$  with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Low switching losses
- $T_{vj\ max} = 175^{\circ}C$

## APPLICATIONS

- High frequency switching application
- Medical applications
- Motion/servo control
- UPS systems



**GA Series Module**

## ABSOLUTE MAXIMUM RATINGS

$T_c=25^{\circ}C$  unless otherwise specified

Symbol	Parameter	Test Conditions	Values	Unit
<b>IGBT</b>				
$V_{CES}$	Collector - Emitter Voltage	$T_{vj}=25^{\circ}C$	1200	V
$V_{GES}$	Gate - Emitter Voltage		$\pm 20$	V
$I_c$	DC Collector Current	$T_c=25^{\circ}C$	60	A
		$T_c=80^{\circ}C$	40	A
$I_{CM}$	Repetitive Peak Collector Current	$t_p=1ms$	80	A
$P_{tot}$	Power Dissipation Per IGBT		250	W
<b>Diode</b>				
$V_{RRM}$	Repetitive Reverse Voltage	$T_{vj}=25^{\circ}C$	1200	V
$I_{F(AV)}$	Average Forward Current	$T_c=25^{\circ}C$	40	A
$I_{FRM}$	Repetitive Peak Forward Current	$t_p=1ms$	80	A

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### ELECTRICAL AND THERMAL CHARACTERISTICS $T_c=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>IGBT</b>						
$V_{GE(th)}$	Gate - Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=1.6\text{mA}$	5.4	6	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	$I_C=40\text{A}, V_{GE}=15\text{V}, T_{Vj}=25^\circ\text{C}$		2.1	2.5	V
		$I_C=40\text{A}, V_{GE}=15\text{V}, T_{Vj}=125^\circ\text{C}$		2.5		V
$I_{CES}$	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{Vj}=25^\circ\text{C}$			2	mA
		$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{Vj}=125^\circ\text{C}$			10	mA
$I_{GES}$	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE} \pm 15\text{V}, T_{Vj}=125^\circ\text{C}$	-400		400	nA
$R_{Gint}$	Integrated Gate Resistor			-		$\Omega$
$Q_g$	Gate Charge	$V_{CE}=600\text{V}, I_C=50\text{A}, V_{GE}=15\text{V}$		0.18		$\mu\text{C}$
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		2.4		nF
$C_{res}$	Reverse Transfer Capacitance				0.13	
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=600\text{V}, I_C=40\text{A}, R_G=15\Omega, V_{GE}=\pm 15\text{V},$ Inductive Load	$T_{Vj}=25^\circ\text{C}$	50		ns
			$T_{Vj}=125^\circ\text{C}$	60		ns
			$T_{Vj}=150^\circ\text{C}$	70		ns
$t_r$	Rise Time		$T_{Vj}=25^\circ\text{C}$	40		ns
			$T_{Vj}=125^\circ\text{C}$	45		ns
			$T_{Vj}=150^\circ\text{C}$	50		ns
$t_{d(off)}$	Turn - off Delay Time	$V_{CC}=600\text{V}, I_C=40\text{A}, R_G=15\Omega, V_{GE}=\pm 15\text{V},$ Inductive Load	$T_{Vj}=25^\circ\text{C}$	320		ns
			$T_{Vj}=125^\circ\text{C}$	360		ns
			$T_{Vj}=150^\circ\text{C}$	400		ns
$t_f$	Fall Time		$T_{Vj}=25^\circ\text{C}$	40		ns
			$T_{Vj}=125^\circ\text{C}$	50		ns
			$T_{Vj}=150^\circ\text{C}$	60		ns
$E_{on}$	Turn - on Energy	$V_{CC}=600\text{V}, I_C=40\text{A}, R_G=15\Omega, V_{GE}=\pm 15\text{V},$ Inductive Load	$T_{Vj}=125^\circ\text{C}$	3.2		mJ
			$T_{Vj}=150^\circ\text{C}$	3.7		mJ
$E_{off}$	Turn - off Energy		$T_{Vj}=125^\circ\text{C}$	2.5		mJ
			$T_{Vj}=150^\circ\text{C}$	3.0		mJ
$I_{sc}$	Short Circuit Current	$t_{psc} \leq 10\mu\text{s}, V_{GE}=15\text{V}$ $T_{Vj}=125^\circ\text{C}, V_{CC}=600\text{V}$		160		A
$R_{thJC}$	Junction-to-Case Thermal Resistance ( Per IGBT )				0.6	K/W
<b>Diode</b>						
$V_F$	Forward Voltage	$I_F=40\text{A}, V_{GE}=0\text{V}, T_{Vj}=25^\circ\text{C}$		2.15	2.45	V
		$I_F=40\text{A}, V_{GE}=0\text{V}, T_{Vj}=125^\circ\text{C}$		2.20		V
$t_{rr}$	Reverse Recovery Time	$I_F=40\text{A}, V_R=600\text{V}$		165		ns
$I_{RRM}$	Max. Reverse Recovery Current	$di_F/dt=-1000\text{A}/\mu\text{s}$		41		A
$E_{rec}$	Reverse Recovery Energy	$T_{Vj}=125^\circ\text{C}$		2.3		mJ
$R_{thJCD}$	Junction-to-Case Thermal Resistance ( Per Diode )				1.5	K/W

**MODULE CHARACTERISTICS**

$T_C=25^{\circ}\text{C}$  unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$T_{Vj\ max}$	Max. Junction Temperature				175	$^{\circ}\text{C}$
$T_{Vj\ op}$	Operating Temperature		-40		150	$^{\circ}\text{C}$
$T_{stg}$	Storage Temperature		-40		125	$^{\circ}\text{C}$
$V_{isol}$	Insulation Test Voltage	AC, $t=1\text{min}$		3000		V
Torque	Module-to-Sink	Recommended (M5)	2.5		5	$\text{N}\cdot\text{m}$
Torque	Module Electrodes	Recommended (M5)	2.5		5	$\text{N}\cdot\text{m}$
Weight				120		g

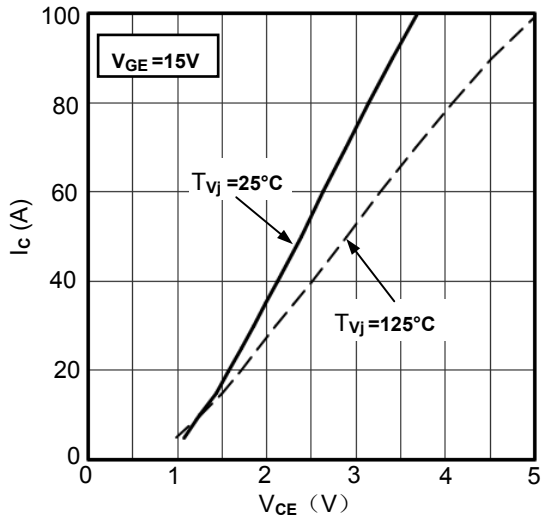


Figure1. Typical Output Characteristics

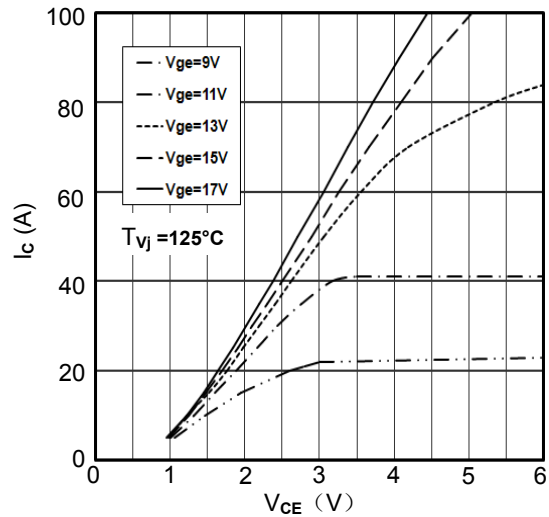


Figure2. Typical Output Characteristics

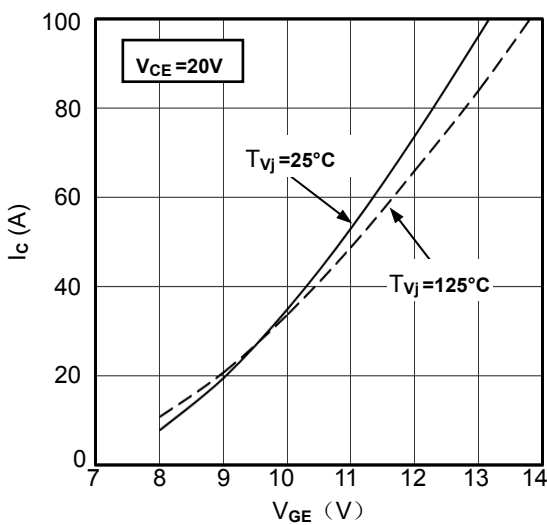


Figure3. Typical Transfer characteristics

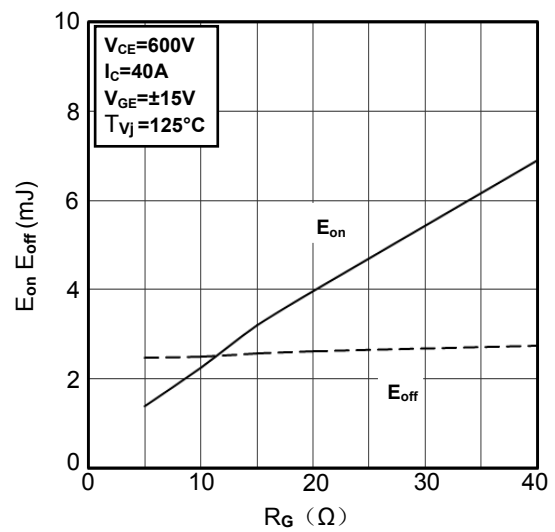


Figure4. Switching Energy vs. Gate Resistor

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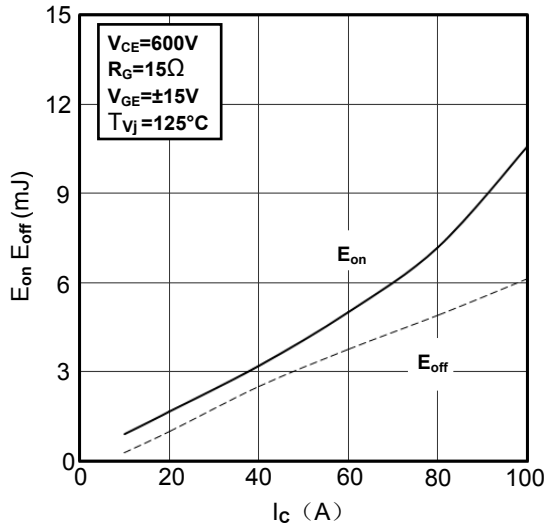


Figure 5. Switching Energy vs. Collector Current

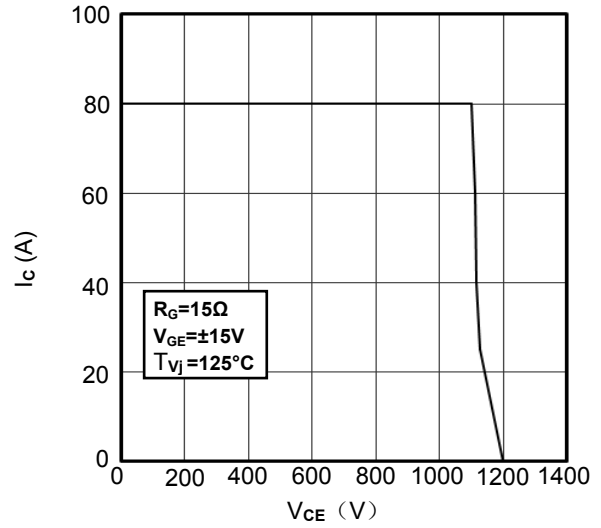


Figure 6. Reverse Biased Safe Operating Area

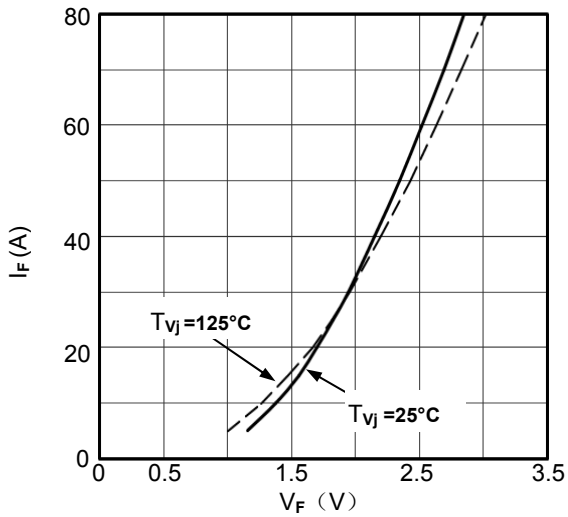


Figure 7. Diode Forward Characteristics

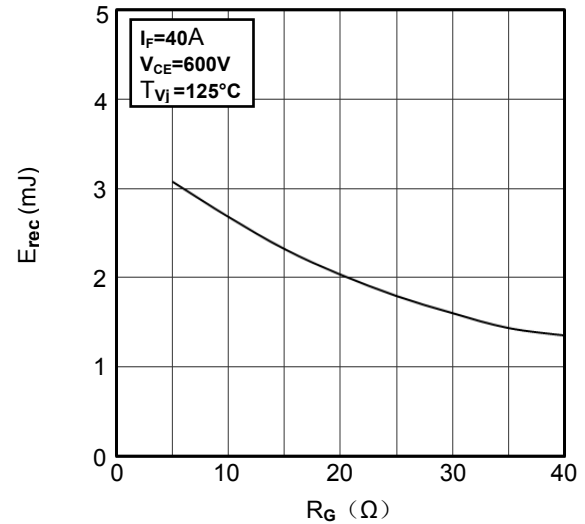


Figure 8. Switching Energy vs. Gate Resistor

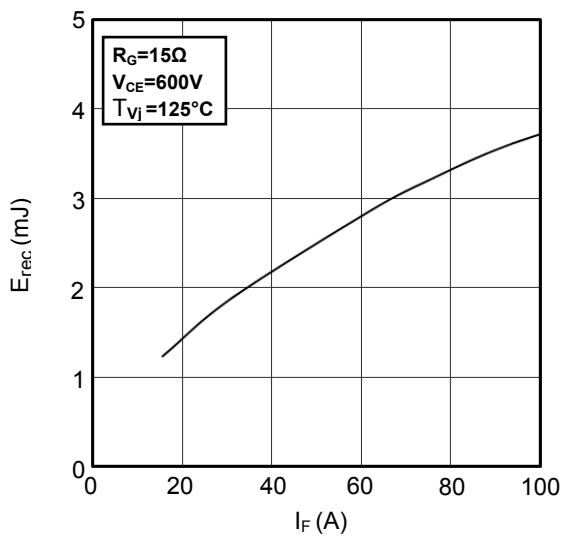


Figure 9. Switching Energy vs. Forward Current

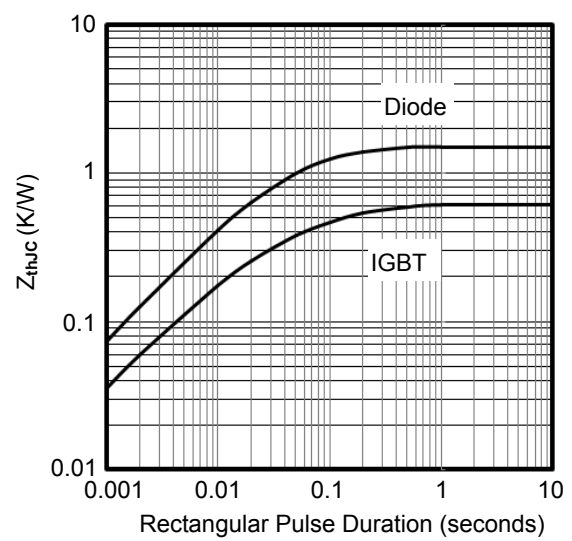


Figure 10. Transient Thermal Impedance

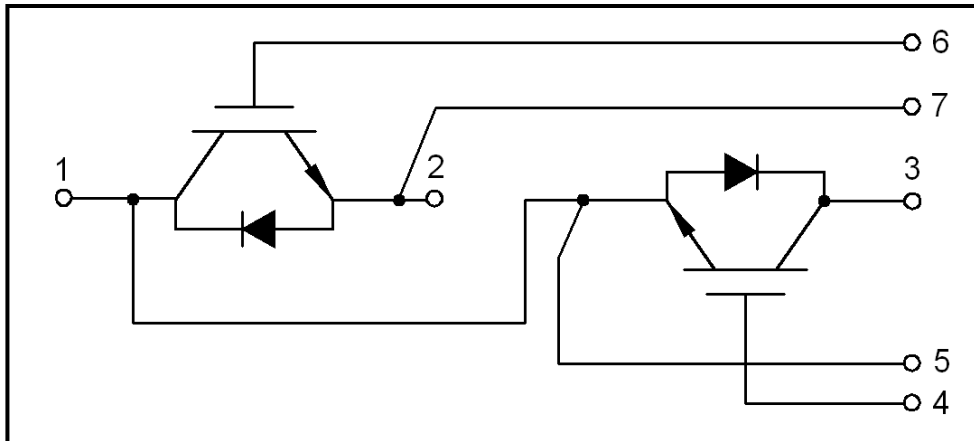
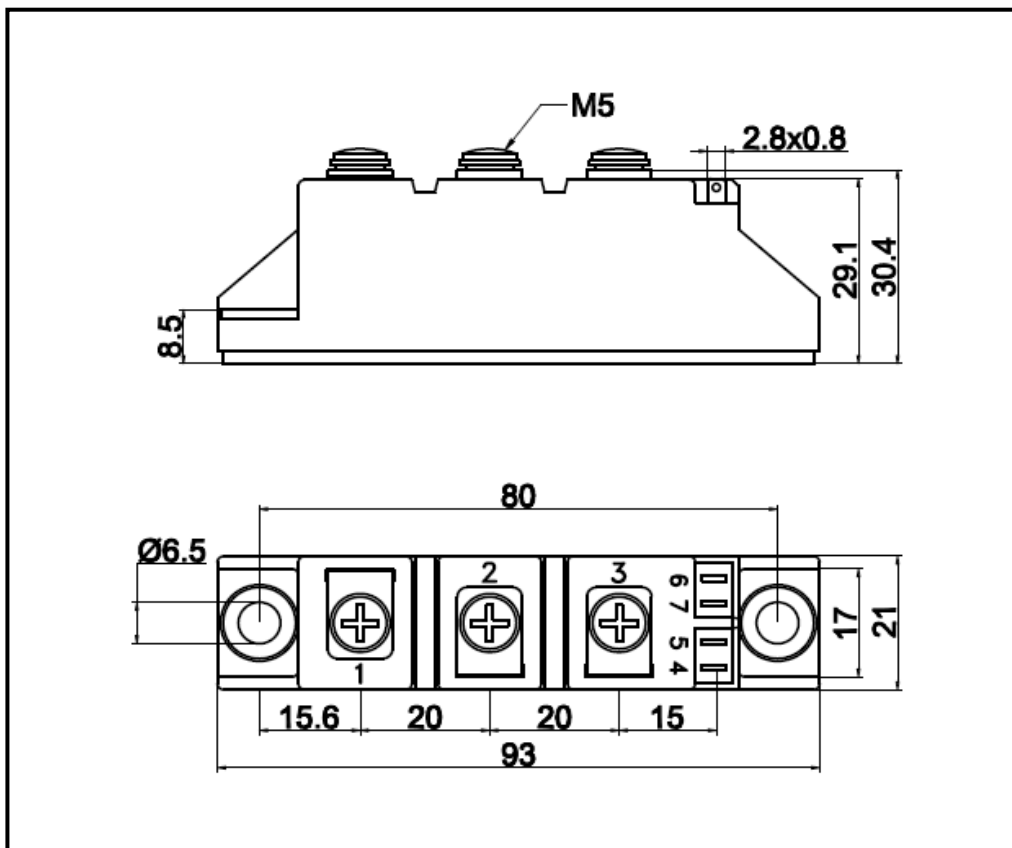


Figure11. Circuit Diagram



Dimensions (mm)  
Figure12. Package Outline