



IGBT Modules

V_{CE}	650	V
I_C	40	A
$V_{CE(SAT)} I_C=40A$	1.80	V

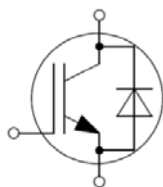
Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply
- Motion/servo control

Features

- High breakdown voltage to 650V for improved reliability
- Maximum junction temperature 175°C
- Positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- High short circuit capability(5us)

Circuit



Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	V_{CE}	650	V
DC Collector Current, limited by T_{jmax} $T_C=25^{\circ}C$ $T_C=100^{\circ}C$	I_C	80 40	A
Diode Forward Current, limited by T_{jmax} $T_C=25^{\circ}C$ $T_C=100^{\circ}C$	I_F	80 40	A
Continuous Gate-Emitter Voltage	V_{GE}	± 20	V
Transient Gate-Emitter Voltage	V_{GE}	± 30	V
Turn off Safe Operating Area $V_{CE} \leq 650V$, $T_j \leq 150^{\circ}C$		160	A
Pulsed Collector Current, $V_{GE}=15V$, t_p limited by T_{jmax}	I_{CM}	160	A
Diode Pulsed Current, t_p limited by T_{jmax}	I_{Fpuls}	160	A
Short Circuit Withstand Time, $V_{GE}=15V$, $V_{CC}=400V$, $V_{CEM} \leq 650V$	T_{sc}	5	μs
Power Dissipation, $T_j=175^{\circ}C$, $T_c=25^{\circ}C$	P_{tot}	250	W



Operating Junction Temperature	T_j	-40...+175	°C
Storage Temperature	T_s	-55...+150	°C
Soldering Temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	°C

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static						
Collector-Emitter Breakdown Voltage	BV_{CES}	$V_{GE}=0V, I_C=250\mu A$	650		-	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=250\mu A$	4.5	5.0	5.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A$ $T_j=25^\circ\text{C}$, $T_j=125^\circ\text{C}$ $T_j=150^\circ\text{C}$		1.80 2.10 2.20	2.00	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$ $T_j=25^\circ\text{C}$, $T_j=150^\circ\text{C}$			0.25 1	mA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$			100	nA

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V$, $f=1\text{MHz}$	-	1.90	-	nF
Reverse Transfer Capacitance	C_{res}		-	0.12	-	
Gate Charge	Q_G	$V_{CC}=300V, I_C=40A$, $V_{GE}=15V$	-	0.20	-	uC
Short Circuit Collector Current	I_{SC}	$V_{GE}=15V, t_{sc}\leq 5\mu s$, $V_{CC}=300V, T_j\leq 150^\circ\text{C}$	-	200	-	A

**Electrical Characteristics of the Diode** ($T_j = 25^\circ\text{C}$ unless otherwise specified):

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static						
Diode Forward Voltage	V_F	$I_F = 40\text{A}$ $T_j = 25^\circ\text{C}$, $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$		2.00 2.00 2.00		V

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T _j = 25℃						
Turn-on Delay Time	t _{d(on)}	V _{CC} =300V, I _C =40A, V _{GE} = -15v~15V, R _g =33Ω,L _s =60nH	-	40	-	ns
Rise Time	t _r		-	68	-	ns
Turn-on Energy	E _{on}		-	0.90	-	mJ
Turn-off Delay Time	t _{d(off)}		-	115	-	ns
Fall Time	t _f		-	35	-	ns
Turn-off Energy	E _{off}		-	0.40	-	mJ
Dynamic , at T _j = 125℃						
Turn-on Delay Time	t _{d(on)}	V _{CC} =300V, I _C =40A,, V _{GE} = -15v~15V, R _g =33Ω,L _s =60nH	-	48	-	ns
Rise Time	t _r		-	76	-	ns
Turn-on Energy	E _{on}		-	1.35	-	mJ
Turn-off Delay Time	t _{d(off)}		-	150	-	ns
Fall Time	t _f		-	40	-	ns
Turn-off Energy	E _{off}		-	0.60	-	mJ
Dynamic , at T _j = 150℃						
Turn-on Delay Time	t _{d(on)}	V _{CC} =300V, I _C =40A,, V _{GE} = -15v~15V, R _g =33Ω,L _s =60nH	-	50	-	ns
Rise Time	t _r		-	80	-	ns
Turn-on Energy	E _{on}		-	1.50	-	mJ
Turn-off Delay Time	t _{d(off)}		-	190	-	ns
Fall Time	t _f		-	45	-	ns
Turn-off Energy	E _{off}		-	0.70	-	mJ

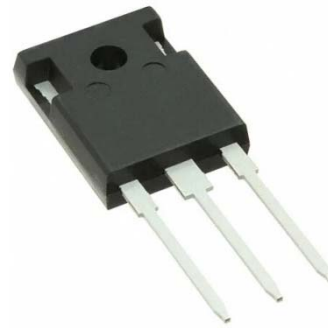
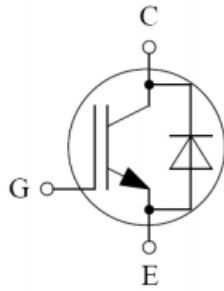
**Electrical Characteristics of the DIODE**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T _j = 25°C						
Reverse Recovery Current	I _{rr}	I _F =40A,V _R =300V di/dt= -400A/μs	-	9.0	-	A
Reverse Recovery Charge	Q _{rr}		-	0.14	-	uC
Diode Reverse Recovery Time	T _{rr}			180		ns
Reverse Recovery Energy	E _{rec}		-	0.09	-	mJ
Dynamic , at T _j = 125°C						
Reverse Recovery Current	I _{rr}	I _F =40A,V _R =300V di/dt= -400A/μs	-	14	-	A
Reverse Recovery Charge	Q _{rr}		-	0.30	-	uC
Diode Reverse Recovery Time	T _{rr}			260		ns
Reverse Recovery Energy	E _{rec}		-	0.15	-	mJ
Dynamic , at T _j = 150°C						
Reverse Recovery Current	I _{rr}	I _F =40A,V _R =300V di/dt= -400A/μs	-	16	-	A
Reverse Recovery Charge	Q _{rr}		-	0.35	-	uC
Diode Reverse Recovery Time	T _{rr}			280		ns
Reverse Recovery Energy	E _{rec}		-	0.18	-	mJ

Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	R _{th(j-c)}	0.60	K/W
Diode Thermal Resistance, Junction - Case	R _{th(j-c)}	1.40	K/W
Thermal Resistance, Junction - Ambient	R _{th(j-a)}	40	K/W

● Circuit Diagram



● Package Outline Information

CASE: TO 247

