

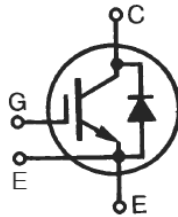


# High-frequency switch IGBT Module 1200V / 150A

## Features

- ◆ Fast switching field stop IGBT trench technology
- ◆ Low switching loss
- ◆ Superfast diodes
- ◆ High short circuit capability

Preliminary



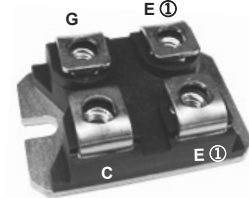
## Applications

- ◆ Welder / Power Supply
- ◆ UPS / Inverter
- ◆ Industrial Motor Drive

## Maximum Ratings (T<sub>c</sub>=25°C)

Item	Symbol	Rated Value	Unit
Collector-Emitter Voltage	V <sub>CES</sub>	1200	V
Gate-Emitter Voltage	V <sub>GES</sub>	±20	V
DC-Collector Current	T <sub>c</sub> = 80°C I <sub>C,nom.</sub>	150	A
Repetitive Peak Collector Current	tp = 1ms I <sub>CRM</sub>	300	A
Total Power Dissipation	P <sub>tot</sub>	680	W
Isolation Voltag (e Terminal to Base, AC 1 min.)	V <sub>iso</sub>	3000	V
DC Forward Current	I <sub>F</sub>	150	A
Repetitive Peak Forward. Current	tp = 1ms I <sub>FRM</sub>	300	A
Junction Temperature Range	T <sub>J</sub>	-40~+150	°C
Storage Temperature Range	T <sub>stg</sub>	-40~+125	°C
Mounting Torque		1.3	N.m
Weight		30.5	g

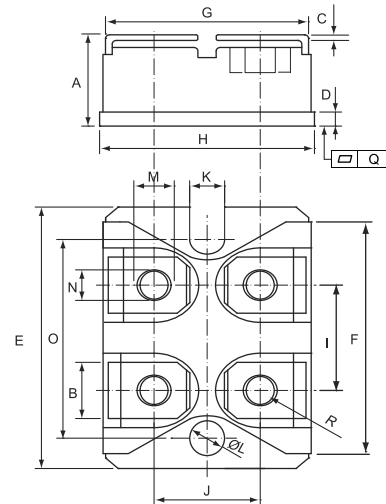
### SOT-227



G = Gate, C = Collector, E = Emitter

① either emitter terminal can be used as Main or Kelvin Emitter

Dimensions in inches and (millimeters)



	DIMENSIONS			
	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.460	0.483	11.68	12.28
B	0.307	0.323	7.80	8.20
C	0.030	0.033	0.75	0.85
D	0.071	0.081	1.80	2.05
E	1.488	1.504	37.80	38.20
F	1.248	1.260	31.70	32.00
G	0.917	0.957	23.30	24.30
H	0.996	1.008	25.30	25.60
I	0.579	0.602	14.70	15.30
J	0.492	0.516	12.50	13.10
K	0.161	0.169	4.10	4.30
L	0.161	0.169	4.10	4.30
M	0.181	0.197	4.60	5.00
N	0.165	0.181	4.20	4.60
O	1.181	1.197	30.00	30.40
Q	-0.002	0.004	-0.05	0.10
R	M4*8			



■ **Electrical Characteristics** (  $T_{VJ} = 25^{\circ}\text{C}$  )

Characteristic		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Collector-Emitter Cut-Off Current		$I_{CES}$	$V_{CE} = 1200\text{V}$ $V_{GE} = 0\text{V}$	-	-	1000	$\mu\text{A}$
Gate-Emitter Leakage Current		$I_{GES}$	$V_{GE} = 20\text{V}$ $V_{CE} = 0\text{V}$	-	-	400	nA
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	$I_C = 150\text{A}$ , $V_{GE} = 15\text{V}$	-	1.9	2.2	V
Gate-Emitter Threshold Voltage		$V_{GE(th)}$	$V_{CE} = V_{GE}$ , $I_C = 4\text{mA}$	4.5	5.5	6.5	V
Input Capacitance		$C_{ies}$	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$	-	20	-	nF
Output Capacitance		$C_{oes}$	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$	-	0.50	-	nF
Reverse Transfer Capacitance		$C_{res}$	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$	-	0.33	-	nF
Switching Time	Rise Time	$t_r$	$V_{CC} = 600\text{V}$ $I_C = 150\text{A}$ $R_G = 1\Omega$ $V_{GE} = \pm 15\text{V}$	-	0.05	-	$\mu\text{s}$
	Turn-On Time	$t_{d,on}$		-	0.076	-	
	Fall Time	$t_f$		-	0.075	-	
	Turn-Off Time	$t_{d,off}$		-	0.309	-	
Turn-on Energy Loss Per Pulse		$E_{on}$	$I_C = 150\text{A}$ , $V_{CC} = 600\text{V}$ $V_{GE} = 15\text{V}$ , $R_G = 1\Omega$	-	1.0	-	mJ
Turn-off Energy Loss Per Pulse		$E_{off}$	Inductive load	-	11.2	-	mJ
External Gate Resistance		$R_G$	Per Switch	4.7	-	20	$\Omega$
Internal Gate Resistance		$R_G$		4.7			$\Omega$

■ **Free Wheeling Diode Ratings & Characteristics** (  $T_{VJ} = 25^{\circ}\text{C}$  )

Characteristic		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Peak Forward Voltage		$V_F$	$I_F = 150\text{A}$ , $V_{GE} = 0\text{V}$	-	1.8	2.3	V
Peak Reverse Recovery Current		$I_{RM}$	$I_F = 150\text{A}$ , $R_G = 1\Omega$ $V_R = 600\text{V}$ , $V_{GE} = -15\text{V}$	-	80	-	A
Recovered Charge		$Q_r$	$I_F = 150\text{A}$ , $R_G = 1\Omega$ $V_R = 600\text{V}$ , $V_{GE} = -15\text{V}$	-	7.8	-	$\mu\text{C}$
Reverse Recovery Energy		$E_{rec}$	$I_F = 150\text{A}$ , $R_G = 1\Omega$ $V_R = 600\text{V}$ , $V_{GE} = -15\text{V}$	-	5.0	-	mJ
Reverse Recovery Time		$T_{rr}$	$I_F = 150\text{A}$ , $R_G = 1\Omega$ $V_R = 300\text{V}$ , $V_{GE} = -15\text{V}$	-	115	-	ns

■ **Thermal Characteristics** (  $T_C = 25^{\circ}\text{C}$  )

Characteristic		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Thermal Impedance	IGBT	$R_{th(j-c)}$	Junction to Case	-	-	0.20	$^{\circ}\text{C/W}$
	Diode			-	-	0.35	



Typical Characteristics

Preliminary Data

Fig.1 Output characteristic (Typical)

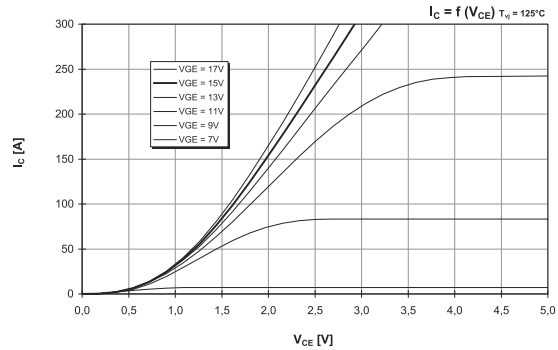
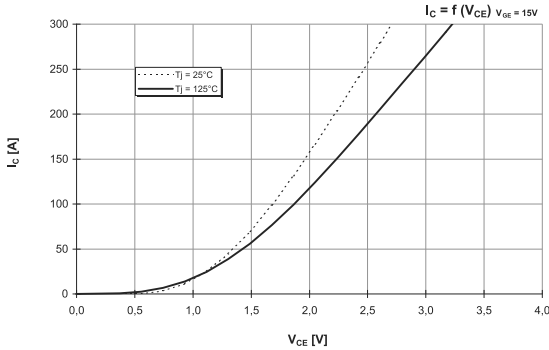


Fig.2 Transfer characteristic (Typical)

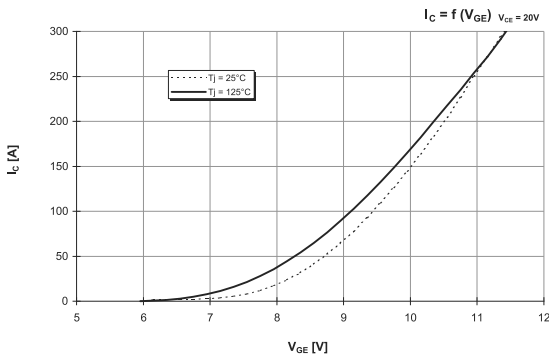


Fig.3 Forward characteristic of inverse diode (typical)

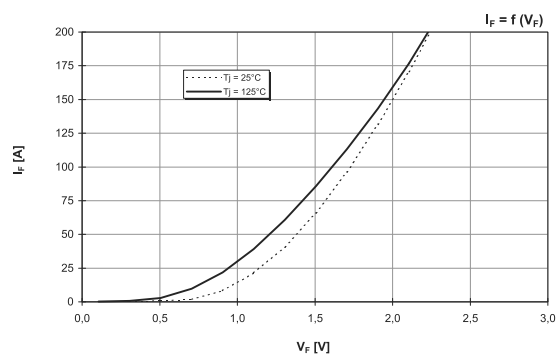


Fig.4 Switching losses (Typical)

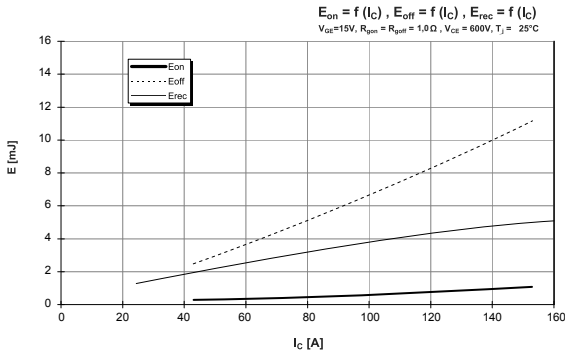


Fig.5 Switching losses IGBT, Inverter (typical)

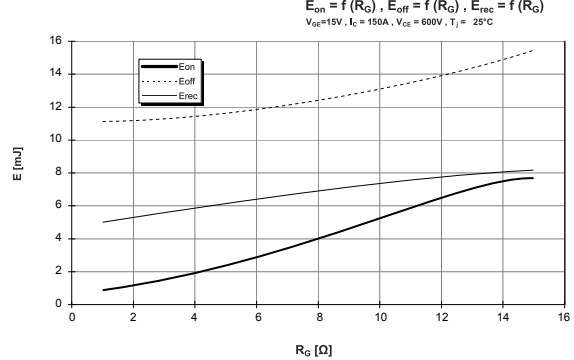
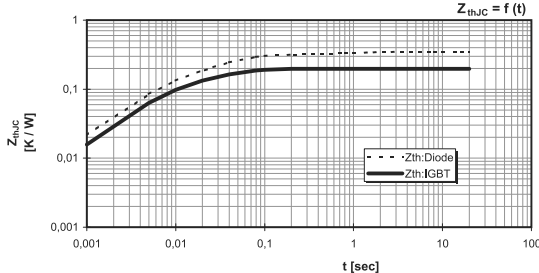
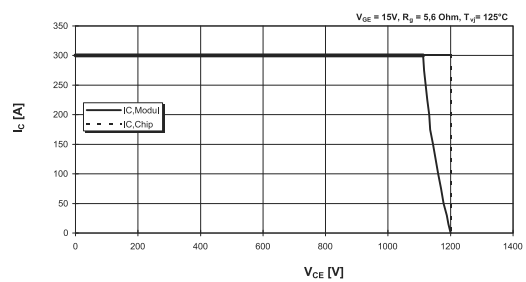


Fig.5 Transient thermal impedance



i	1	2	3	4
$r_f$ [K/kW] : IGBT	44.54	33.9	21.52	0.04
$\tau_f$ [sec] : IGBT	0.006	0.029	0.043	1.014
$r_f$ [K/kW] : Diode	68.24	101.68	52.66	27.42
$\tau_f$ [sec] : Diode	0.006	0.035	0.033	0.997

Fig.6 Reverse bias safe operation area (RBSOA)





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