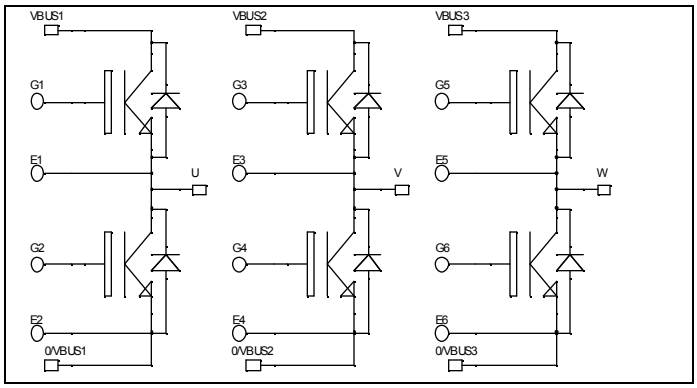
Triple phase leg Trench IGBT® Power Module

V_{CES} = 1700V
I_C = 50A @ Tc = 80°C

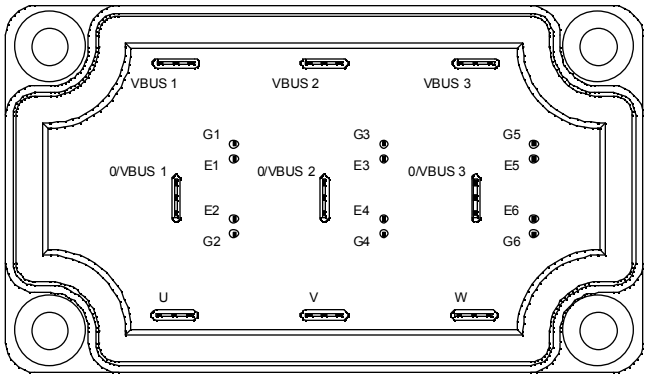


Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features

- Trench + Field Stop IGBT® Technology
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 20 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - Avalanche energy rated
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- High level of integration
- Kelvin emitter for easy drive



Benefits

- Stable temperature behavior
- Very rugged
- Solderable terminals for easy PCB mounting
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Very low (12mm) profile
- Each leg can be easily paralleled to achieve a phase leg of three times the current capability
- Module can be configured as a three phase bridge
- Module can be configured as a boost followed by a full bridge

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		1700	V
I_C	Continuous Collector Current	T_C = 25°C	70	A
		T_C = 80°C	50	
I_{CM}	Pulsed Collector Current	T_C = 25°C	100	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	310	W
RBSOA	Reverse Bias Save Operating Area	T_j = 125°C	100A @ 1600V	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed

All ratings @ T_j = 25°C unless otherwise specified

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
BV_{CES}	Collector - Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 2.5mA		1700			V
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V, V_{CE} = 1700V				5	mA
$V_{CE(on)}$	Collector Emitter on Voltage	V_{GE} =15V, I_C = 50A	T_j = 25°C		2.0	2.4	V
			T_j = 125°C		2.4		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE}, I_C = 2.5 mA		5.0		6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				600	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	V_{GE} = 0V ;V_{CE} = 25V f = 1MHz		4400		pF
C_{rss}	Reverse Transfer Capacitance			150		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 900V I_C = 50A R_G = 22Ω		200		ns
T_r	Rise Time			90		
$T_{d(off)}$	Turn-off Delay Time			720		
T_f	Fall Time			90		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) V_{GE} = ±15V V_{Bus} = 900V I_C = 50A R_G = 22Ω Diode		220		ns
T_r	Rise Time			90		
$T_{d(off)}$	Turn-off Delay Time			820		
T_f	Fall Time			110		
E_{on}	Turn-on Switching Energy ❶			29		mJ
E_{off}	Turn-off Switching Energy ❷			22		

❶ E_{on} includes diode reverse recovery
❷ In accordance with JEDEC standard JESD24-1

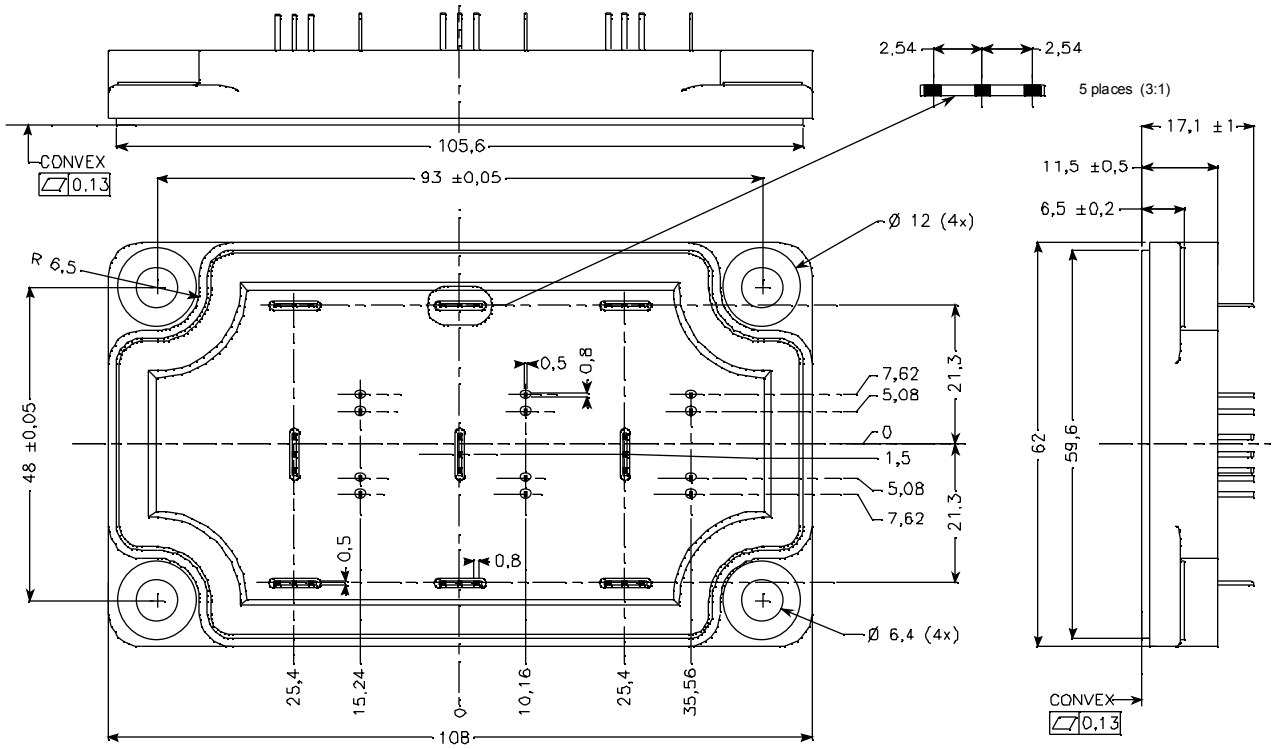
Reverse diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1700			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1700V	T_j = 25°C			250	µA
			T_j = 125°C			500	
V_F	Diode Forward Voltage	I_F = 50A V_{GE} = 0V	T_j = 25°C		1.8	2.2	V
			T_j = 125°C		1.9		
Q_{rr}	Reverse Recovery Charge	I_F = 50A V_R = 900V di/dt =990A/µs	T_j = 25°C		19		µC
			T_j = 125°C		30		

Thermal and package characteristics

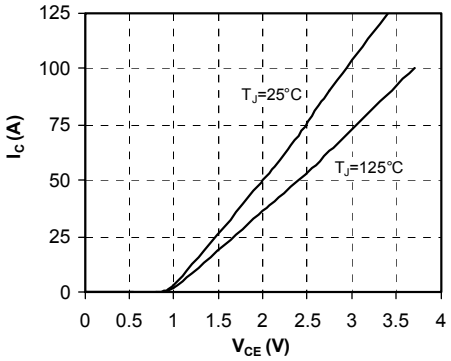
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case		IGBT			0.4	°C/W
			Diode			0.7	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			3500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
Wt	Package Weight					250	g

Package outline

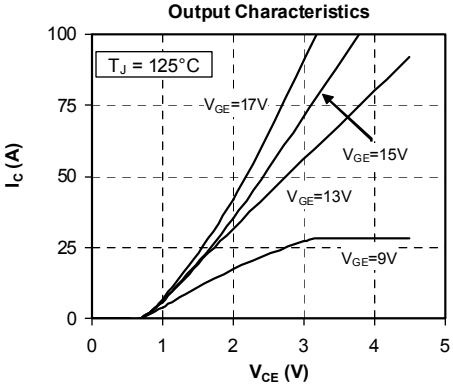


Typical Performance Curve

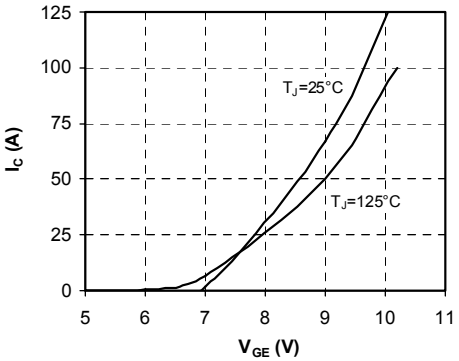
Output Characteristics (V_{GE}=15V)



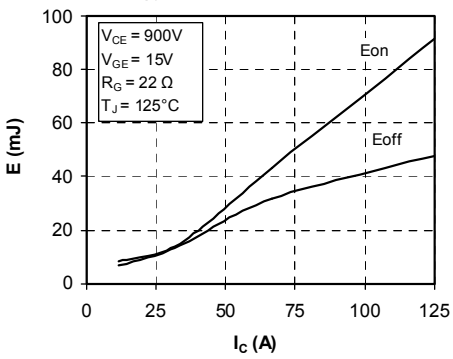
Output Characteristics



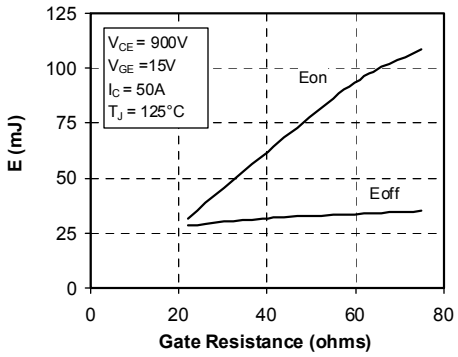
Transfert Characteristics



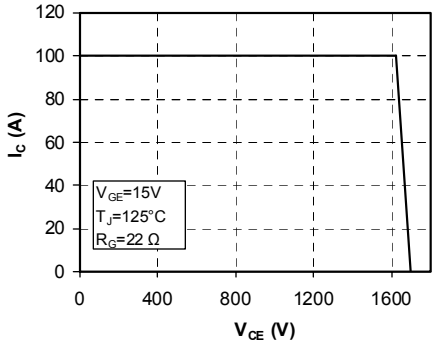
Energy losses vs Collector Current



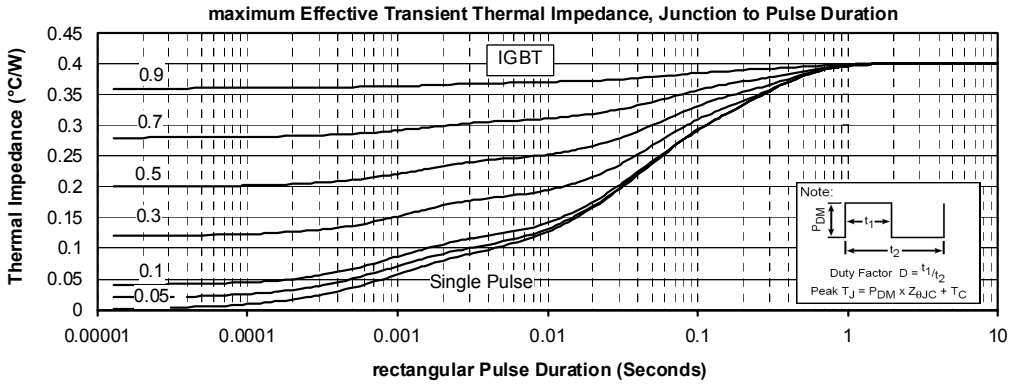
Switching Energy Losses vs Gate Resistance



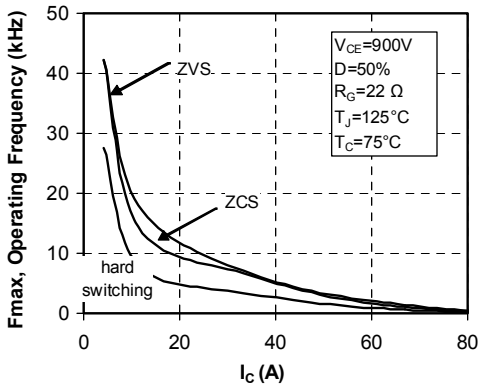
Reverse Safe Operating Area



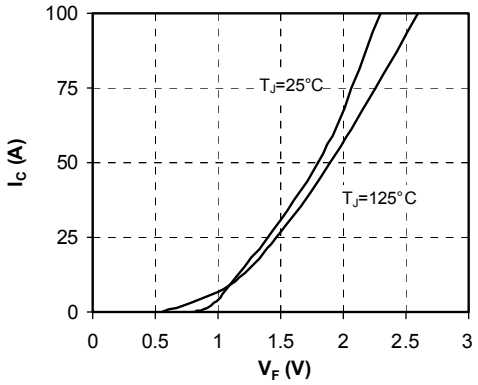
maximum Effective Transient Thermal Impedance, Junction to Pulse Duration



Operating Frequency vs Collector Current



Forward Characteristic of diode



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