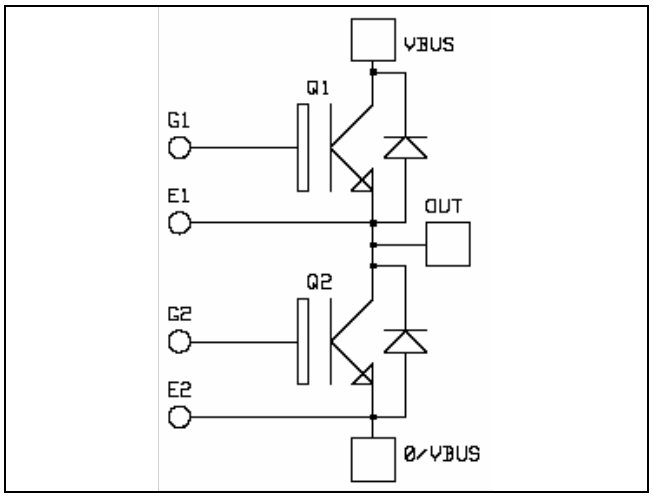
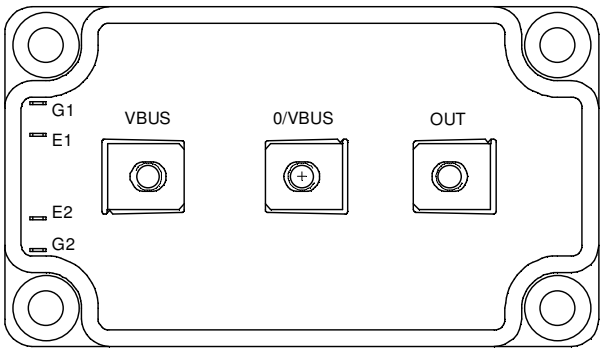
Phase leg
PT IGBT Power Module

V_{CES} = 1200V
I_C = 180A @ Tc = 80°C





Application

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

Features

- Power MOS 7® Punch Through (PT) IGBT
  - Low conduction loss
  - Ultra fast tail current shutoff
  - Low gate charge
  - Switching frequency capability in the 50kHz range
  - Soft recovery parallel diodes
  - Low diode VF
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		1200	V
I_C	Continuous Collector Current	T_c = 25°C	250	A
		T_c = 80°C	180	
I_{CM}	Pulsed Collector Current	T_c = 25°C	630	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_c = 25°C	1041	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°C	630A @ 960V	

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 = 750µA		1200			V
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V V_{CE} = 1200V	T_j = 25°C			750	µA
			T_j = 125°C			7500	
$V_{CE(on)}$	Collector Emitter on Voltage	V_{GE} =15V I_C = 180A	T_j = 25°C		3.3	3.9	V
			T_j = 125°C		3.0		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE}, I_C = 6 mA		3		6	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = ±20V, V_{CE} = 0V				±250	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz		19.4		nF
C_{oes}	Output Capacitance			1.48		
C_{res}	Reverse Transfer Capacitance			0.18		
Q_g	Total gate Charge	V_{GE} = 15V V_{Bus} = 600V I_C = 180A		900		nC
Q_{ge}	Gate – Emitter Charge			126		
Q_{gc}	Gate – Collector Charge			372		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = 15V V_{Bus} = 600V I_C = 180A R_G = 0.8Ω		16		ns
T_r	Rise Time			20		
$T_{d(off)}$	Turn-off Delay Time			94		
T_f	Fall Time			40		
E_{on1}	Turn-on Switching Energy			4.5		mJ
E_{on2}	Turn-on Switching Energy ❶			7.8		
E_{off}	Turn-off Switching Energy ❷			4.08		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) V_{GE} = 15V V_{Bus} = 600V I_C = 180A R_G = 0.8Ω		16		ns
T_r	Rise Time			20		
$T_{d(off)}$	Turn-off Delay Time			147		
T_f	Fall Time			75		
E_{on1}	Turn-on Switching Energy			4.5		mJ
E_{on2}	Turn-on Switching Energy ❶			12.8		
E_{off}	Turn-off Switching Energy ❷			10.5		

Reverse diode ratings and characteristics

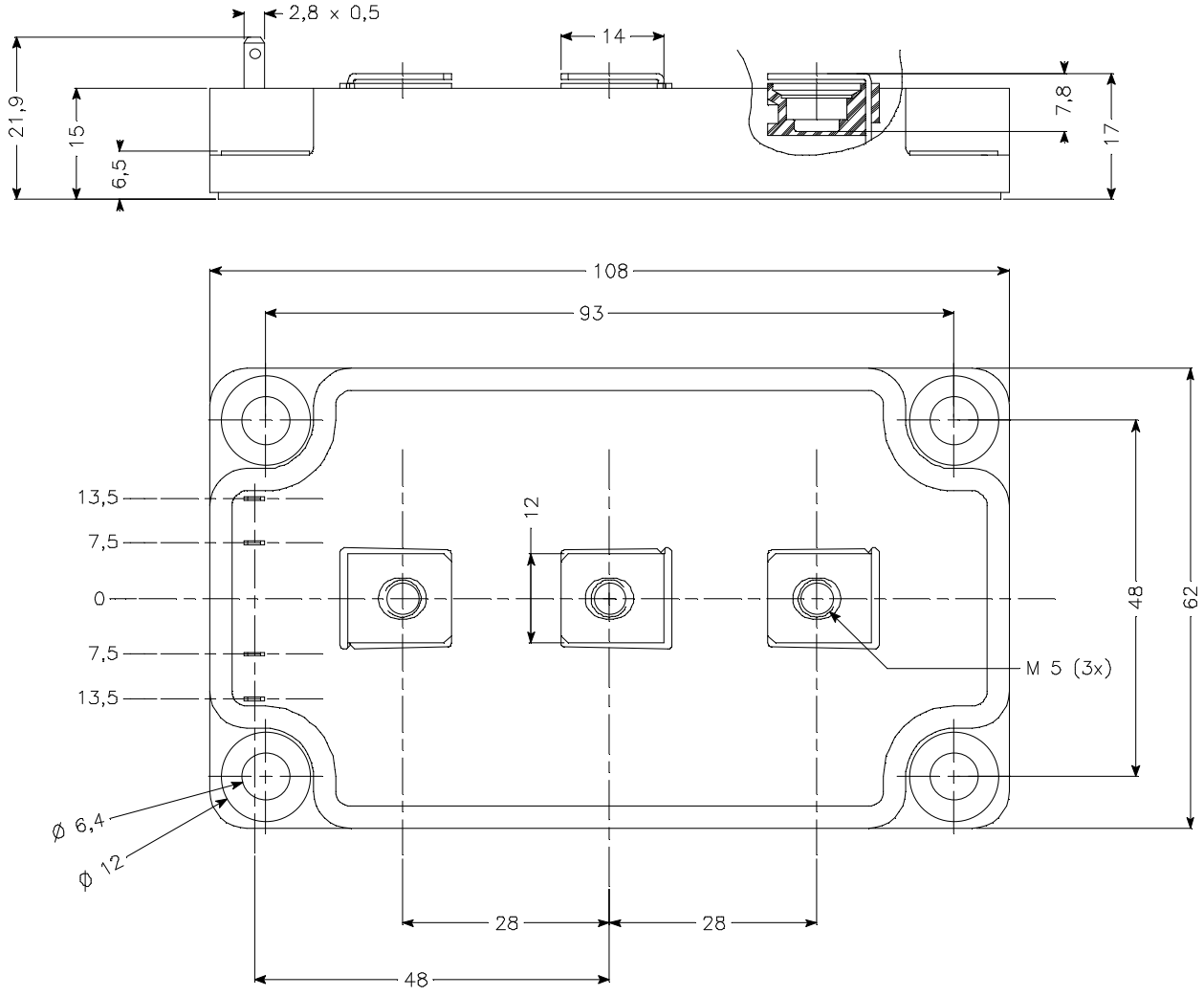
Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	Tc = 70°C		200		A
V_F	Diode Forward Voltage	I_F = 200A			2.0	2.5	V
		I_F = 400A			2.3		
		I_F = 200A	T_j = 125°C		1.8		
t_{rr}	Reverse Recovery Time	I_F = 200A V_R = 800V di/dt =400A/µs	T_j = 25°C		420		ns
			T_j = 125°C		580		
Q_{rr}	Reverse Recovery Charge	I_F = 200A V_R = 800V di/dt =400A/µs	T_j = 25°C		2.5		µC
			T_j = 125°C		10.7		

❶ E_{on2} includes diode reverse recovery
❷ In accordance with JEDEC standard JESD24-1

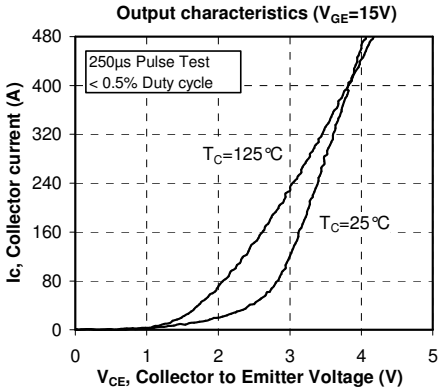
Thermal and package characteristics

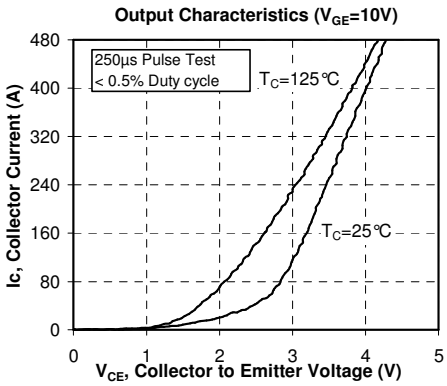
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case		IGBT			0.12	°C/W
			Diode			0.32	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
		For terminals	M5	2		3.5	
Wt	Package Weight					280	g

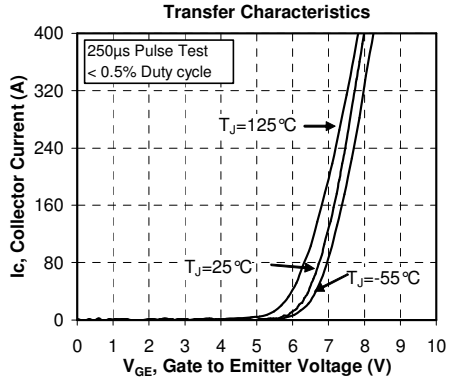
Package outline

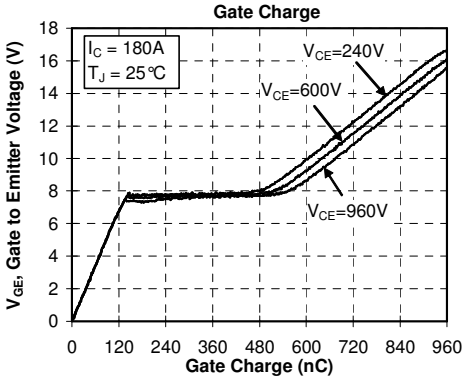


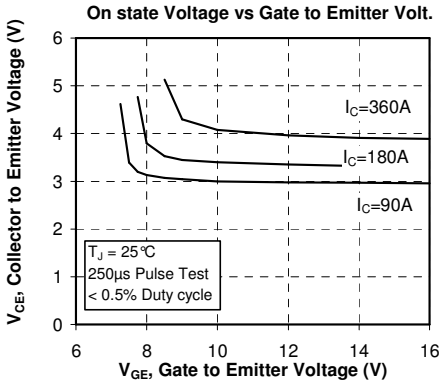
Typical Performance Curve

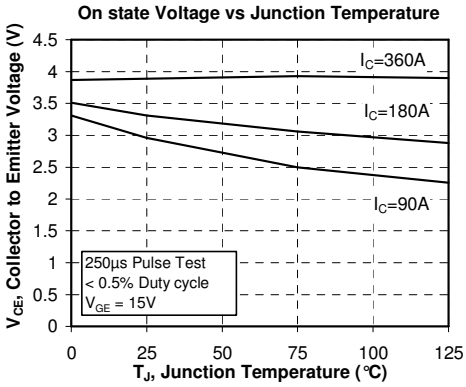


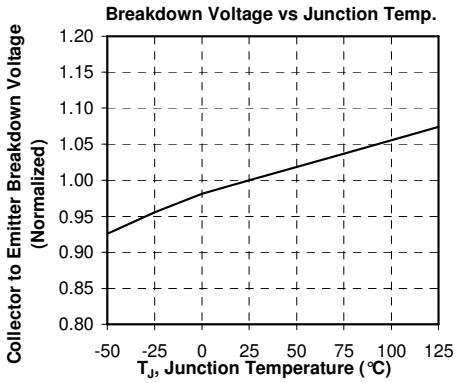


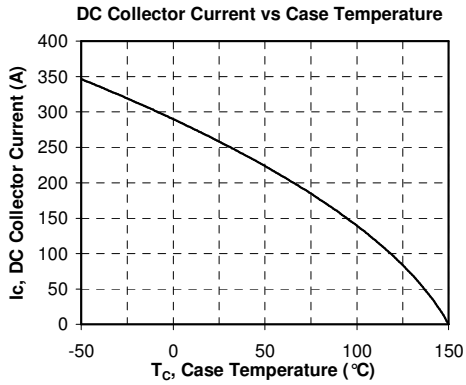




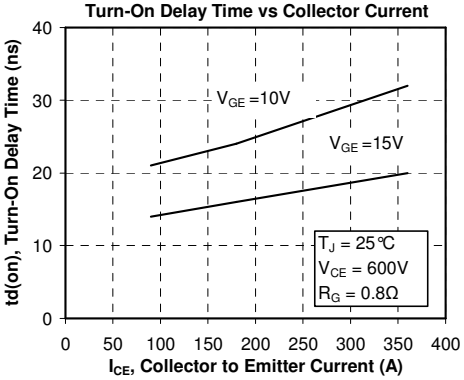




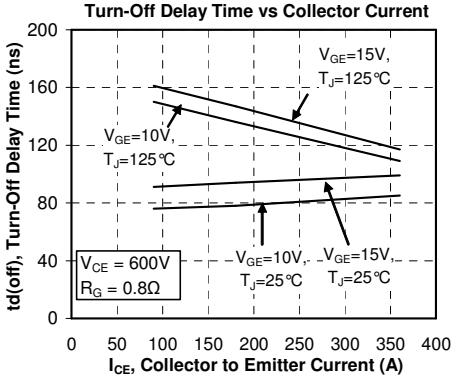




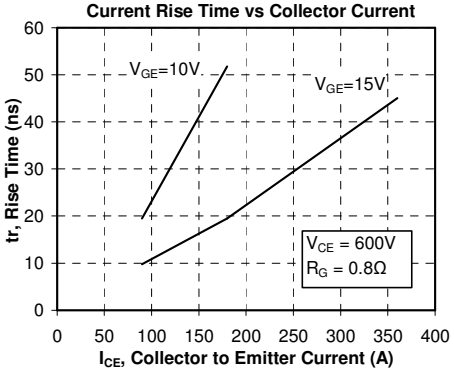
Turn-On Delay Time vs Collector Current



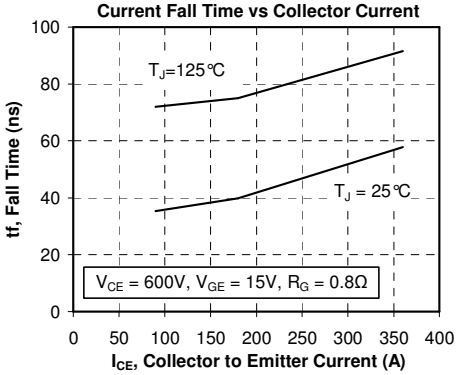
Turn-Off Delay Time vs Collector Current



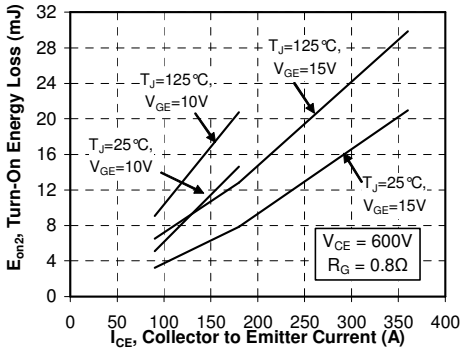
Current Rise Time vs Collector Current



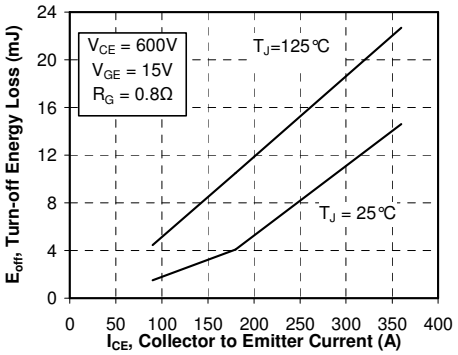
Current Fall Time vs Collector Current



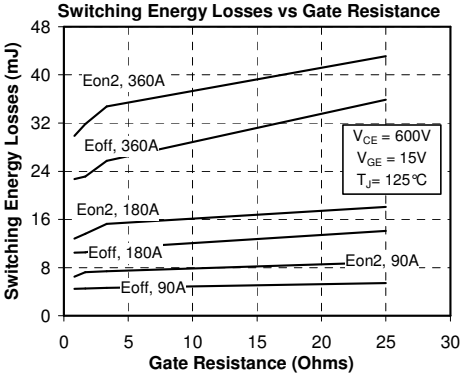
Turn-On Energy Loss vs Collector Current



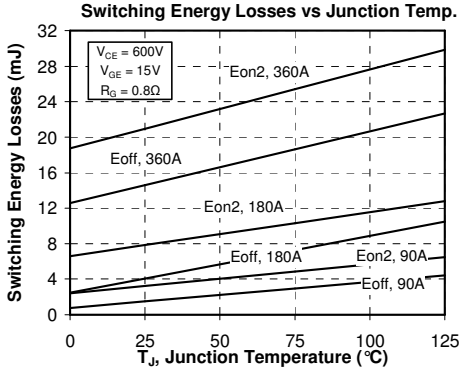
Turn-Off Energy Loss vs Collector Current



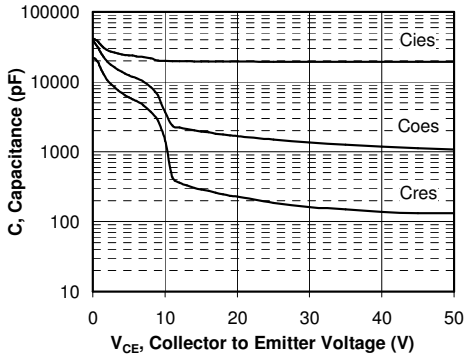
Switching Energy Losses vs Gate Resistance



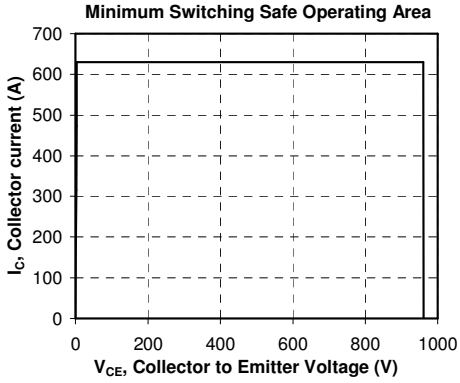
Switching Energy Losses vs Junction Temp.



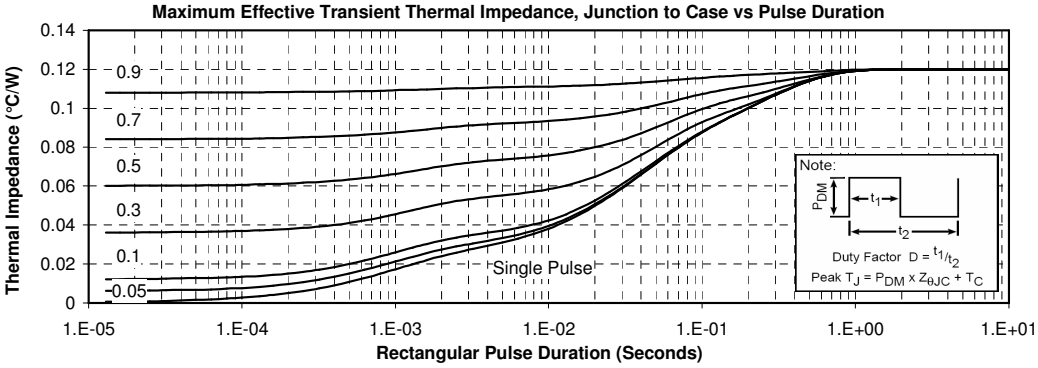
Capacitance vs Collector to Emitter Voltage



Minimum Switching Safe Operating Area



Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



Operating Frequency vs Collector Current