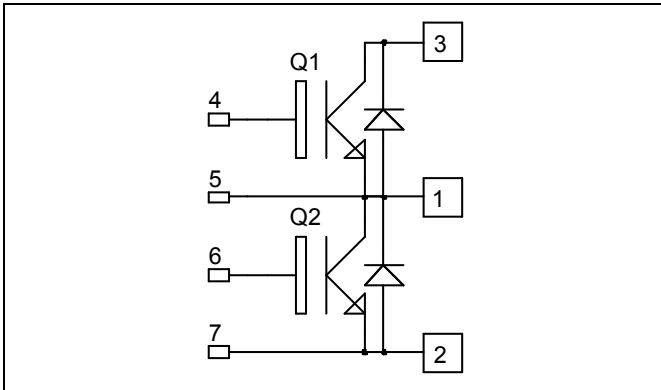


**Phase leg  
Trench + Field Stop IGBT  
Power Module**

**$V_{CES} = 600V$   
 $I_C = 400A @ T_c = 80^\circ C$**



### Application

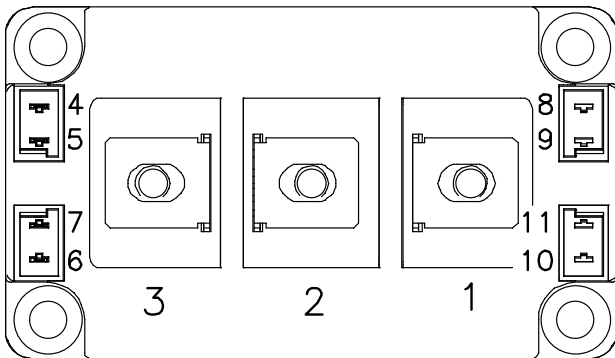
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

### 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
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- High level of integration
- M6 power connectors

### Benefits

- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive  $T_C$  of  $V_{CEsat}$
- RoHS Compliant



### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage	600	V
$I_C$	Continuous Collector Current	$T_C = 25^\circ C$	500
		$T_C = 80^\circ C$	400
$I_{CM}$	Pulsed Collector Current	$T_C = 25^\circ C$	800
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ C$	1250
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^\circ C$	800A @ 520V

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

**Electrical Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{GE} = 0\text{V}, V_{CE} = 600\text{V}$			500	$\mu\text{A}$
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 400\text{A}$	$T_j = 25^\circ\text{C}$	1.5	1.9	V
			$T_j = 150^\circ\text{C}$	1.7		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 6.4\text{ mA}$	5.0	5.8	6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			400	nA

**Dynamic Characteristics**

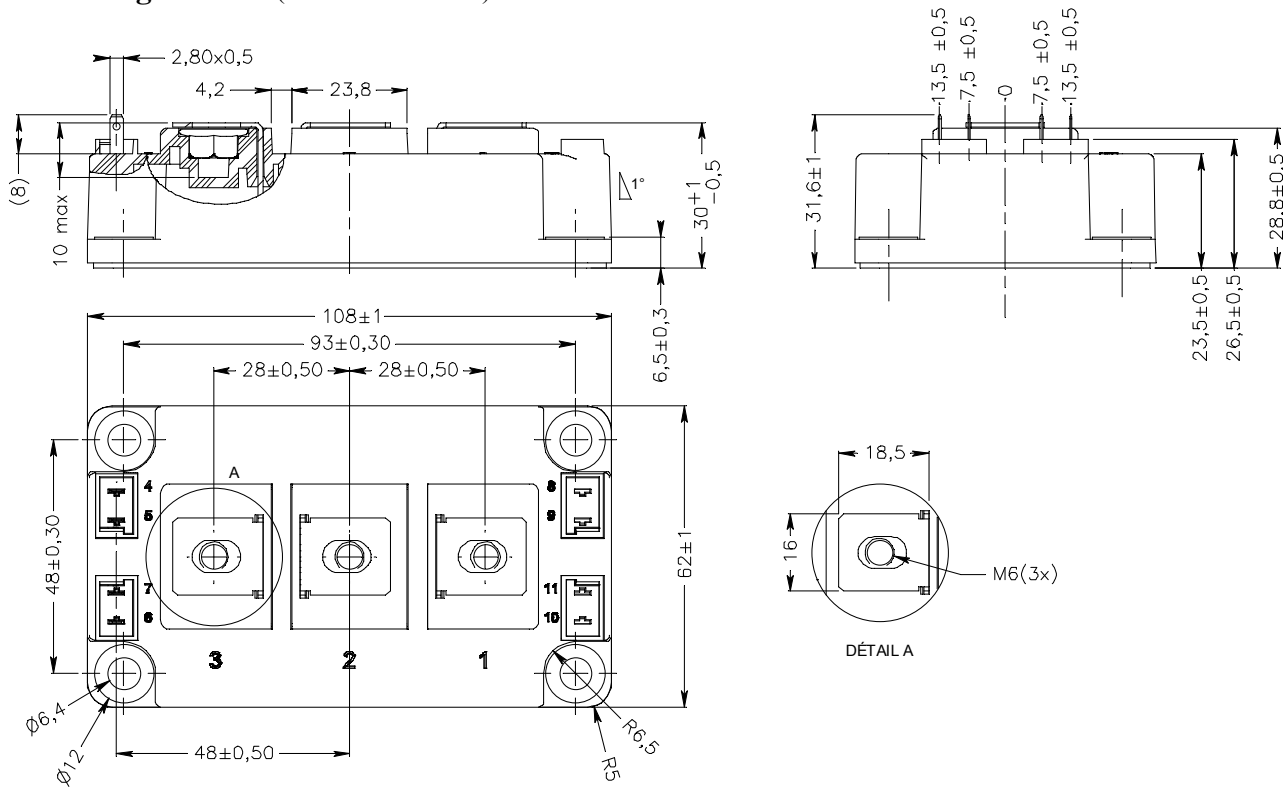
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}$		24		nF
$C_{oes}$	Output Capacitance	$V_{CE} = 25\text{V}$		1.5		
$C_{res}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.75		
$Q_G$	Gate charge	$V_{GE} = \pm 15\text{V}, I_C = 300\text{A}$ $V_{CE} = 300\text{V}$		4.2		$\mu\text{C}$
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 400\text{A}$ $R_G = 1.5\Omega$		110		ns
$T_r$	Rise Time			50		
$T_{d(off)}$	Turn-off Delay Time			490		
$T_f$	Fall Time			50		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $150^\circ\text{C}$ ) $V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 400\text{A}$ $R_G = 1.5\Omega$		130		ns
$T_r$	Rise Time			60		
$T_{d(off)}$	Turn-off Delay Time			530		
$T_f$	Fall Time			70		
$E_{on}$	Turn on Energy	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 400\text{A}$ $R_G = 1.5\Omega$	$T_j = 25^\circ\text{C}$	3.2		mJ
			$T_j = 150^\circ\text{C}$	3.4		
$E_{off}$	Turn off Energy		$T_j = 25^\circ\text{C}$	15		
			$T_j = 150^\circ\text{C}$	15.5		
$I_{sc}$	Short Circuit data	$V_{GE} \leq 15\text{V}; V_{Bus} = 360\text{V}$ $t_p \leq 6\mu\text{s}; T_j = 150^\circ\text{C}$		2000		A

**Reverse diode ratings and characteristics**

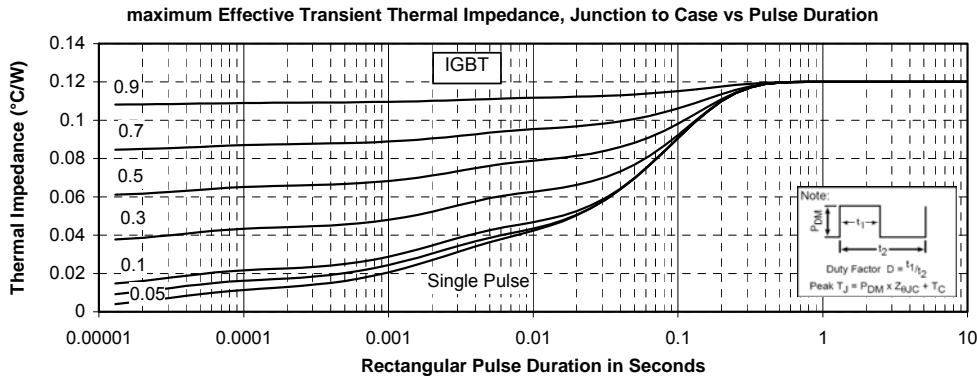
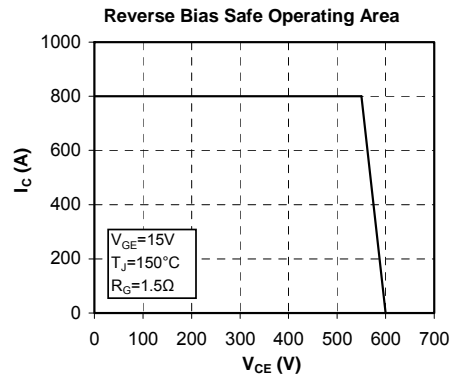
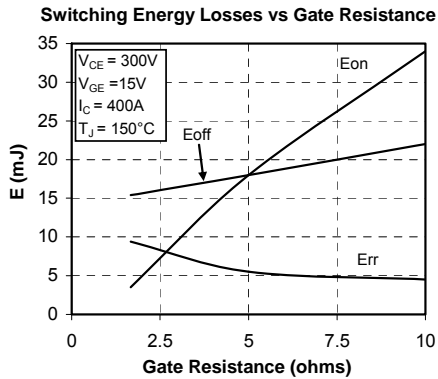
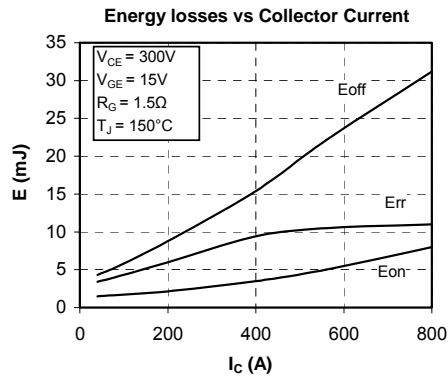
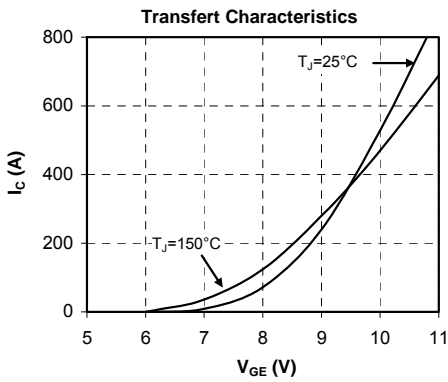
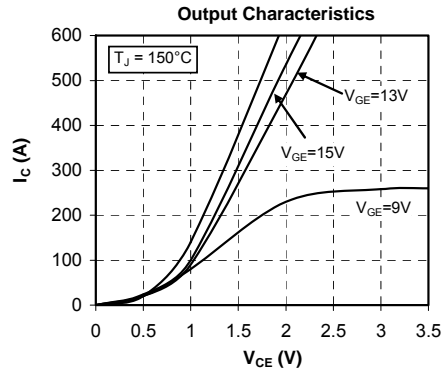
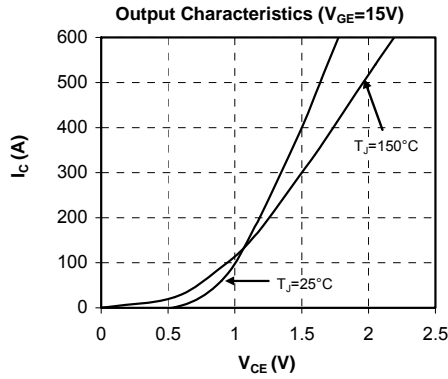
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RRM}$	Maximum Reverse Leakage Current	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$		500	$\mu\text{A}$
			$T_j = 150^\circ\text{C}$		750	
$I_F$	DC Forward Current		$T_c = 80^\circ\text{C}$	400		A
$V_F$	Diode Forward Voltage	$I_F = 400\text{A}$ $V_{GE} = 0\text{V}$	$T_j = 25^\circ\text{C}$	1.6	2	V
			$T_j = 150^\circ\text{C}$	1.5		
$t_{rr}$	Reverse Recovery Time	$I_F = 400\text{A}$ $V_R = 300\text{V}$ $di/dt = 4800\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	125		ns
			$T_j = 150^\circ\text{C}$	180		
$Q_{rr}$	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$	18.8		$\mu\text{C}$
			$T_j = 150^\circ\text{C}$	39.5		
$E_{rr}$	Reverse Recovery Energy		$T_j = 25^\circ\text{C}$	4.4		mJ
			$T_j = 150^\circ\text{C}$	9.6		

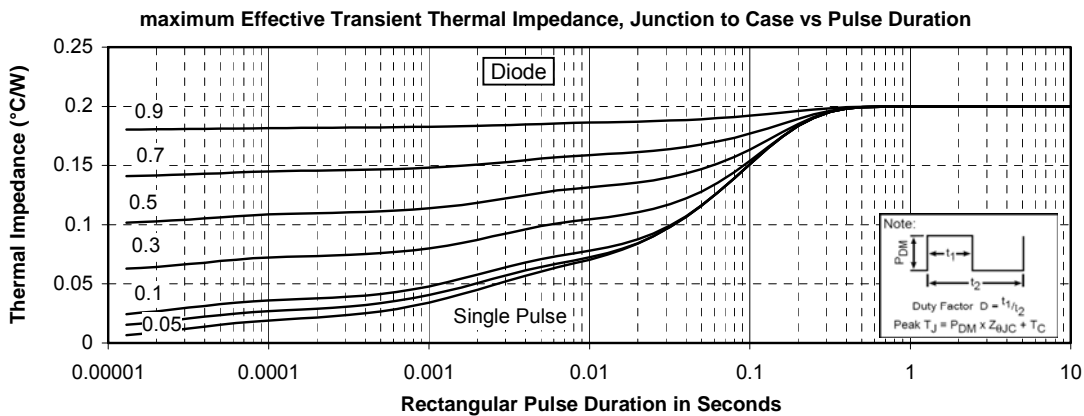
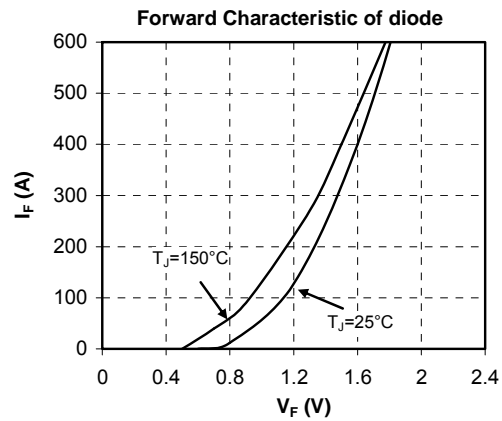
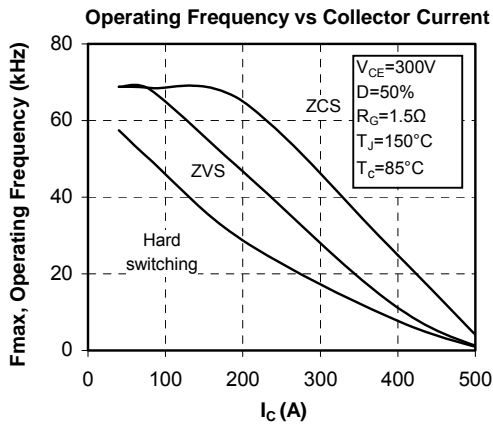
**Thermal and package characteristics**

Symbol	Characteristic	Min	Typ	Max	Unit	
$R_{thJC}$	Junction to Case Thermal Resistance	IGBT		0.12	°C/W	
		Diode		0.20		
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol}<1$ mA, 50/60Hz	2500			V	
$T_J$	Operating junction temperature range	-40		175	°C	
$T_{STG}$	Storage Temperature Range	-40		125		
$T_C$	Operating Case Temperature	-40		125		
Torque	Mounting torque	For terminals	M6	3	5	N.m
		To Heatsink	M6	3	5	
Wt	Package Weight			350	g	

**D3 Package outline** (dimensions in mm)


## Typical Performance Curve





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Microsemi's products are covered by one or more of U.S patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 6,939,743 7,352,045 5,283,201 5,801,417 5,648,283 7,196,634 6,664,594 7,157,886 6,939,743 7,342,262 and foreign patents. U.S and Foreign patents pending. All Rights Reserved.