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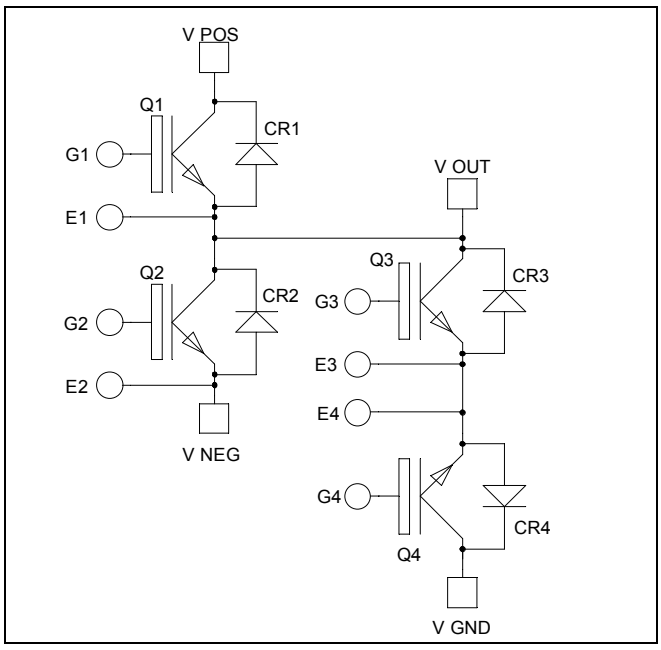
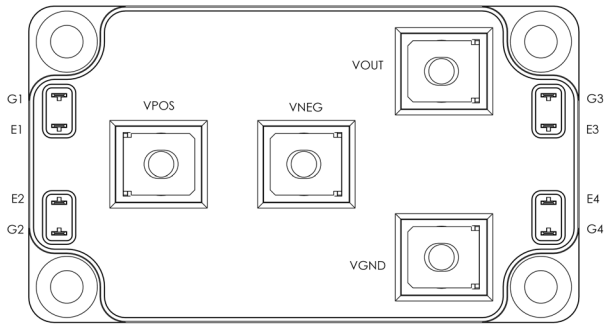
APTGLQ200HR120G

Phase Leg & Dual Common Emitter Power Module

Fast Trench & Field Stop IGBT4 (Q1, Q2):
V_{CES} = 1200V ; I_C = 200A @ Tc = 80°C

Trench & Field Stop IGBT3 (Q3, Q4):
V_{CES} = 600V ; I_C = 100A @ Tc = 80°C





Application

- Uninterruptible Power Supplies

Features

- ***Q1, Q2 (High speed Trench & Field Stop IGBT4)***
- ***Q3, Q4 (Trench & Field Stop IGBT3)***
  - Low voltage drop
  - Low tail current
  - Low leakage current
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration

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}
- Low profile
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed.
See application note APT0502 on www.microsemi.com

1. High speed Trench & Field Stop IGBT4 Phase Leg Q1&Q2 (per IGBT)

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Voltage		1200	V
I_C	Continuous Collector Current	$T_C = 25°C$	300	A
		$T_C = 80°C$	200	
I_{CM}	Pulsed Collector Current	$T_C = 25°C$	640	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation		1000	W
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150°C$	320A @ 1100V	

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{CES}	Zero Gate Voltage Collector Current	$V_{GE} = 0V$, $V_{CE} = 1200V$				200	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 160A$	$T_j = 25°C$	1.7	2.05	2.4	V
			$T_j = 150°C$		2.6		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}$, $I_C = 4$ mA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20V$, $V_{CE} = 0V$				480	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1MHz$			9200		pF
C_{oes}	Output Capacitance				600		
C_{res}	Reverse Transfer Capacitance				540		
Q_G	Gate charge	$V_{GE} = 15V$, $I_C = 160A$ $V_{CE} = 960V$			740		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = ±15V$ $V_{Bus} = 600V$ $I_C = 160A$ $R_G = 3Ω$			30		ns
T_r	Rise Time				57		
$T_{d(off)}$	Turn-off Delay Time				290		
T_f	Fall Time				16		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) $V_{GE} = ±15V$ $V_{Bus} = 600V$ $I_C = 160A$ $R_G = 3Ω$			30		ns
T_r	Rise Time				49		
$T_{d(off)}$	Turn-off Delay Time				366		
T_f	Fall Time				48		
E_{on}	Turn on Energy	$V_{GE} = ±15V$ $V_{Bus} = 600V$ $I_C = 160A$ $R_G = 3Ω$	$T_j = 25°C$		12.6		mJ
			$T_j = 150°C$		15		
E_{off}	Turn off Energy		$T_j = 25°C$		4.8		
			$T_j = 150°C$		9		
I_{sc}	Short Circuit data	$V_{GE} ≤ 15V$; $V_{Bus} = 600V$ $t_p ≤ 10µs$; $T_j = 150°C$			600		A
R_{thJC}	Junction to Case Thermal Resistance					0.15	°C/W

Diode ratings and characteristics (D1 & D2) (per diode)

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Peak Repetitive Reverse Voltage					1200	V
I_{RM}	Reverse Leakage Current	V_R=1200V				200	µA
I_F	DC Forward Current		Tc = 50°C		180		A
V_F	Diode Forward Voltage	I_F = 150A	T_j = 25°C		1.7	2.2	V
			T_j = 150°C		1.65		
t_{rr}	Reverse Recovery Time	I_F = 150A V_R = 600V di/dt =3800A/µs	T_j = 25°C		155		ns
			T_j = 150°C		300		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		14.6		µC
			T_j = 150°C		30.4		
E_{rr}	Reverse Recovery Energy		T_j = 25°C		5.2		mJ
			T_j = 150°C		11		
R_{thJC}	Junction to Case Thermal Resistance					0.32	°C/W

2. Trench & Field Stop IGBT3 Dual common emitter Q3&Q4 (per IGBT)

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Voltage		600	V
I_C	Continuous Collector Current	T_C = 25°C	150	A
		T_C = 80°C	100	
I_{CM}	Pulsed Collector Current	T_C = 25°C	200	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	340	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°C	200A @ 550V	

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V, V_{CE} = 600V				250	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 100A	T_j = 25°C		1.5	1.9	V
			T_j = 150°C		1.7		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 1.5 mA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				400	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz			6100		pF
C_{oes}	Output Capacitance				390		
C_{res}	Reverse Transfer Capacitance				190		
Q_G	Gate charge	V_{GE} = ±15V, I_C = 100A V_{CE} = 300V			1.1		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 100A R_G = 3.3Ω			115		ns
T_r	Rise Time				45		
$T_{d(off)}$	Turn-off Delay Time				225		
T_f	Fall Time				55		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 100A R_G = 3.3Ω			130		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				300		
T_f	Fall Time				70		
E_{on}	Turn on Energy	V_{GE} = ±15V V_{Bus} = 300V I_C = 100A R_G = 3.3Ω	T_j = 25°C		0.4		mJ
			T_j = 150°C		0.875		
E_{off}	Turn off Energy		T_j = 25°C		2.5		mJ
			T_j = 150°C		3.5		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 360V t_p≤10µs ; T_j = 150°C			500		A
R_{thJC}	Junction to Case Thermal Resistance					0.45	°C/W

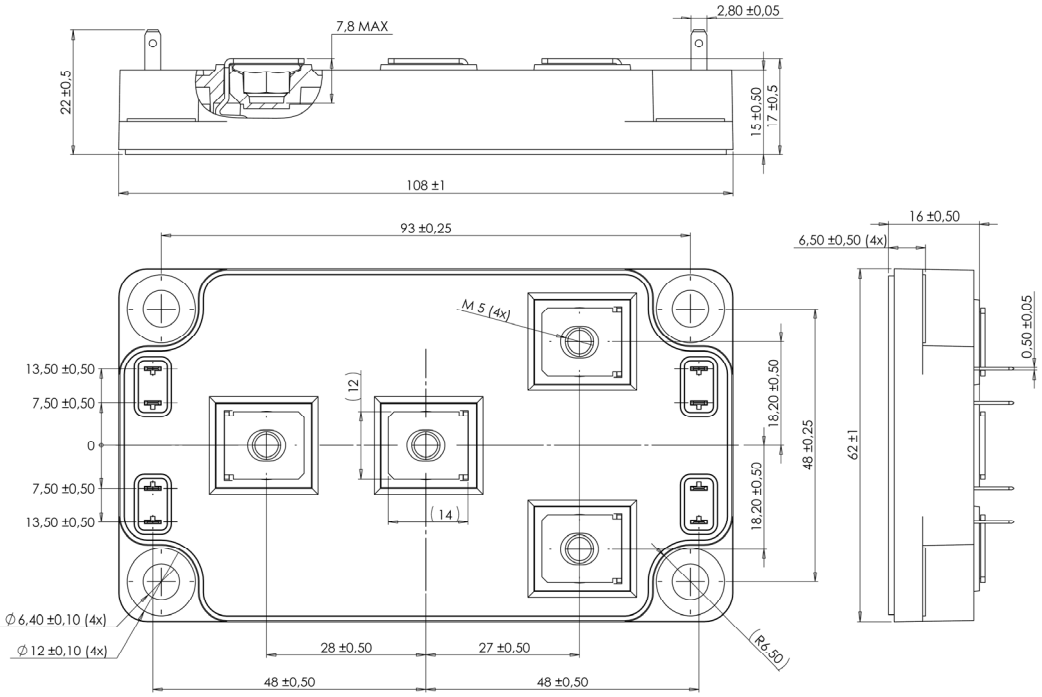
Diode ratings and characteristics (D3 & D4) (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage					600	V
I_{RM}	Reverse Leakage Current	V_R=600V				250	µA
I_F	DC Forward current		Tc = 25°C		150		A
V_F	Diode Forward Voltage	I_F = 150A V_{GE} = 0V	T_j = 25°C		1.6	2	
			T_j = 150°C		1.5		V
t_{rr}	Reverse Recovery Time	I_F = 150A V_R = 300V di/dt =3000A/µs	T_j = 25°C		130		ns
			T_j = 150°C		225		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		6.5		µC
			T_j = 150°C		14.5		
E_r	Reverse Recovery Energy		T_j = 25°C		1.6		mJ
			T_j = 150°C		3.5		
R_{thJC}	Junction to Case Thermal Resistance					0.52	°C/W

3. Thermal & Package characteristics

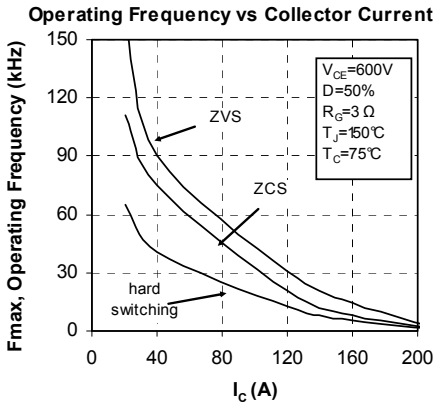
Symbol	*Characteristic*			*Min*	*Max*	*Unit*
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range			-40	175	°C
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -25	
T_{STG}	Storage Temperature Range			-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				300	g

Package outline (dimensions in mm)

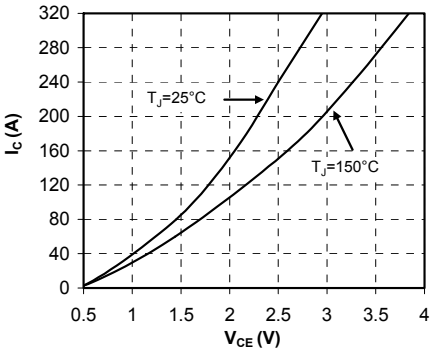


See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

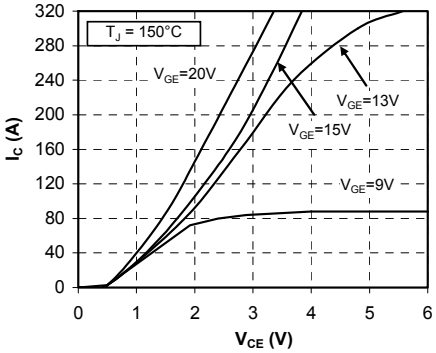
High speed Trench & Field Stop IGBT4 performance curve (per IGBT)



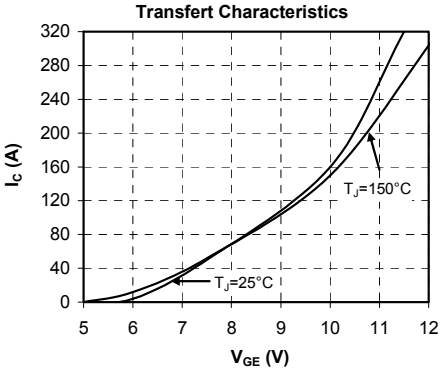
Output Characteristics (V_{GE}=15V)



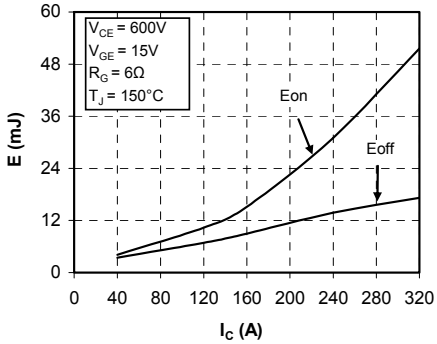
Output Characteristics



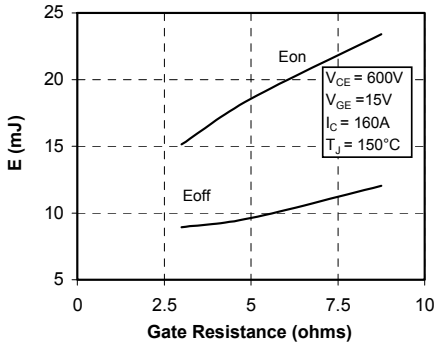
Transfert Characteristics



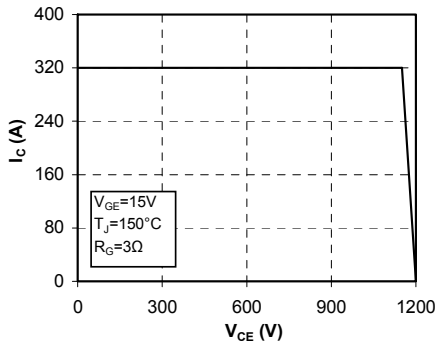
Energy losses vs Collector Current



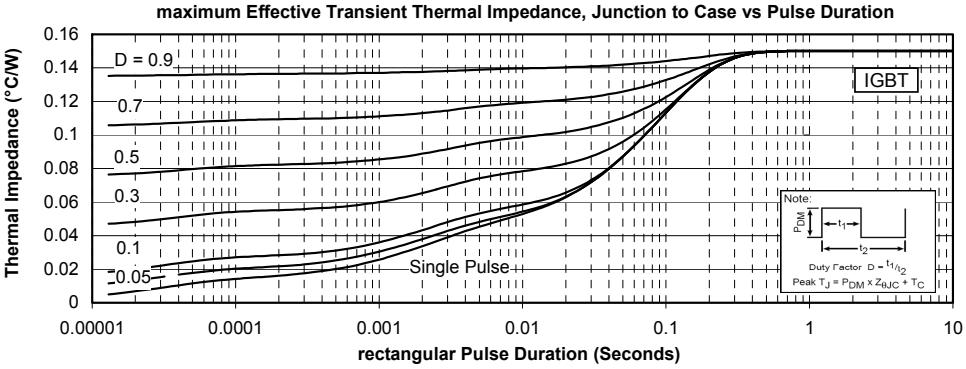
Switching Energy Losses vs Gate Resistance



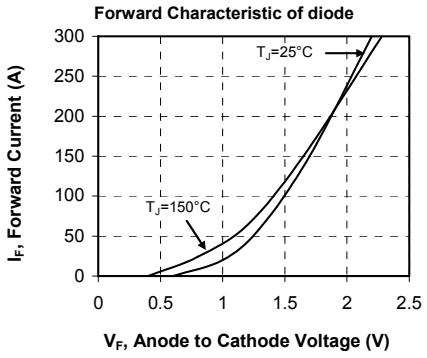
Reverse Bias Safe Operating Area

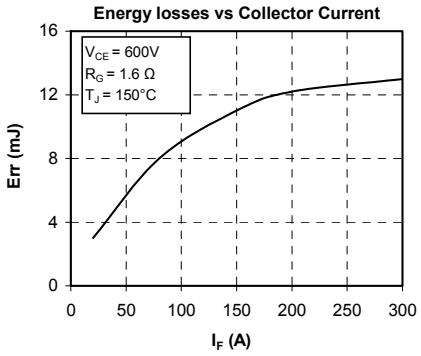


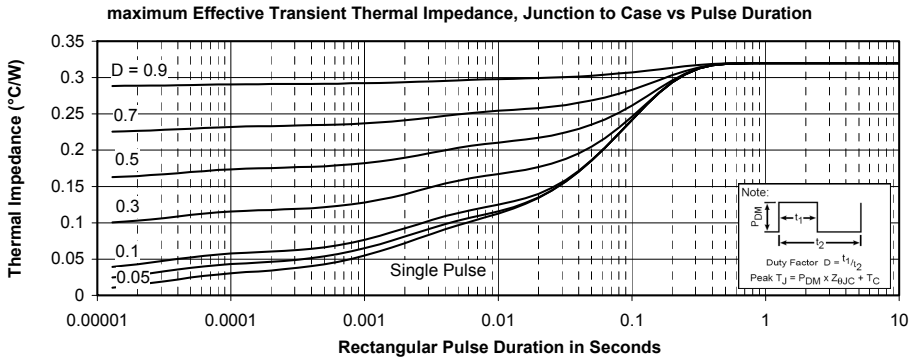
maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



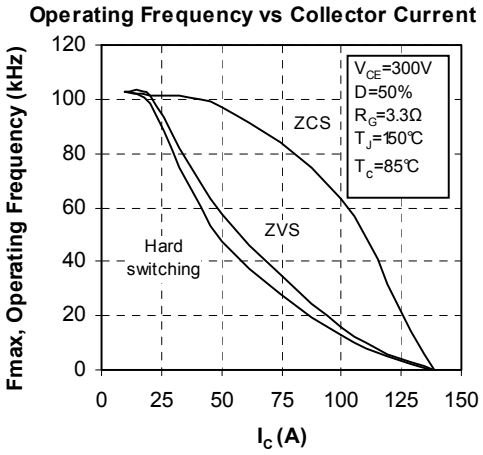
Diode D1 & D2 performance curve (per diode)



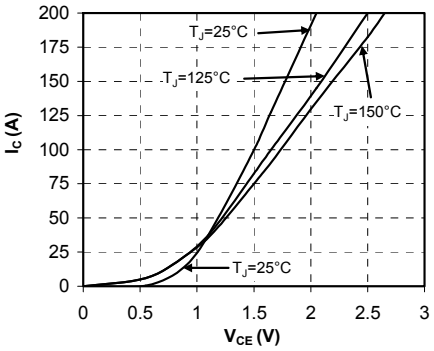




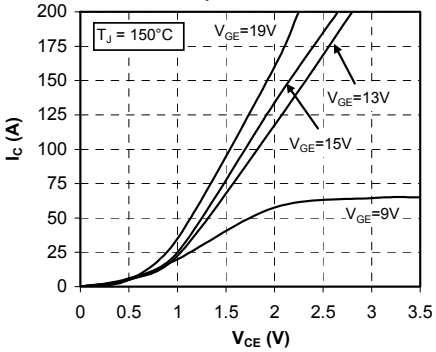
Trench & Field Stop IGBT3 performance curve (per IGBT)



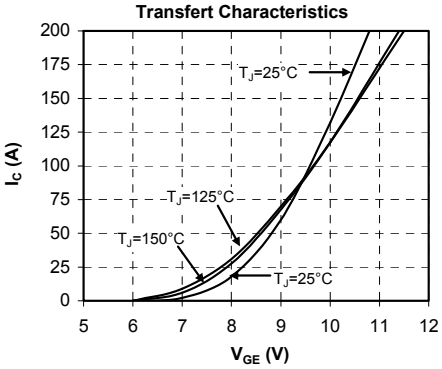
Output Characteristics (V_{GE}=15V)



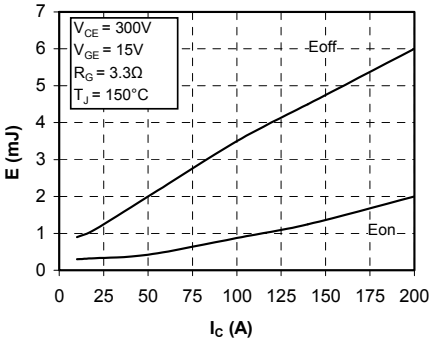
Output Characteristics



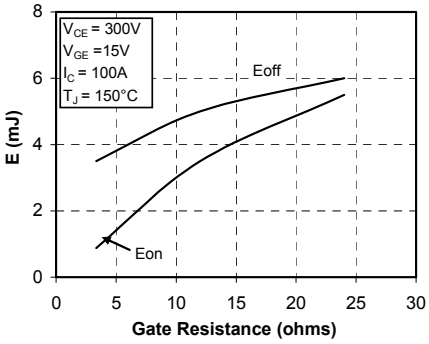
Transfert Characteristics



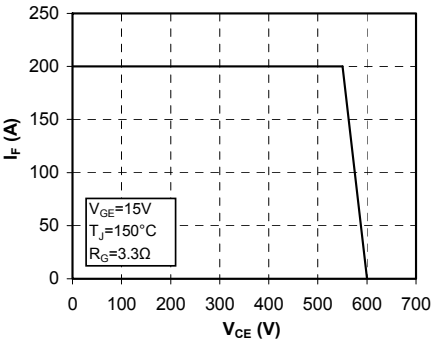
Energy losses vs Collector Current



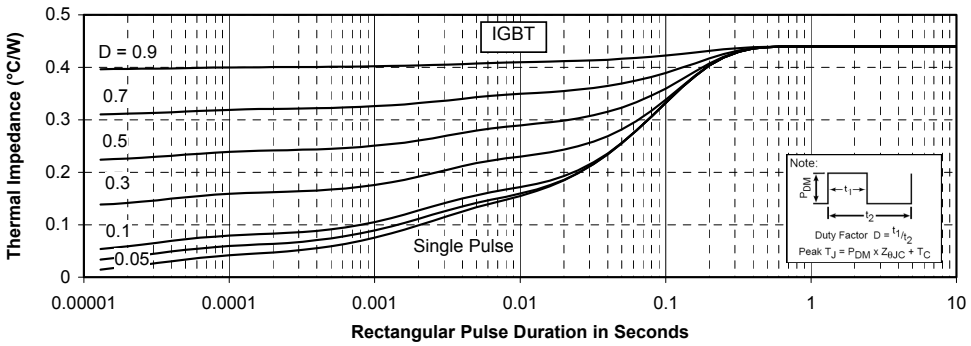
Switching Energy Losses vs Gate Resistance



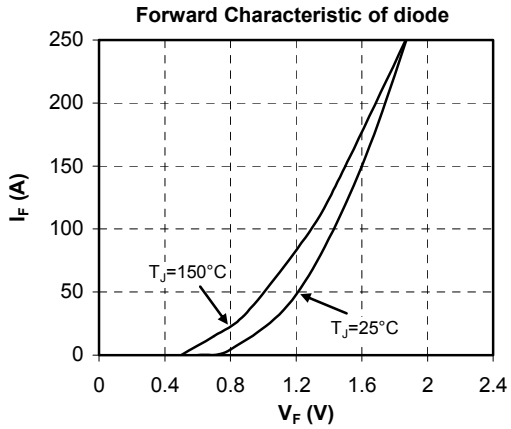
Reverse Bias Safe Operating Area

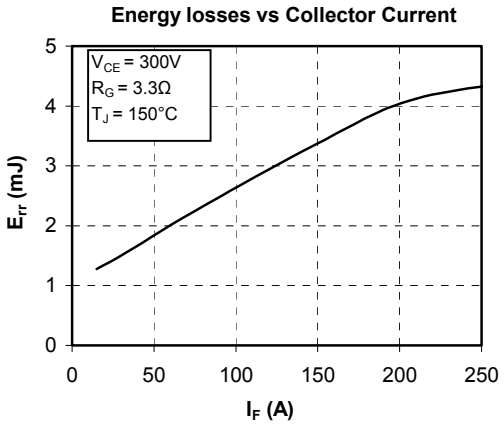


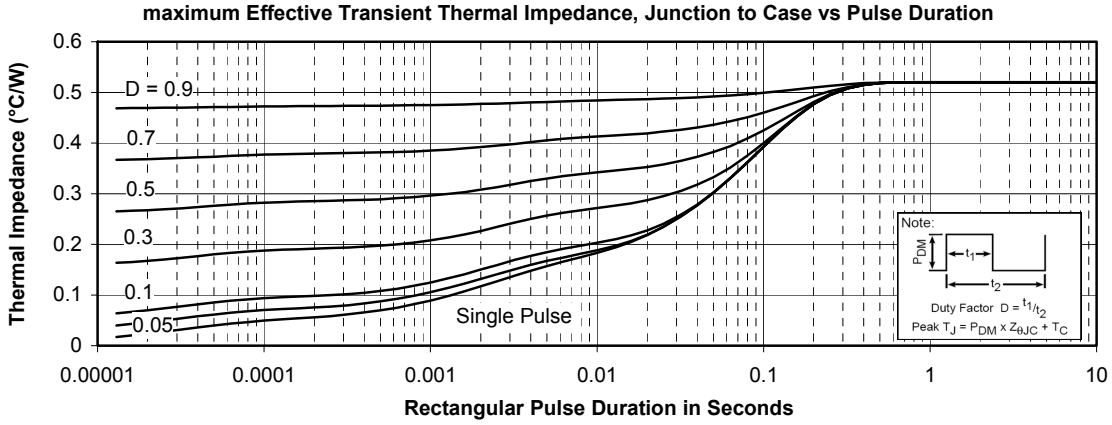
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



Diode D3 & D4 performance curve (per diode)







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