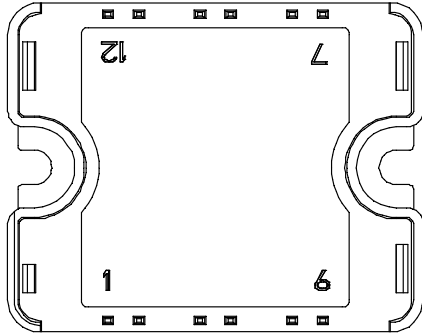
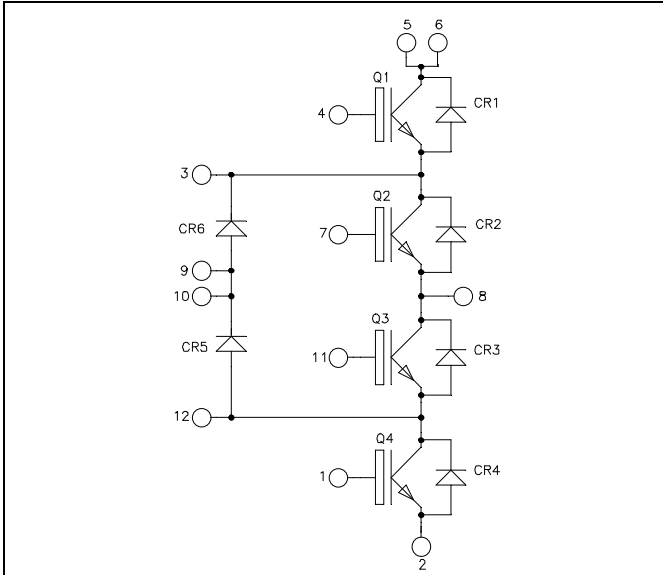


**Three level inverter
Trench + Field Stop IGBT
Power Module**

**$V_{CES} = 600V$
 $I_C = 30A @ T_c = 80^\circ C$**



All multiple inputs and outputs must be shorted together
5/6 ; 9/10

Application

- Solar converter
- Uninterruptible Power Supplies

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
- 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 TC of VCEsat
- Low profile
- RoHS Compliant

Q1 to Q4 Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{CES}	Collector - Emitter Breakdown Voltage	600	V
I_C	Continuous Collector Current	$T_c = 25^\circ C$	50
		$T_c = 80^\circ C$	30
I_{CM}	Pulsed Collector Current	$T_c = 25^\circ C$	60
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	90
RBSOA	Reverse Bias Safe Operating Area	$T_J = 150^\circ C$	60A @ 550V

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

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

Q1 to Q4 Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	$V_{GE} = 0\text{V}, V_{CE} = 600\text{V}$			250	μA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 30\text{A}$	$T_j = 25^\circ\text{C}$	1.5	1.9	V
			$T_j = 150^\circ\text{C}$	1.7		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 400\mu\text{A}$	5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			300	nA

Q1 to Q4 Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0\text{V}$		1600		pF
C_{oes}	Output Capacitance	$V_{CE} = 25\text{V}$		110		
C_{res}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		50		
Q_G	Gate charge	$V_{GE} = \pm 15\text{V}, I_C = 30\text{A}$ $V_{CE} = 300\text{V}$		0.3		μC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C)		110		ns
T_r	Rise Time	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$		45		
$T_{d(off)}$	Turn-off Delay Time	$I_C = 30\text{A}$		200		
T_f	Fall Time	$R_G = 10\Omega$		40		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C)		120		ns
T_r	Rise Time	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$		50		
$T_{d(off)}$	Turn-off Delay Time	$I_C = 30\text{A}$		250		
T_f	Fall Time	$R_G = 10\Omega$		60		
E_{on}	Turn-on Switching Energy	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$	$T_j = 25^\circ\text{C}$	0.16		mJ
			$T_j = 150^\circ\text{C}$	0.3		
E_{off}	Turn-off Switching Energy	$I_C = 30\text{A}$ $R_G = 10\Omega$	$T_j = 25^\circ\text{C}$	0.7		mJ
			$T_j = 150^\circ\text{C}$	1.05		
I_{sc}	Short Circuit data	$V_{GE} \leq 15\text{V}; V_{Bus} = 360\text{V}$ $t_p \leq 6\mu\text{s}; T_j = 150^\circ\text{C}$		150		A
R_{thJC}	Junction to Case Thermal Resistance				1.6	$^\circ\text{C}/\text{W}$

CR1 to CR4 diode ratings and characteristics

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
V _{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I _{RM}	Maximum Reverse Leakage Current	V _R =600V	T _j = 25°C T _j = 150°C			150 350	μA
I _F	DC Forward Current		T _c = 80°C		20		A
V _F	Diode Forward Voltage	I _F = 20A V _{GE} = 0V	T _j = 25°C T _j = 150°C		1.6 1.5	2	V
t _{rr}	Reverse Recovery Time	I _F = 20A V _R = 300V di/dt = 1600A/μs	T _j = 25°C T _j = 150°C		100 150		ns
Q _{rr}	Reverse Recovery Charge		T _j = 25°C T _j = 150°C		1.1 2.3		μC
E _{rr}	Reverse Recovery Energy		T _j = 25°C T _j = 150°C		0.23 0.50		mJ
R _{thJC}	Junction to Case Thermal Resistance					3.25	°C/W

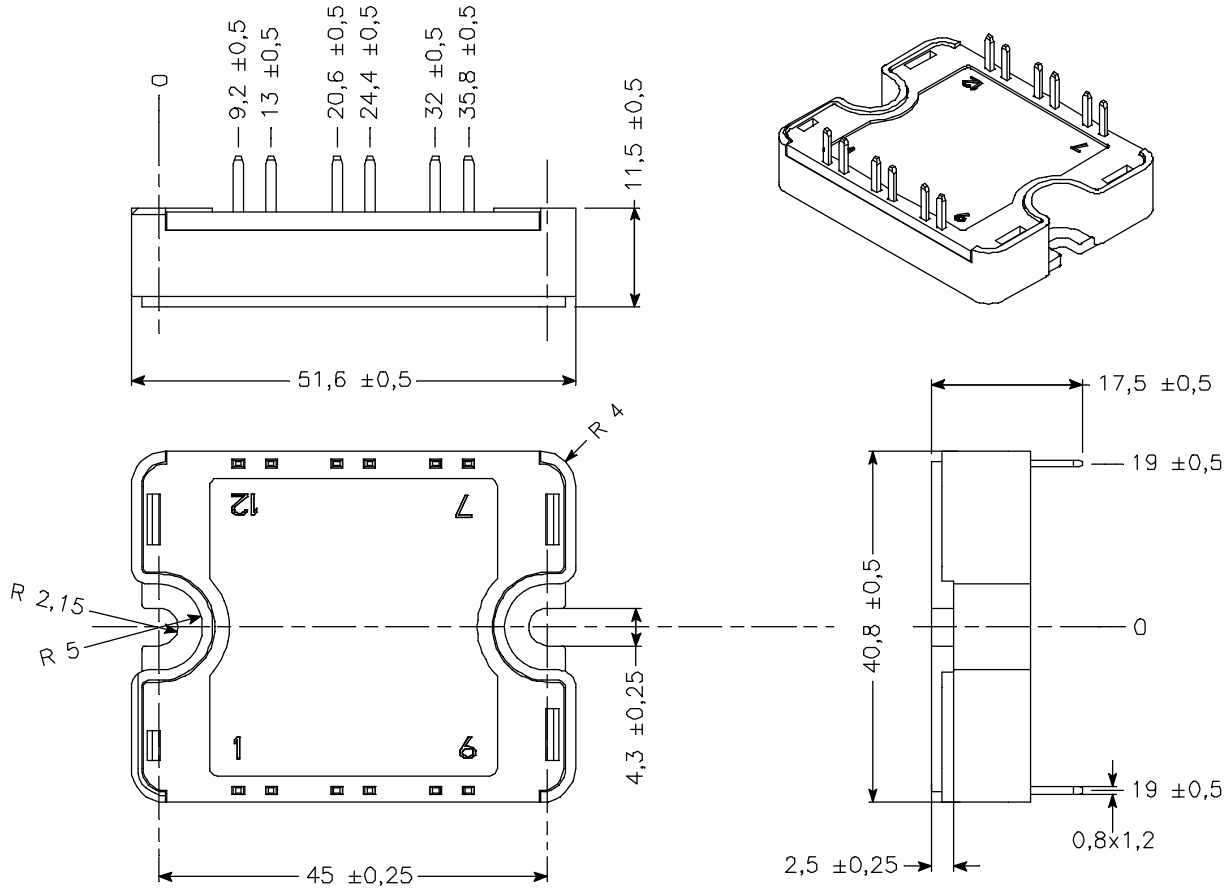
CR5 & CR6 diode ratings and characteristics

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
V _{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I _{RM}	Maximum Reverse Leakage Current	V _R =600V	T _j = 25°C T _j = 150°C			150 350	μA
I _F	DC Forward Current		T _c = 80°C		30		A
V _F	Diode Forward Voltage	I _F = 30A V _{GE} = 0V	T _j = 25°C T _j = 150°C		1.6 1.5	2	V
t _{rr}	Reverse Recovery Time	I _F = 30A V _R = 300V di/dt = 1800A/μs	T _j = 25°C T _j = 150°C		100 150		ns
Q _{rr}	Reverse Recovery Charge		T _j = 25°C T _j = 150°C		1.5 3.1		μC
E _{rr}	Reverse Recovery Energy		T _j = 25°C T _j = 150°C		0.34 0.75		mJ
R _{thJC}	Junction to Case Thermal Resistance					2.45	°C/W

Thermal and package characteristics

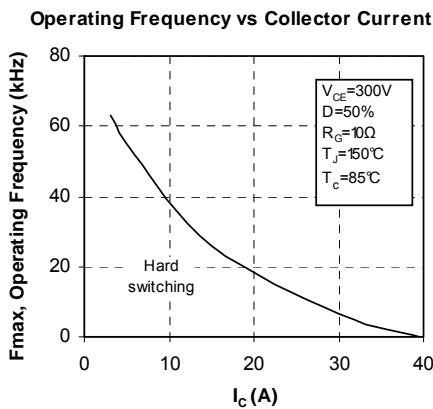
<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, I _{isol} < 1mA, 50/60Hz	2500			V	
T _J	Operating junction temperature range	-40		175	°C	
T _{STG}	Storage Temperature Range	-40		125		
T _C	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M4	2.5	4.7	N.m
Wt	Package Weight				80	g

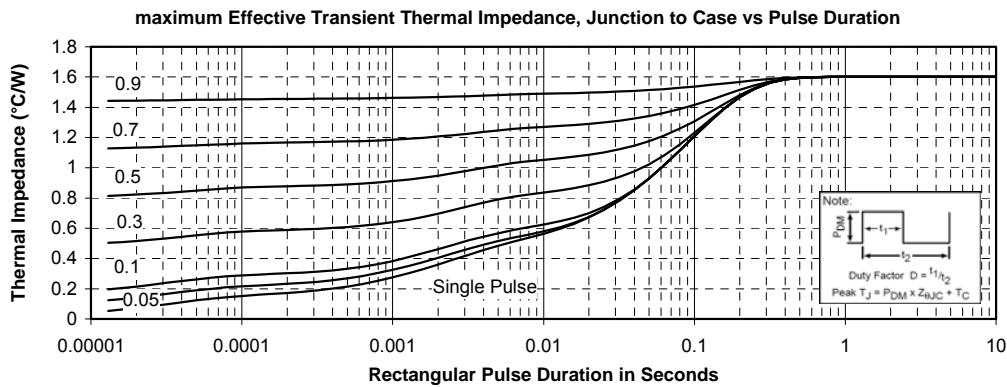
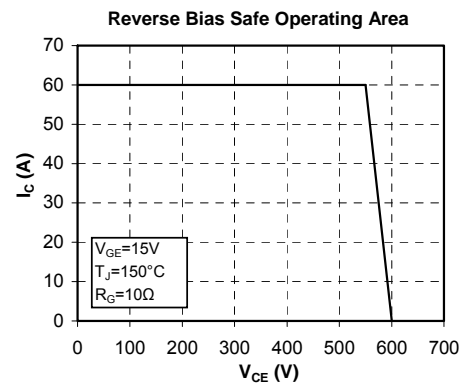
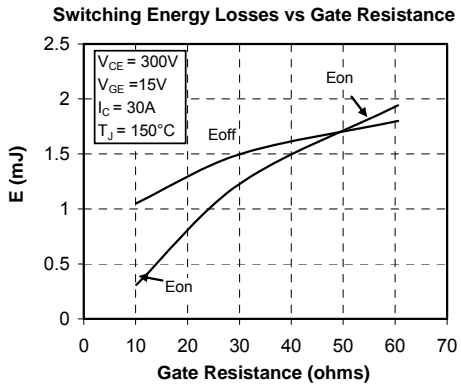
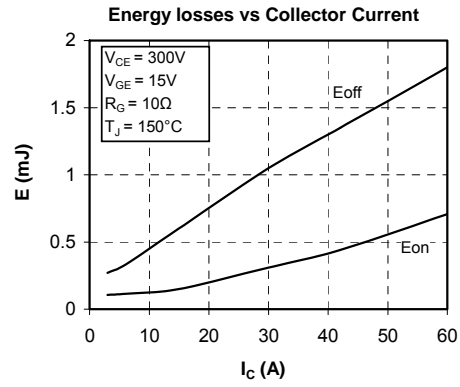
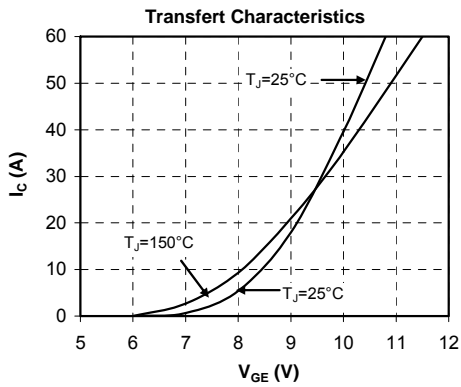
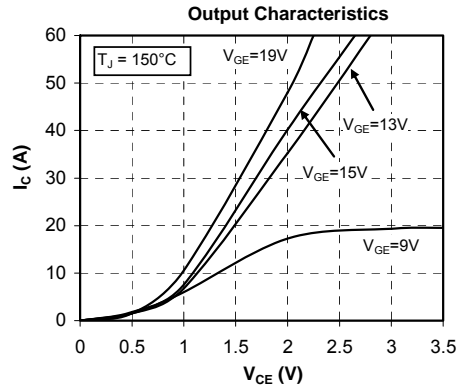
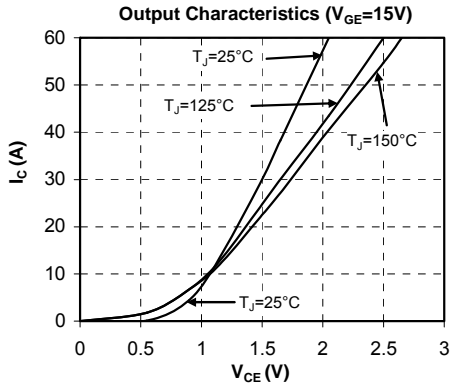
SP1 Package outline (dimensions in mm)



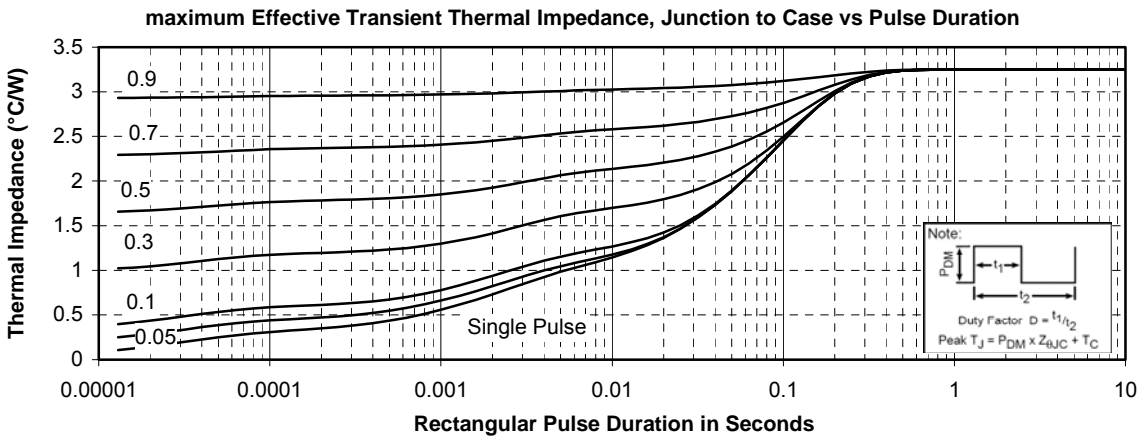
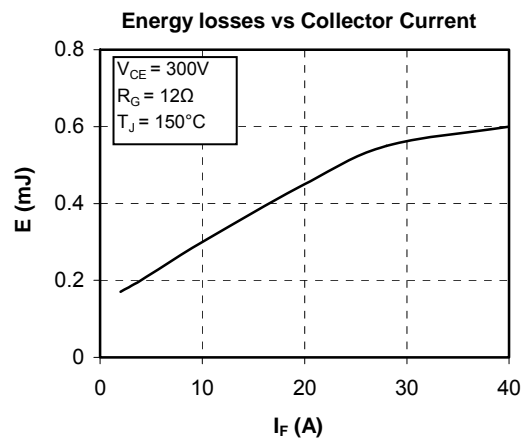
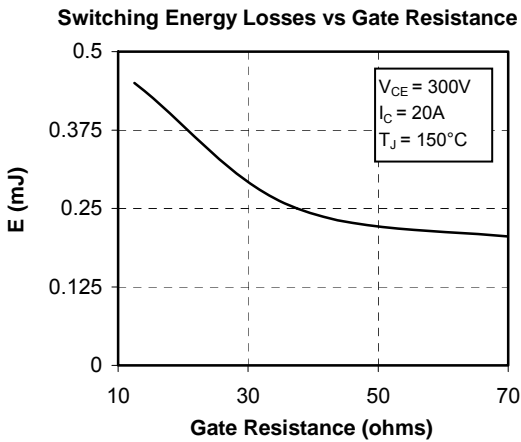
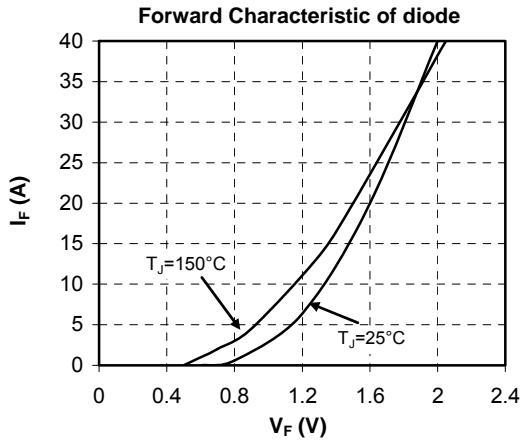
See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

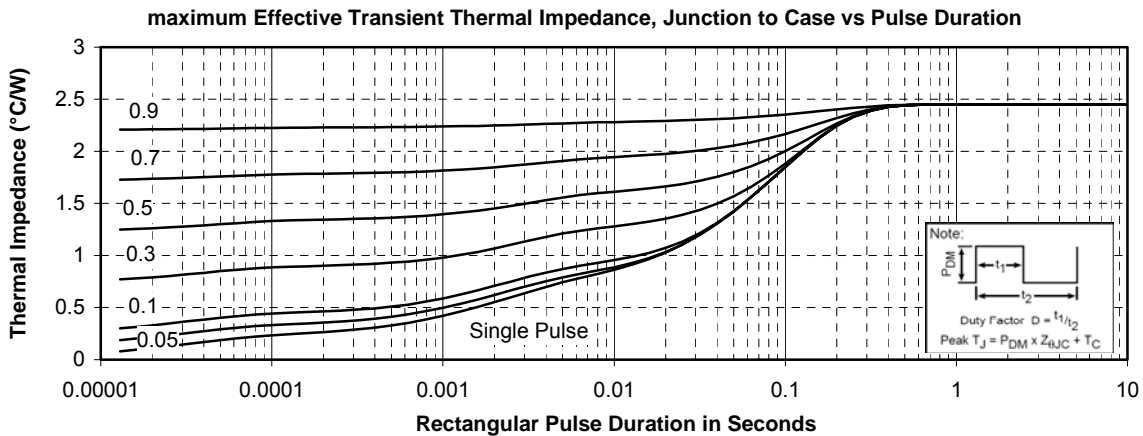
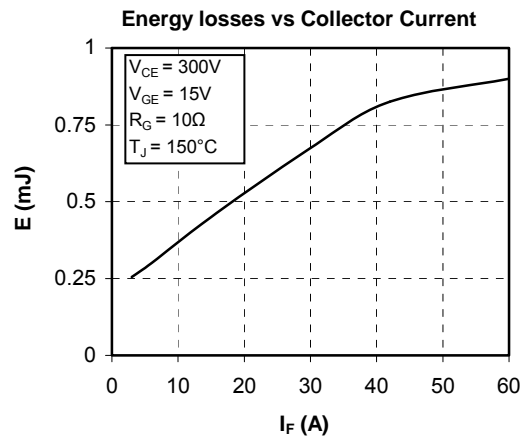
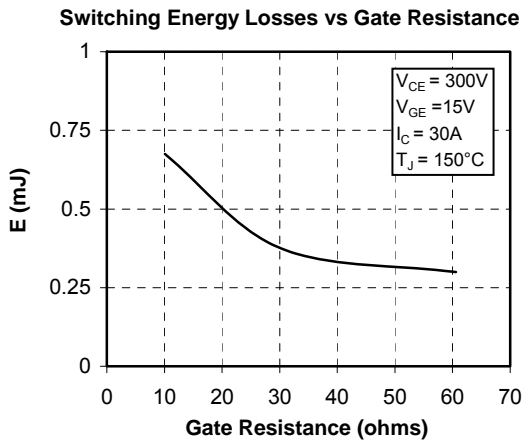
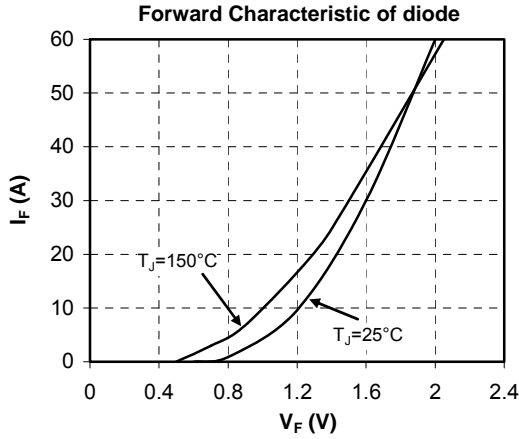
Q1 to Q4 Typical performance curve





CR1 to CR4 Typical performance curve



CR5 & CR6 Typical performance curve


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