

SiC MOSFET Power Module

Features

Preliminary

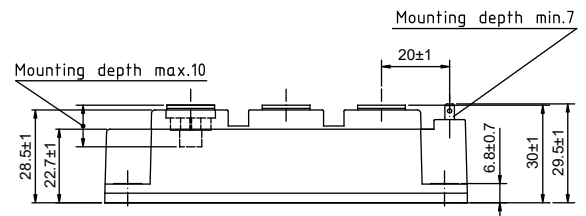
- ◆ $V_{DSS} = 1200V$
- ◆ $R_{DS(ON)}$ typ. $5.5m\Omega @ V_{GS} = 15V$
- ◆ High speed switching with low capacitances
- ◆ Easy to parallel and simple to drive
- ◆ Pb Free & RoHS Compliant
- ◆ Electrically Isolation base plate



Dimensions in inches and (millimeters)

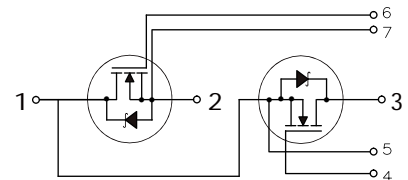
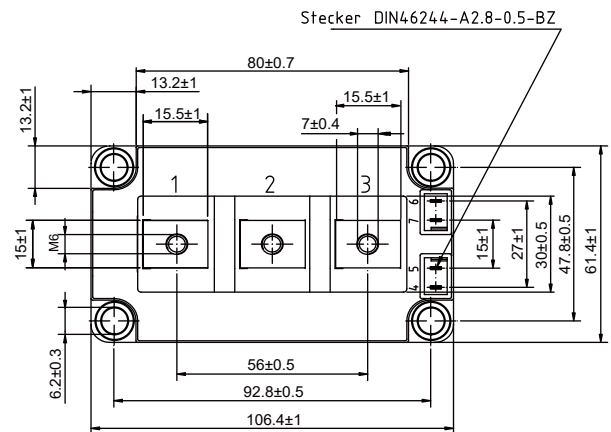
Applications

- ◆ Solar Inverters
- ◆ UPS
- ◆ Motor Drive
- ◆ Induction heating
- ◆ Switch Mode Power Supplies
- ◆ Battery Chargers
- ◆ DC/DC Converters



Absolute Maximum Ratings ($T_c=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Ratings	Unit	
Drain-Source Voltage	V_{DS}	1200	V	
Gate-Source Voltage (dynamic)	$V_{GS(max)}$	-10/+23	V	
Gate-Source Voltage (static)	$V_{GS(OP)}$	-4/+15	V	
Drain Current-Continuous	I_D	@ $T_c = 25^\circ C$ @ $T_c = 100^\circ C$ 450 300	A	
Drain Current-Pulsed	I_{DM}	@ $T_c = 25^\circ C$ 900	A	
Maximum Power Dissipation	P_D	1000	W	
Storage Temperature Range	T_{STG}	-40 to +125	$^\circ C$	
Operating Junction Temperature Range	T_{VJ}	-40 to +175	$^\circ C$	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.15	$^\circ C/W$	
Isolation Voltage (A.C. 1 minute) between All Terminals and Baseplate	V_{iso}	3000	V	
Mounting torque (M6 Screw)	To heatsink To terminals	M_d	3~6 2.5~5	Nm

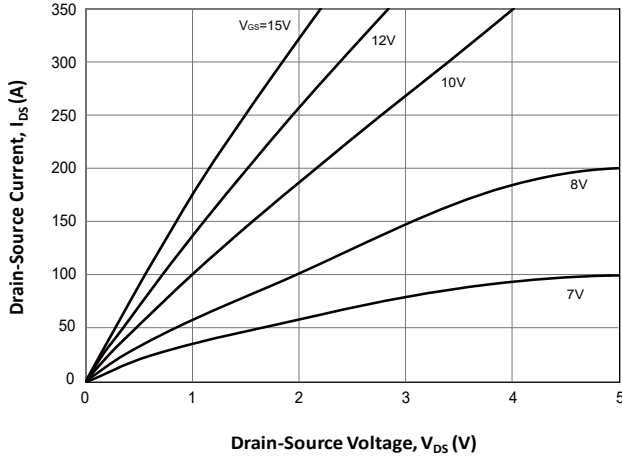
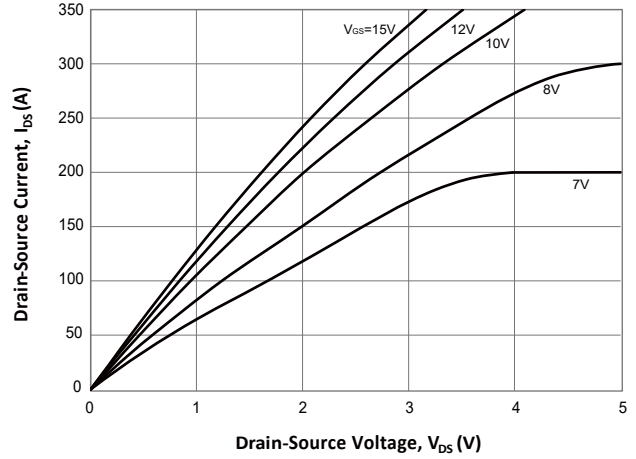
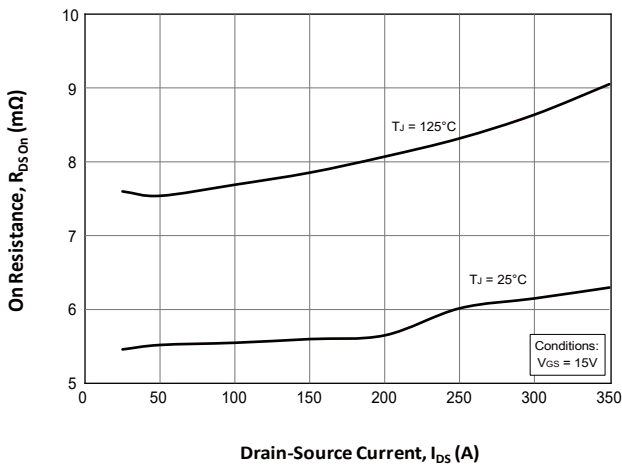
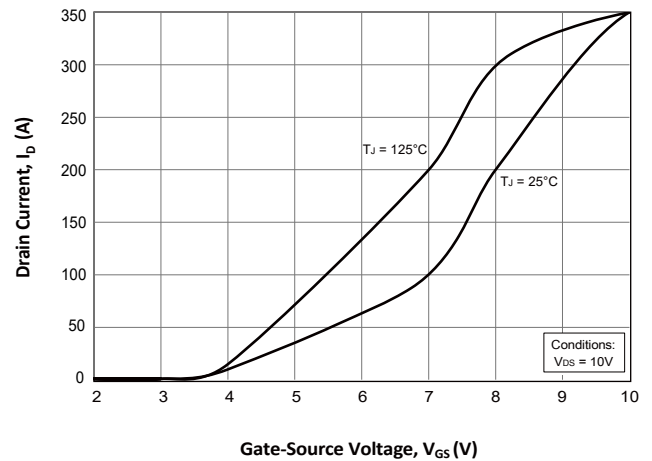
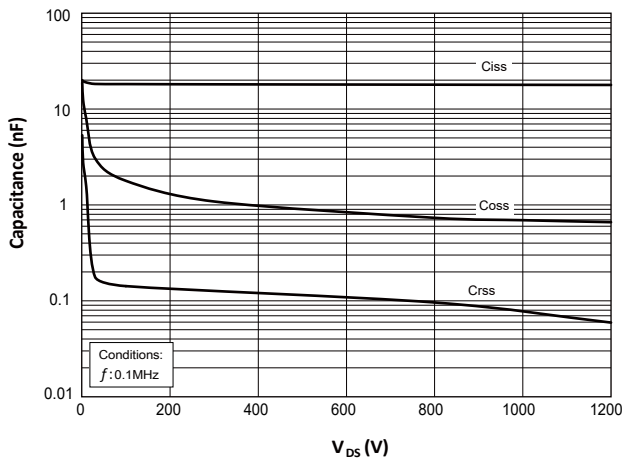
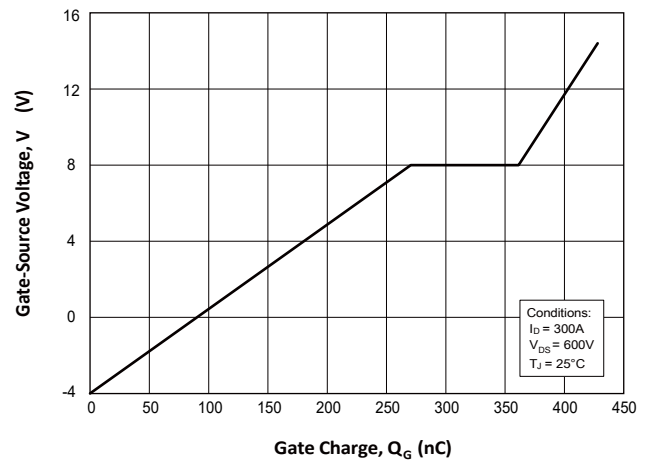


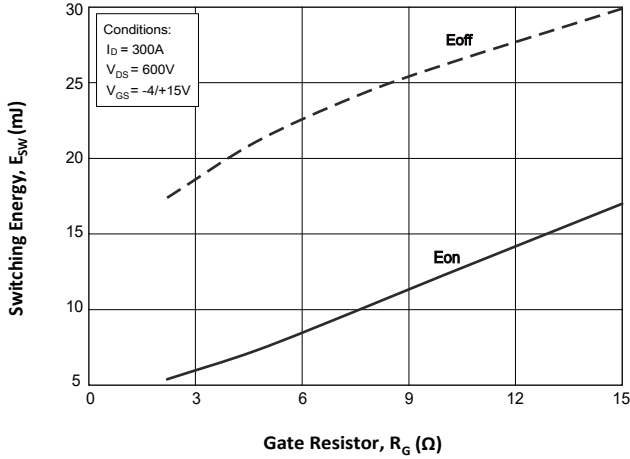
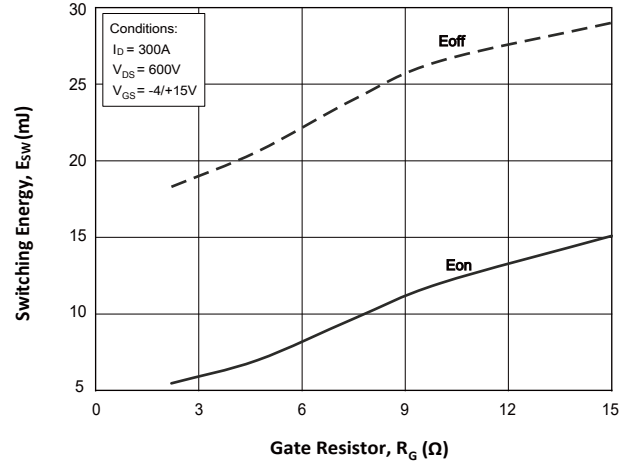
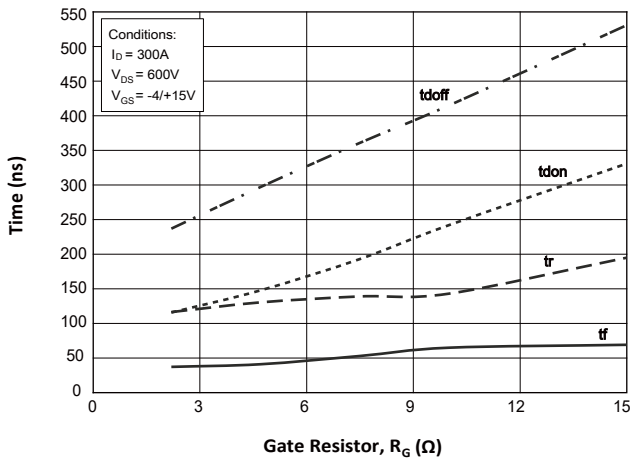
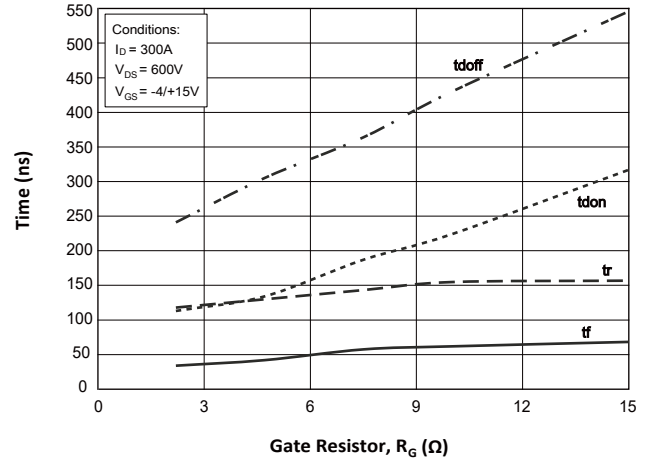
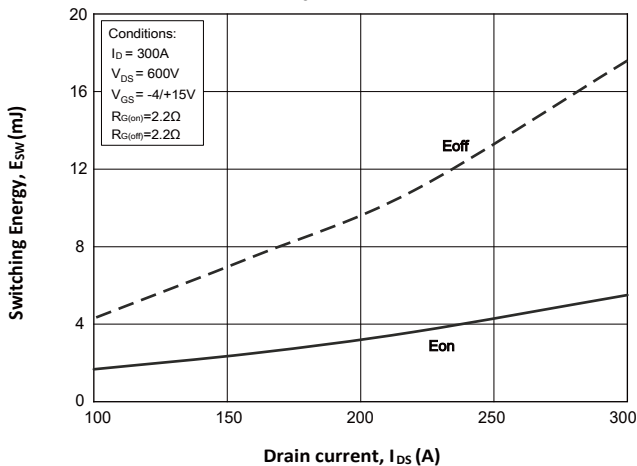
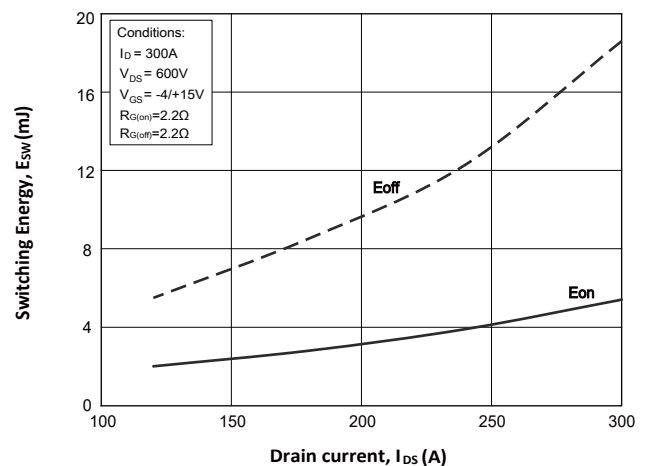
Electrical Characteristics @ $T_{VJ} = 25^{\circ}\text{C}$ (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
OFF Characteristics							
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_{DS}=0.5mA$	1200	-	-	V	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS}=0V, V_{DS}=1200V$	-	-	200	μA	
Gate-Body Leakage	I_{GSS}	$V_{GS}=20V, V_{DS}=0V$	-	-	500	nA	
ON Characteristics							
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_{DS}=100mA$	1.8	2.6	3.7	V	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=15V, I_{DS}=100A$	-	5.5	7.2	m Ω	
Gate Resistance	$R_{G(int)}$	Internal gate resistor	$T_{VJ}=25^{\circ}\text{C}$	-	4.42	Ω	
Dynamic Characteristics							
Input Capacitance	C_{iss}	$V_{DS}=800V$	-	17.9	-	nF	
Output Capacitance	C_{oss}	$V_{GS}=0V$ $V_{AC}=1V$	-	0.74	-		
Reverse Transfer Capacitance	C_{rss}	Freq.=100KHz	-	0.096	-		
Total Gate Charge	Q_g	$V_{DS}=600V$	-	428	-	nC	
Gate to Source Charge	Q_{gs}	$V_{GS}=-4V/+15V$	-	270	-		
Gate to Drain Charge	Q_{gd}	$I_{DS}=300A$	-	91	-		
Switching Characteristics							
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=600V$ $V_{GS}=-4V/+15V$ $I_{DS}=300A$ $R_{G(on)}=2.2\Omega$ $R_{G(off)}=2.2\Omega$	$T_{VJ}=25^{\circ}\text{C}$	-	129	-	ns
			$T_{VJ}=150^{\circ}\text{C}$	-	113	-	
Rise Time	t_r		$T_{VJ}=25^{\circ}\text{C}$	-	111	-	
			$T_{VJ}=150^{\circ}\text{C}$	-	118	-	
Turn-Off Delay Time	$t_{d(off)}$		$T_{VJ}=25^{\circ}\text{C}$	-	201	-	
			$T_{VJ}=150^{\circ}\text{C}$	-	241	-	
Fall Time	t_f		$T_{VJ}=25^{\circ}\text{C}$	-	33	-	
			$T_{VJ}=150^{\circ}\text{C}$	-	34	-	
Turn-On Switching Energy	E_{on}	$V_{DD}=600V$ $V_{GS}=-4V/+15V$ $I_{DS}=300A$	$T_{VJ}=25^{\circ}\text{C}$	-	5.4	-	mJ
			$T_{VJ}=150^{\circ}\text{C}$	-	5.5	-	
Turn-Off Switching Energy	E_{off}	$R_{G(on)}=2.2\Omega$ $R_{G(off)}=2.2\Omega$	$T_{VJ}=25^{\circ}\text{C}$	-	17.3	-	
			$T_{VJ}=150^{\circ}\text{C}$	-	18.3	-	
Body Diode Characteristics at $T_J = 25^{\circ}\text{C}$, unless otherwise specified							
Continuous Diode Fwd Current	I_{SDC}	$V_{GS}=0V$	-	300	-	A	
Drain-Source Reverse Voltage	V_{SD}	$I_{SD}=310A, V_{GS}=0V$	-	4.4	-	V	
MOSFET Forward Recovery Charge	Q_{rr}	$V_{DD}=600V$ $I_{DS}=300A$ $V_{GS}=-4/+15V$ $di/dt=4500 A/\mu s$	$T_{VJ}=25^{\circ}\text{C}$	-	701	-	nC
			$T_{VJ}=150^{\circ}\text{C}$	-	2996	-	
MOSFET Peak Forward Recovery Current	I_{rrm}		$T_{VJ}=25^{\circ}\text{C}$	-	48	-	A
			$T_{VJ}=150^{\circ}\text{C}$	-	120	-	
MOSFET Reverse Recovery Time	T_{rr}		$T_{VJ}=25^{\circ}\text{C}$	-	23	-	ns
		$T_{VJ}=150^{\circ}\text{C}$	-	45	-		

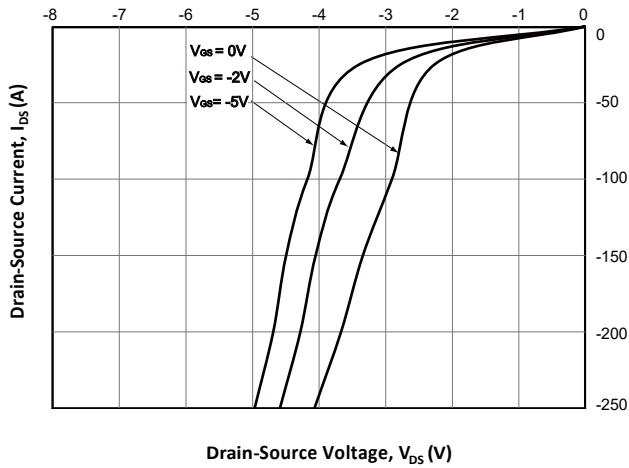
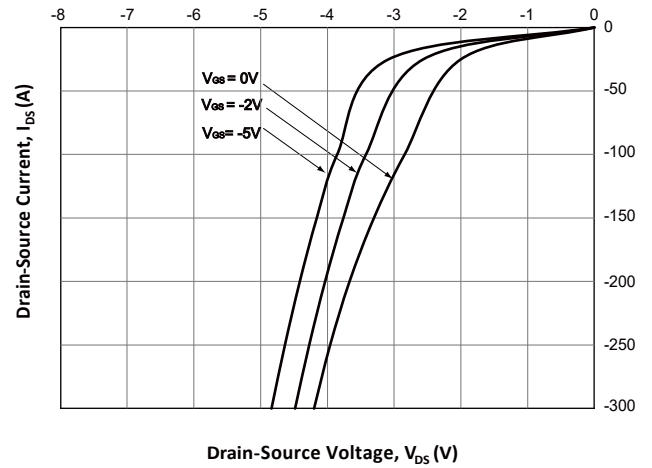
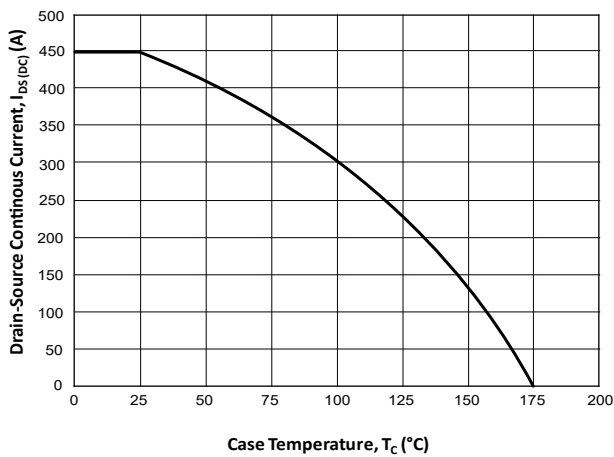
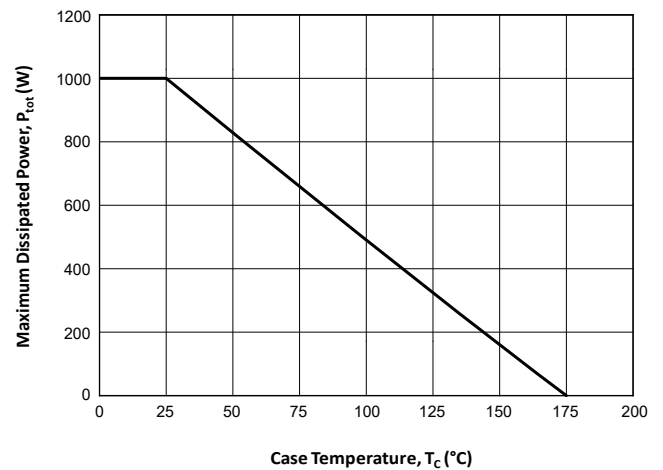
Notes:

 1. Pulse Test: Pulse Width $\leq 300 \mu s$, Duty Cycle $> 2\%$.

Typical Characteristics
Fig.1 Output Characteristics at $T_J = 25^\circ\text{C}$

Fig.2 Output Characteristics at $T_J = 125^\circ\text{C}$

Fig.3 Drain Source on Resistance

Fig.4 Transfer Characteristics

Fig.5 Capacitances vs. Drain-Source Voltage

Fig.6 Gate Charge Characteristics


Typical Characteristics
Fig.7 Switching losses vs R_G change $T_J=125^\circ\text{C}$

Fig.8 Switching losses vs R_G change $T_J=150^\circ\text{C}$

Fig.9 Switching Timer vs R_G Change $T_J=125^\circ\text{C}$

Fig.10 Switching Timer vs R_G Change $T_J=150^\circ\text{C}$

Fig.11 Clamped Inductive Switching Energy vs. Drain Current $T_J=125^\circ\text{C}$

Fig.12 Clamped Inductive Switching Energy vs. Drain Current $T_J=150^\circ\text{C}$


Typical Characteristics

Fig.13 Body Diode curves $T_J = 25^\circ\text{C}$

Fig.14 Body Diode curves $T_J = 125^\circ\text{C}$

Fig.15 Continuous Drain Current (MOSFET) vs. Case Temperature

Fig.16 Max. Power Dissipation (MOSFET) Derating vs. Case Temperature


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