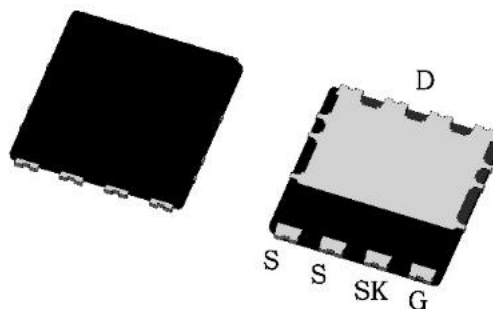


650V N-Channel MOSFET
Description

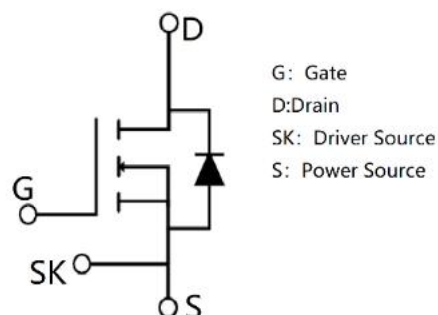
Silicon Carbide (SiC) MOSFET use a completely new technology that provide superior switching performance and higher reliability compared to Silicon. In addition, the low ON resistance and compact chip size ensure low capacitance and gate charge. Consequently, system benefits include highest efficiency, faster operating frequency, increased power density, reduced EMI, and reduced system size.

Features

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low RDS(on)
- Optimized package with separate driver source pin
- Easy to parallel and simple to drive
- ROHS Compliant, Halogen free


Application

- EV motor drive
- High Voltage DC/DC Converters
- Switch Mode Power Supplies
- Solar inverters
- EV charging


Ordering Information

Part Number	Marking	Package	Packaging
ASR35N650MD88	ASR35N650MD88	PDFN8*8	Reel

Absolute Maximum Ratings(Tc=25℃)

Symbol	Parameter	Value	Unit
V _{DS}	Drain-Source Voltage	650	V
I _D	Drain Current(continuous)at Tc=25℃	60	A
I _D	Drain Current(continuous)at Tc=100℃	48	A
I _{DM}	Drain Current (pulsed)	135	A
V _{GS}	Gate-Source Voltage	-10/+22	V
P _D	Power Dissipation T _C = 25℃	242	W
T _J , Tstg	Junction and Storage Temperature Range	-55 to +175	℃

Electrical Characteristics(T_J = 25℃ unless otherwise specified)
Typical Performance-Static

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV _{DS}	Drain-source Breakdown Voltage	I _D =250uA, V _{GS} =0V	650			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =650V, V _{GS} =0V, T _J =25℃		5	100	uA
I _{GSS}	Gate-body Leakage Current	V _{DS} =0V ; V _{GS} =-10 to 22V		10	250	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D =10mA	2	3	4	V
V _{GS(on)}	Recommended turn-on Voltage	Static		18		V
V _{GS(off)}	Recommended turn-off Voltage			-5		V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} =18V, I _D =20A		35	44	mΩ
		V _{GS} =18V, I _D =20A T _J =175℃		46		mΩ

Typical Performance-Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input Capacitance	$V_{DS}=600V, f=1MHz,$ $V_{AC}=25mV$		2610		pF
C_{oss}	Output Capacitance			212		pF
C_{rss}	Reverse Transfer Capacitance			10		pF
g_{fs}	Transconductance	$V_{DS}=20V, I_D=20A$		23		S
E_{oss}	C_{oss} Stored Energy	$V_{DS}=600V, f=1MHz$		22		μJ
E_{ON}	Turn-On Energy (Body Diode)	$V_{DS}=400V,$ $V_{GS}=-5/20V, I_D=30A,$ $L=100\mu H, T_J=175^\circ C$		62		μJ
E_{OFF}	Turn-Off Energy (Body Diode)			15		μJ
Q_g	Total Gate Charge	$V_{DS}=400V,$ $V_{GS}=-5V/20V, I_D=30A,$		128		nC
Q_{gs}	Gate-source Charge			33		nC
Q_{gd}	Gate-Drain Charge			24		nC
$R_{G(int)}$	Internal Gate Resistance	$f=1MHz, V_{AC}=25mV$		4.1		Ω
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=400V,$ $V_{GS}=-5V/20V,$ $I_D=30A, L=100\mu H$ $R_{ext}=2.5\Omega$		10		ns
t_r	Rise Time			12		ns
$t_{d(off)}$	Turn-off Delay Time			19		ns
t_f	Fall Time			7		ns

Typical Performance-Reverse Diode($T_J = 25^\circ C$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{FSD}	Forward Voltage	$V_{GS}=0V, I_F=15A, T_J=25^\circ C$		3.5	6	V
		$V_{GS}=0V, I_F=15A, T_J=175^\circ C$		3.0	6	V
I_S	Continuous Diode Forward Current	$V_{GS}=0V, T_C=25^\circ C$		30.5		A
t_{rr}	Reverse Recovery Time	$V_{GS}=-5V, I_F=15A,$ $V_R=400V, di/dt=2400A/\mu s,$ $T_J=175^\circ C$		36		nS
Q_{rr}	Reverse Recovery Charge			160		nC
I_{rrm}	Peak Reverse Recovery Current			10.5		A

Thermal Characteristics

Symbol	Parameter	Value.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.62	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	40	$^\circ C/W$

The values are based on the junction-to case thermal impedance which is measured with the device mounted to a large heat sink assuming maximum junction temperature of $T_J(max)=175^\circ C$

Electrical Characteristics

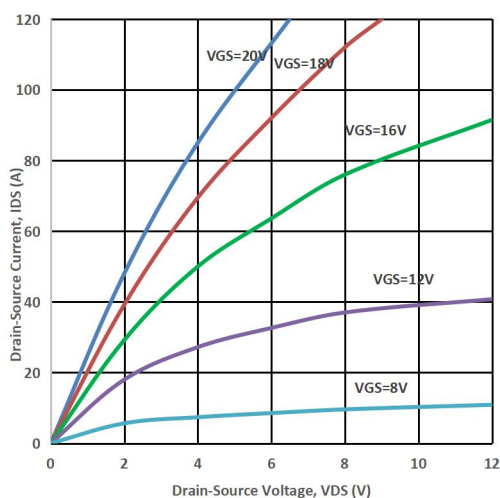
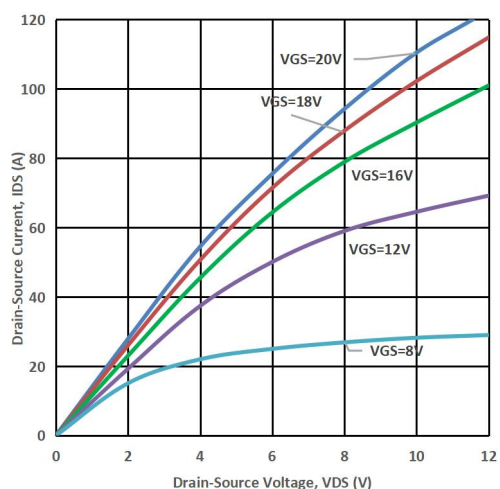
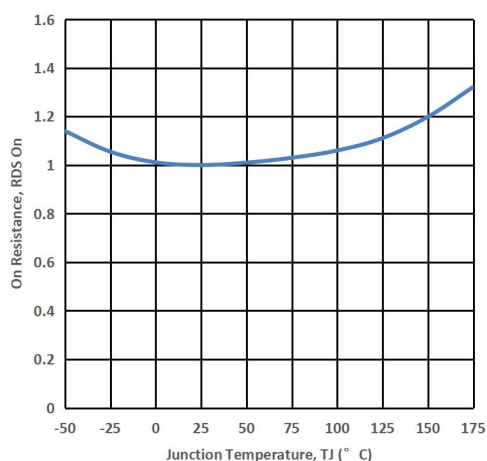
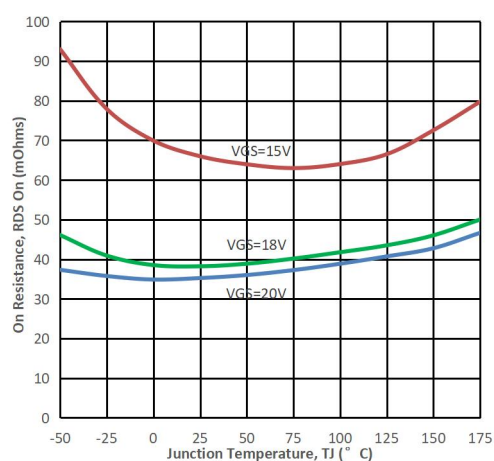
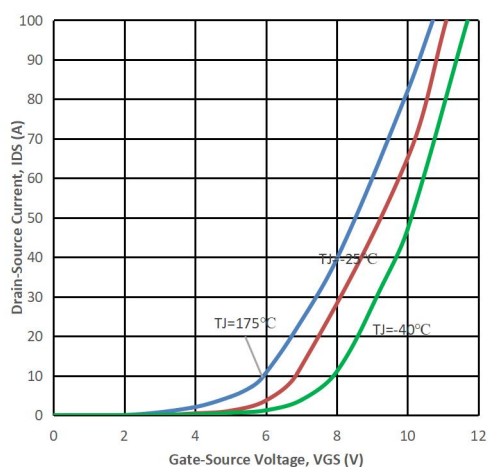
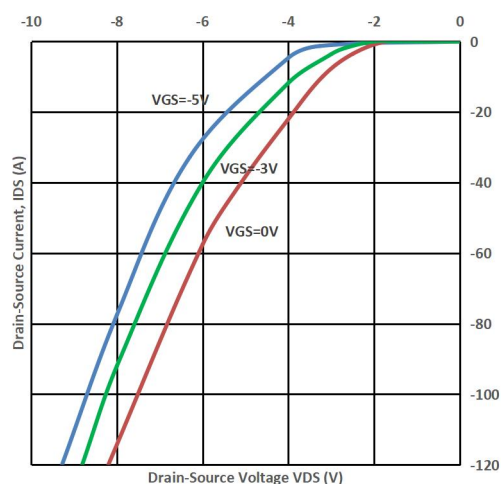
Fig1. Output characteristics ($T_J = 25^\circ\text{C}$)

Fig2. Output characteristics ($T_J = 175^\circ\text{C}$)

Fig3. Normalized On-Resistance vs. Temperature

Fig4. On-Resistance vs. Temperature

Fig5. Transfer Characteristic

Fig6. Body Diode Characteristic at 25°C


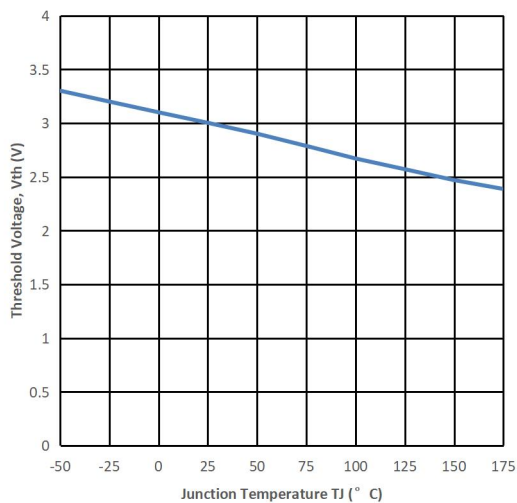
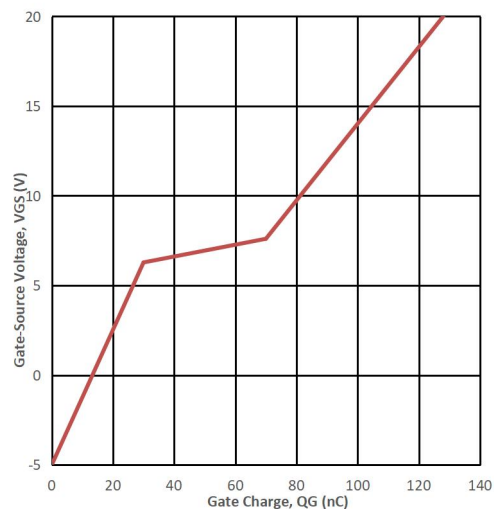
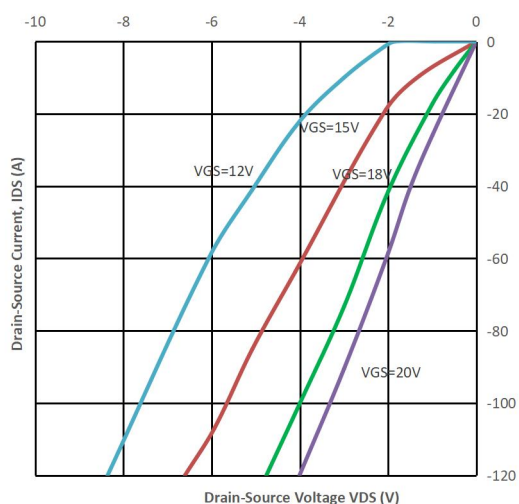
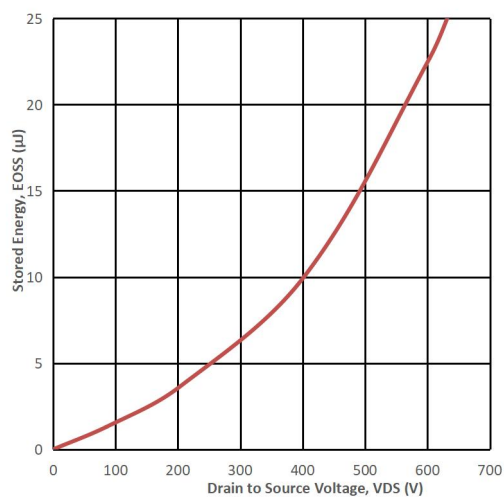
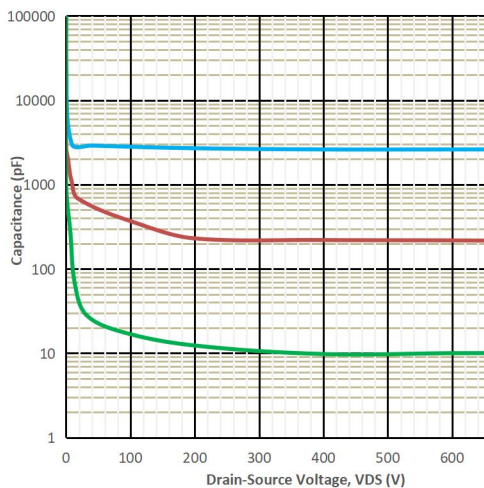
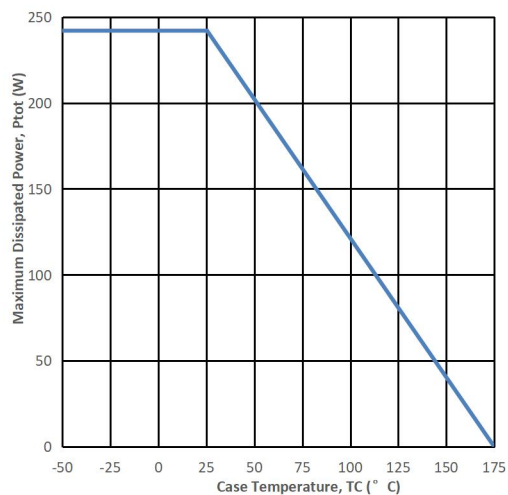
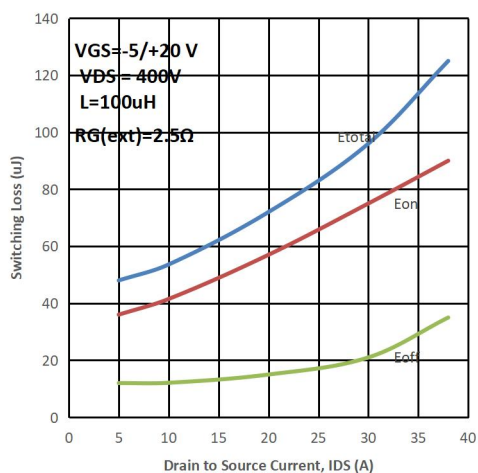
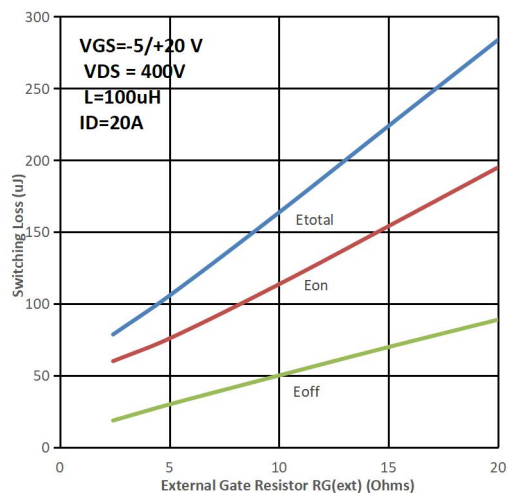
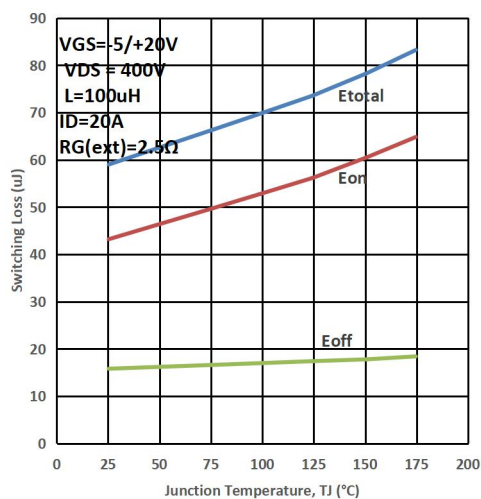
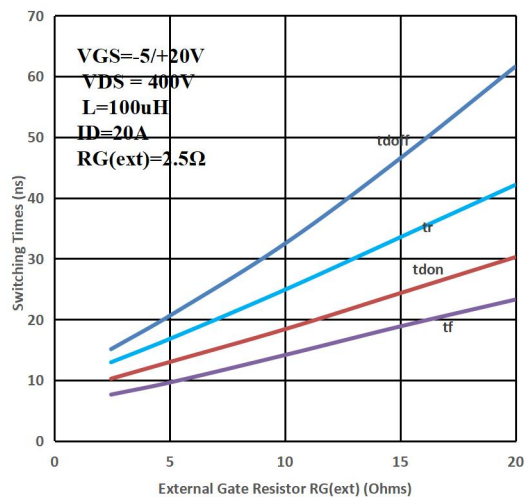
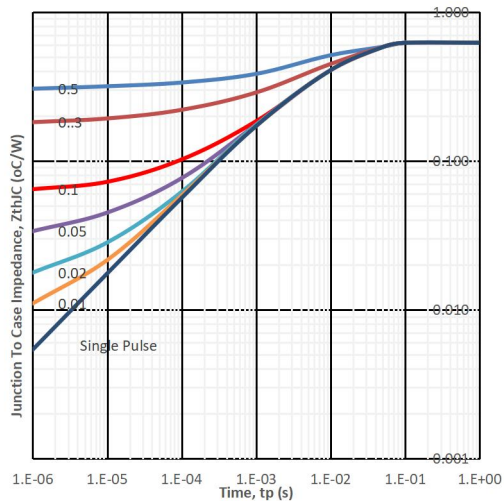
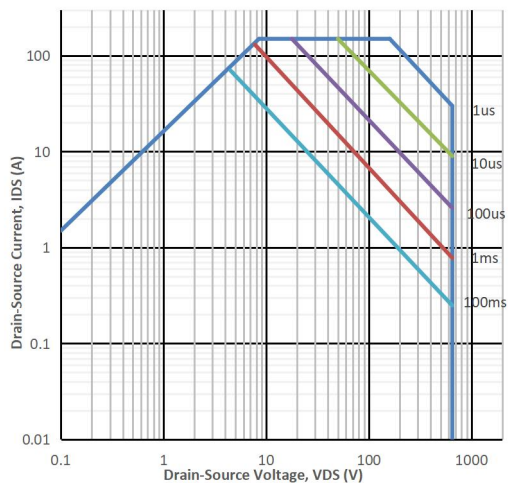
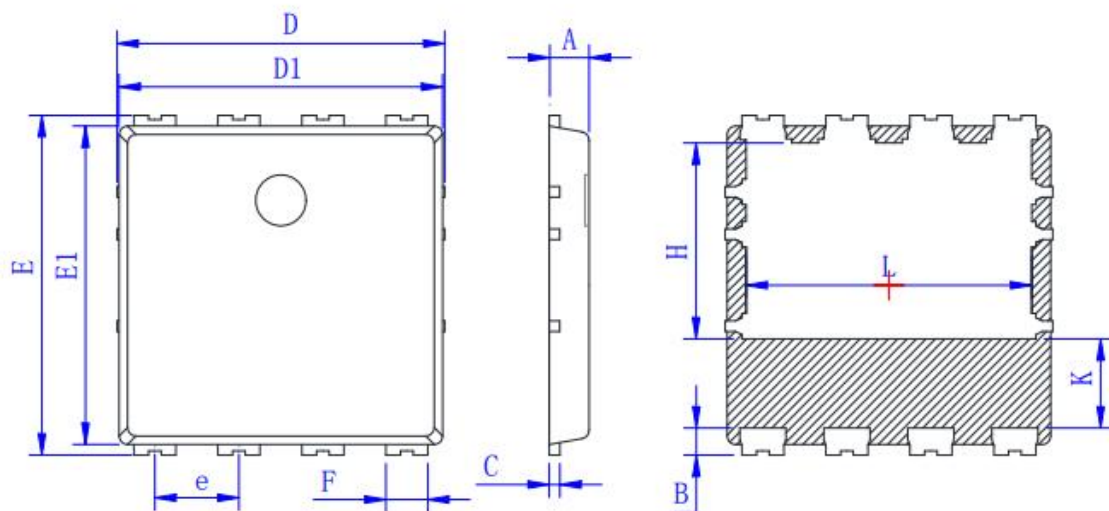
Fig7. Threshold Voltage vs. Temperature

Fig8. Gate Charge Characteristics

Fig9. 3rd Quadrant Characteristic at 25 °C

Fig10. Output Capacitor Stored Energy

Fig11. Capacitances vs. Drain-Source

Fig12. Max Power Dissipation Derating Vs Tc


Fig13. Switching Energy vs. Drain Current

Fig14. Switching Energy vs. $R_{G(\text{ext})}$

Fig15. Switching Energy vs. Temperature

Fig16. Switching Times vs. $R_{G(\text{ext})}$

Fig17. Transient Thermal Impedance

Fig18. Safe Operating Area


Package Drawing:

Dimensions (UNIT: mm)

Symbol	Min	Typ	Max
A	0.90	0.95	1.00
B	0.50	0.60	0.70
C	0.254TYP		
D	7.70	7.80	7.90
D1	7.60	7.70	7.80
E	7.90	8.00	8.10
E1	7.40	7.50	7.60
e	2.0 TYP		
F	1.0 TYP		
H	4.40	4.60	4.70
L	6.60	6.80	6.90
K	2.00		

Notes:

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