



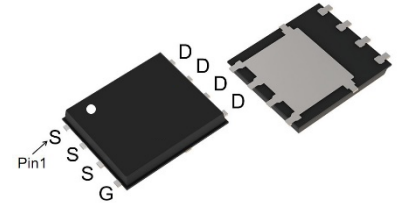
VM6509

60V/57A N-Channel Advanced Power MOSFET

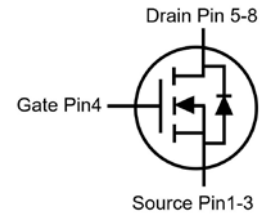
Features

- Enhancement mode
- Low RDS(on) to minimize conduction losses
- VitoMOS[®] II Technology
- 100% Avalanche Tested, 100% Rg Tested

V _{DS}	60	V
R _{DS(on),TYP@ V_{GS}=10V}	4.8	mΩ
R _{DS(on),TYP@ V_{GS}=4.5V}	7.1	mΩ
I _{D(Silicon Limited)}	57	A



PDFN5x6



Part ID	Package Type	Marking	Packing
VM6509	PDFN5x6	VM6509	3000pcs/Reel

Maximum ratings, at T_A=25 °C, unless otherwise specified

Symbol	Parameter	Rating	Unit	
V _{(BR)DSS}	Drain-Source breakdown voltage	60	V	
V _{GS}	Gate-Source voltage	±20	V	
I _S	Diode continuous forward current	T _C = 25°C	28	A
I _D	Continuous drain current @ V _{GS} =10V (Silicon limited)	T _C = 25°C	57	A
I _D	Continuous drain current @ V _{GS} =10V (Silicon limited)	T _C = 100°C	36	A
I _{DM}	Pulse drain current tested ^①	T _C = 25°C	228	A
I _{DSM}	Continuous drain current @ V _{GS} =10V	T _A = 25°C	14	A
		T _A = 70°C	11	A
EAS	Maximum Avalanche energy, single pulsed ^②	36	mJ	
P _D	Maximum power dissipation	T _C = 25°C	34	W
		T _C = 100°C	14	W
P _D SM	Maximum power dissipation ^③	T _A = 25°C	2.1	W
		T _A = 70°C	1.3	W
T _J ,T _{STG}	Operating Junction and Storage Temperature Range	-55 to 150	°C	

Thermal Characteristics

Symbol	Parameter	Typical	Max	Unit
R _{θJC}	Thermal Resistance, Junction-to-Case	3.1	3.7	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	50	60	°C/W



Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @ T _j = 25°C (unless otherwise stated)						
V(BR)DSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	60	--	--	V
IDSS	Zero Gate Voltage Drain Current(T _j =25°C)	V _{DS} =60V, V _{GS} =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T _j =125°C)	V _{DS} =60V, V _{GS} =0V	--	--	100	μA
IGSS	Gate-Body Leakage Current	V _{GS} =±20V, V _{DS} =0V	--	--	±100	nA
VGS(th)	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.1	1.6	2.2	V
RDS(on)	Drain-Source On-State Resistance④	V _{GS} =10V, I _D =40A	--	4.8	6.2	mΩ
		T _j =100°C	--	6.2	--	mΩ
RDS(on)	Drain-Source On-State Resistance④	V _{GS} =4.5V, I _D =20A	--	7.1	9.5	mΩ
Dynamic Electrical Characteristics @ T _j = 25°C (unless otherwise stated)						
Ciss	Input Capacitance	V _{DS} =30V, V _{GS} =0V, f=1MHz	675	1350	2360	pF
Coss	Output Capacitance		215	430	755	pF
Crss	Reverse Transfer Capacitance		10	25	45	pF
Rg	Gate Resistance	f=1MHz	0.2	1	5	Ω
Qg(10V)	Total Gate Charge	V _{DS} =30V, I _D =40A, V _{GS} =10V	--	24	42	nC
Qg(4.5V)	Total Gate Charge		--	12.5	22	nC
Qgs	Gate-Source Charge		--	4.7	8.2	nC
Qgd	Gate-Drain Charge		--	5.5	9.6	nC
Switching Characteristics						
Td(on)	Turn-on Delay Time	V _{DD} =30V, I _D =40A, R _G =3Ω, V _{GS} =10V	--	7.2	--	ns
Tr	Turn-on Rise Time		--	57	--	ns
Td(off)	Turn-Off Delay Time		--	20	--	ns
Tf	Turn-Off Fall Time		--	27	--	ns
Source- Drain Diode Characteristics @ T _j = 25°C (unless otherwise stated)						
VSD	Forward on voltage	I _{SD} =40A, V _{GS} =0V	--	0.9	1.2	V
Trr	Reverse Recovery Time	V _{DD} =30V I _{SD} =40A, V _{GS} =0V	--	21	42	ns
Qrr	Reverse Recovery Charge	di/dt=100A/μs	--	8.3	17	nC

NOTE:

- ① Single pulse; pulse width ≤ 100μs.
- ② Limited by T_{Jmax}, starting T_J = 25°C, L = 0.5mH, R_G = 25Ω, I_{AS} = 12A, V_{GS} = 10V. Part not recommended for use above this value
- ③ The power dissipation PDSM is based on RθJA and the maximum allowed junction temperature of 150°C.
- ④ Pulse width ≤ 380μs; duty cycle ≤ 2%.



Typical Characteristics

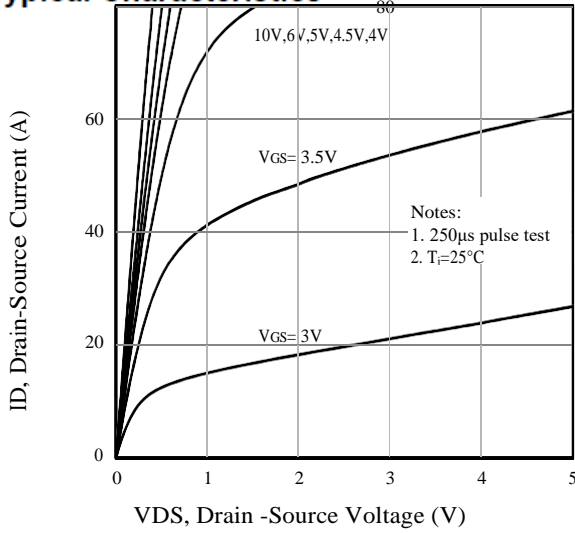


Fig1. Typical Output Characteristics

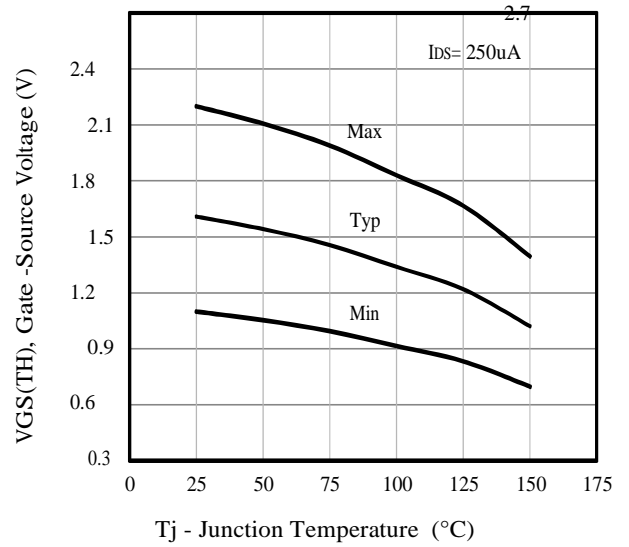


Fig2. Typical $V_{GS(TH)}$ Gate-Source Voltage Vs. T_j

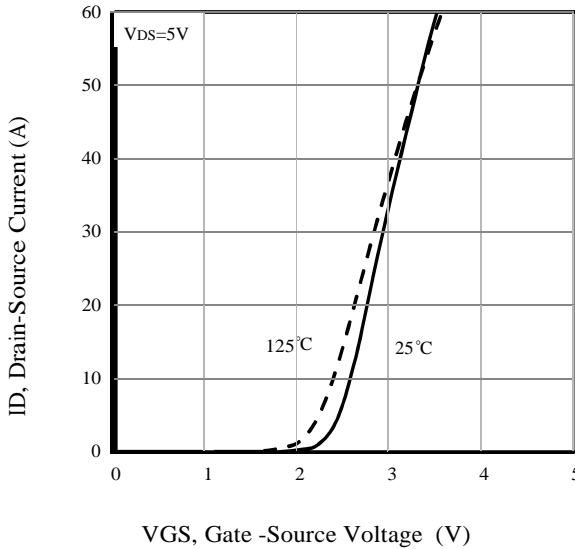


Fig3. Typical Transfer Characteristics

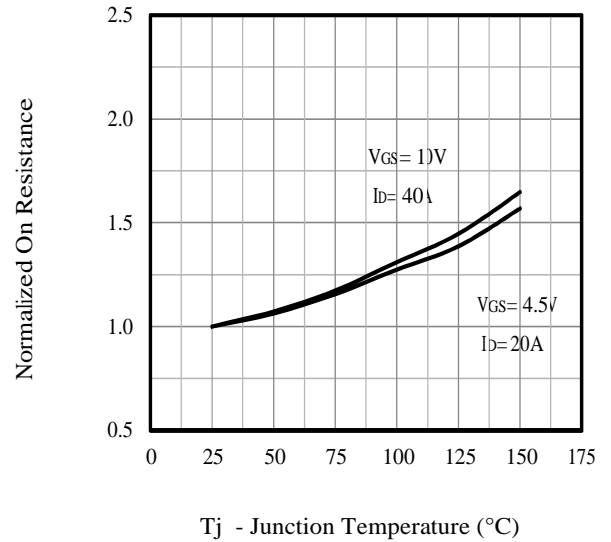


Fig4. Typical Normalized On-Resistance Vs. T_j

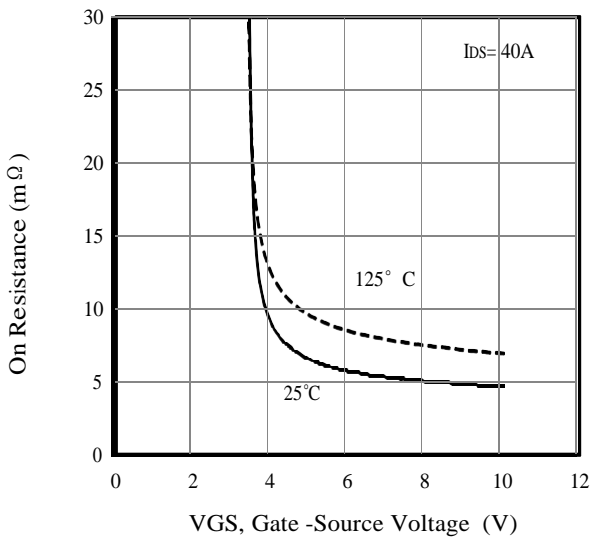


Fig5. Typical On Resistance Vs Gate-Source Voltage

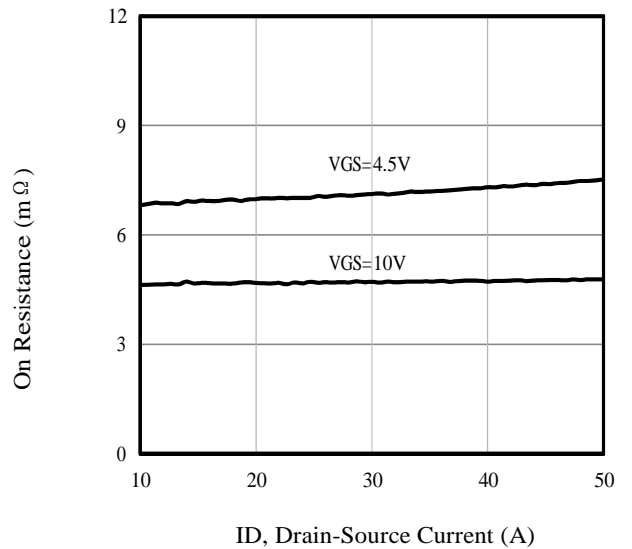


Fig6. Typical On Resistance Vs Drain Current



Typical Characteristics

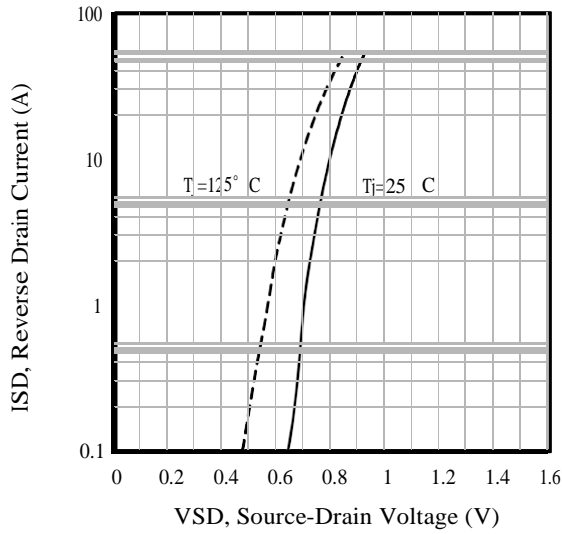


Fig7. Typical Source-Drain Diode Forward Voltage

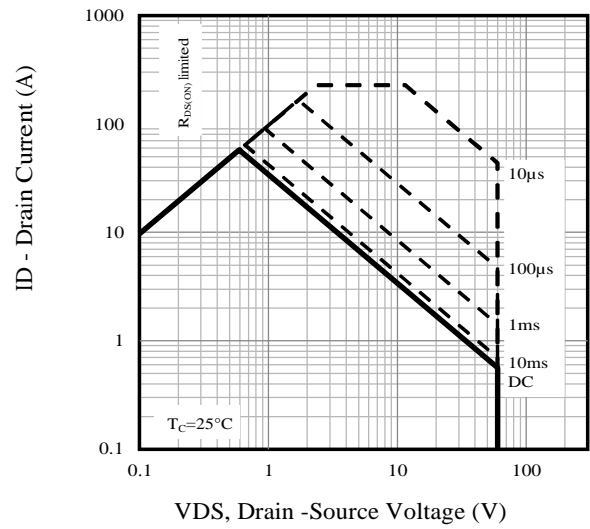


Fig8. Maximum Safe Operating Area

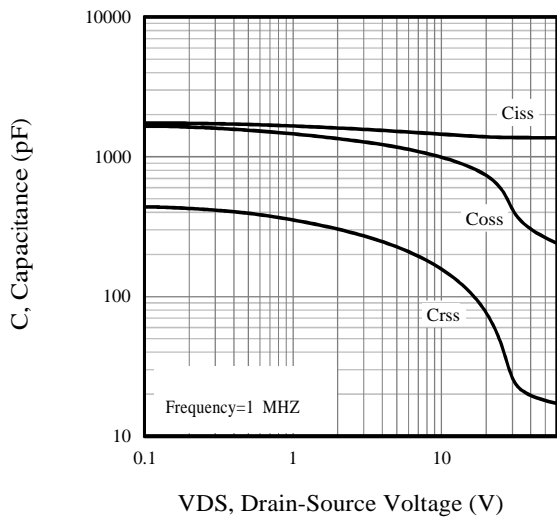


Fig9. Typical Capacitance Vs. Drain-Source Voltage

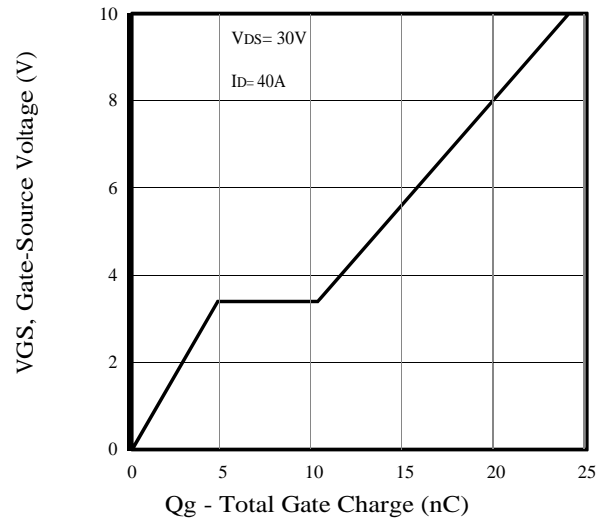


Fig10. Typical Gate Charge Vs. Gate-Source Voltage

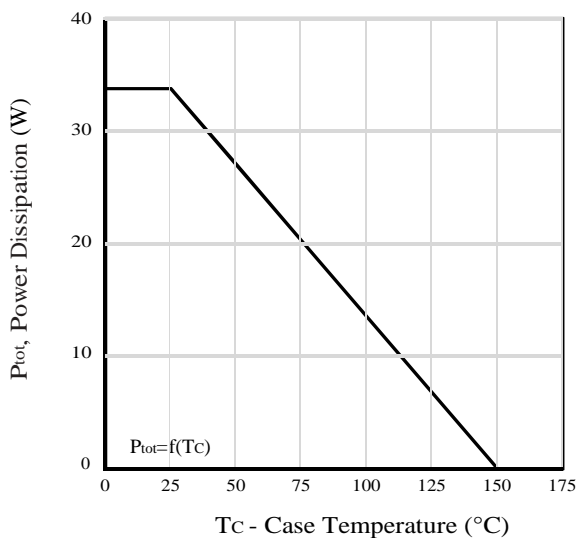


Fig11. Power Dissipation Vs. Case Temperature

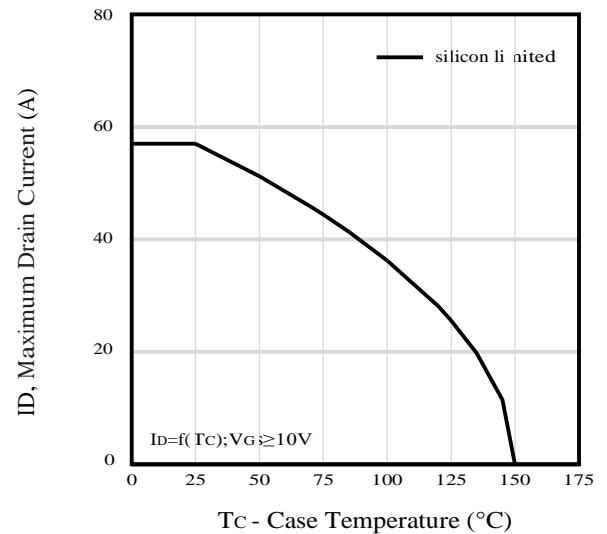


Fig12. Maximum Drain Current Vs. Case Temperature



Typical Characteristics

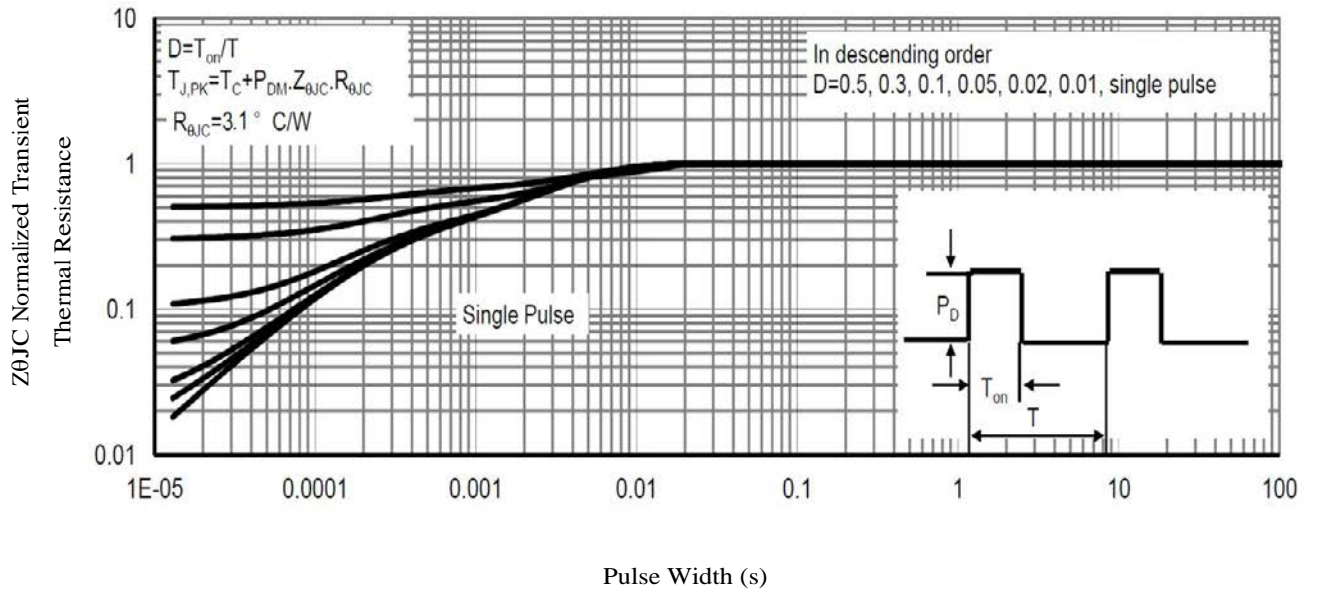


Fig13 . Normalized Maximum Transient Thermal Impedance

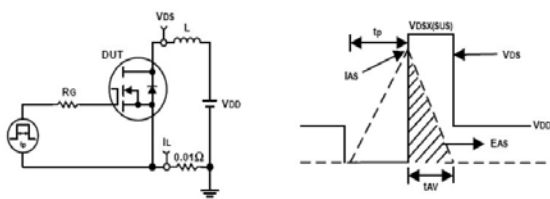


Fig14. Unclamped Inductive Test Circuit and waveforms

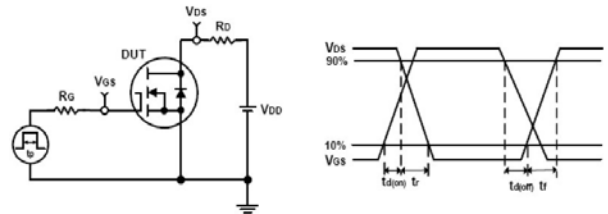
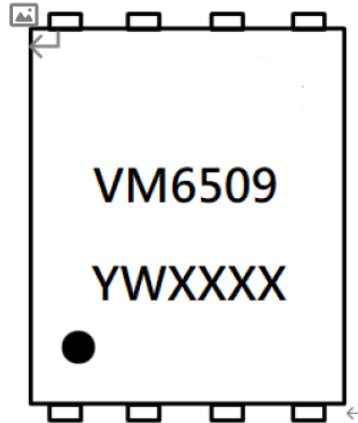


Fig15. Switching Time Test Circuit and waveforms



Marking Information



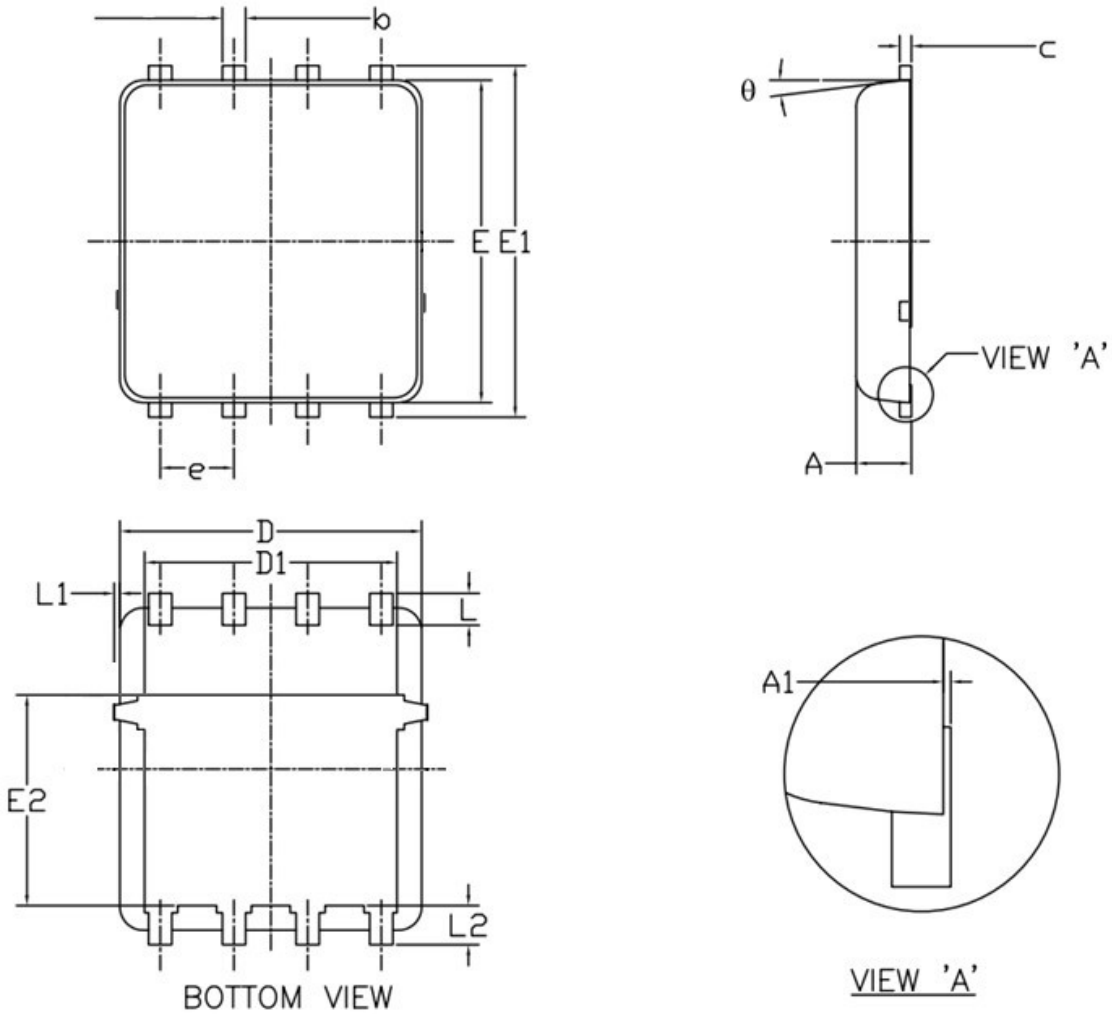
1st line: Part Number (VM6509)
2nd line: Date code (YWXXXX)



VM6509

60V/57A N-Channel Advanced Power MOSFET

PDFN5x6 Package Outline Data



Notes:

1. Refer to JEDEC MO-240 variation AA.
2. Dimensions "D" and "E" do NOT include mold flash protrusions or gate burrs.
3. Dimensions "D" and "E" include interterminal flash or protrusion. Interterminal flash or protrusion shall not exceed 0.25mm per side.

Symbol	DIMENSIONS (unit : mm)		
	Min	Typ	Max
A	0.90	1.00	1.20
A1	0.00	--	0.05
b	0.30	0.40	0.51
c	0.20	0.25	0.33
D	4.80	4.90	5.40
D1	3.61	4.00	4.25
E	5.65	5.80	6.06
E1	5.90	6.10	6.35
E2	3.38	3.58	3.92
e	1.27 BSC		
L	0.51	0.61	0.71
L1	--	--	0.15
L2	0.41	0.51	0.61
θ	0°	--	12°



VM6509

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