IceMOS Technology

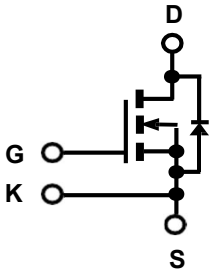
Preliminary
ICE13M120W4

ICE13M120W4
Silicon Carbide Power MOSFET

Product Summary			
I_D	T_A=25°C	118A	Max
$V_{(BR)DSS}$	T_C=25°C	1200V	Min
$r_{DS(on)}$	V_{GS}=18V	12.7mΩ	Typ
Q_g	V_{DS}=800V	210nC	Typ

Features

- 1200V 13mohm SiC MOSFET
- High blocking voltage with low on resistance
- High-speed switching with low capacitances
- Fast Reverse Recovery
- Optimized design for high performance power systems



TO247-4L

1: D, 2: S, 3: K, 4: G

RoHS COMPLIANT RoHS (EU) 2015/863

CE

HALOGEN FREE

Lead Free

Maximum ratings [a] , at T_j=25°C, unless otherwise specified

Parameter	*Symbol*	*Conditions*	*Value*	*Unit*
Continuous drain current	I_D	T_c=25°C	118	A
		T_c=100°C	84	
Pulsed drain current	$I_{D,\ pulse}$		461	A
Maximum gate source voltage	$V_{GS(max)}$		-10/+22	V
Operational gate source voltage	$V_{GS\ op}$		-5/+18	V
Power dissipation	P_{tot}	T_c=25°C	405	W
		T_c=100°C	202	
Storage temperature	T_{stg}		-55 to +150	°C
Operating temperature	T_j		-55 to +175	°C

a Pulse width limited by Tjmax

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	
Thermal characteristics						
Thermal resistance, junction-case	R_{thJC}		-	-	0.37	°C/W
Soldering temperature, wave soldering only allowed at leads	T_{sold}	1.6mm (0.063in.) from case for 10 s	-	-	260	°C

Electrical characteristics [a], at T_j=25°C, unless otherwise specified

Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0V	1200	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=20mA, T_j=25°C	2	3	4	V
		V_{DS}=V_{GS}, I_D=20mA, T_j=175°C	-	2.2	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V, T_j=25°C	-	0.1	50	µA
		V_{DS}=1200V, V_{GS}=0V, T_j=175°C	-	1	-	µA
Gate source leakage current	I_{GSS}	V_{GS}=-10/+22V, V_{DS}=0V	-	-	±100	nA
Drain-source on-state resistance	$R_{DS\ (on)}$	V_{GS}=18V, I_D=100A, T_j=25°C	-	12.7	16.5	mΩ
		V_{GS}=18V, I_D=100A, T_j=175°C	-	22.3	-	mΩ
Gate resistance	R_G	f=1 MHz, V_{AC}=30mV	-	1.4	-	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS}=800V, V_{GS}=0V, f=100 kHz, V_{AC}=30mV	-	5513	-	pF
Output capacitance	C_{oss}		-	225	-	pF
Reverse transfer capacitance	C_{rss}		-	8.5	-	pF
C_{OSS} stored energy	E_{oss}		-	88	-	µJ
Forward transconductance	g_{FS}	V_{DS}=20V, I_D=100A	-	94	-	S
Turn-on delay time	$t_{d(on)}$	V_{DS}=800V, V_{GS}=-5/+18V, I_D=100A, R_G=6Ω (External), T_j=25°C	-	TBD	-	ns
Rise time	t_r		-	TBD	-	ns
Turn-off delay time	$t_{d(off)}$		-	TBD	-	ns
Fall time	t_f		-	TBD	-	ns
Turn-on switching energy	E_{ON}		-	TBD	-	mJ
Turn-off switching energy	E_{OFF}		-	TBD	-	mJ

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	
Dynamic characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DS}=800V, V_{GS}=-5/+18V, I_D=100A, R_G=6Ω (External), T_j=175°C	-	23	-	ns
Rise time	t_r		-	43	-	
Turn-off delay time	$t_{d(off)}$		-	65	-	
Fall time	t_f		-	15	-	
Turn-on switching energy	E_{ON}		-	2	-	mJ
Turn-off switching energy	E_{OFF}		-	0.7	-	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DS}=800V, I_D=100A, V_{GS}=-5 to +18V	-	60	-	nC
Gate to drain charge	Q_{gd}		-	30	-	
Gate charge total	Q_g		-	210	-	
Reverse Diode						
Continuous forward current	I_S	V_{GS}=-5V	-	9	-	A
Diode forward voltage	V_{SD}	V_{GS}=-5V, I_{SD}=50A, T_j=25°C	-	4.3	-	V
		V_{GS}=-5V, I_{SD}=50A, T_j=175°C	-	3.8	-	
Reverse recovery time	t_{rr}	V_{GS}=-5V, V_{RR}=800V, I_{SD}=100A, d_{iF}/d_t=TBD A/µs, T_j=25°C	-	TBD	-	ns
Reverse recovery charge	Q_{rr}		-	TBD	-	nC
Peak reverse recovery current	I_{rm}		-	TBD	-	A
Reverse recovery time	t_{rr}	V_{GS}=-5V, V_{RR}=800V, I_{SD}=100A, d_{iF}/d_t=TBD A/µs, T_j=175°C	-	37	-	ns
Reverse recovery charge	Q_{rr}		-	2.2	-	µC
Peak reverse recovery current	I_{rm}		-	90	-	A

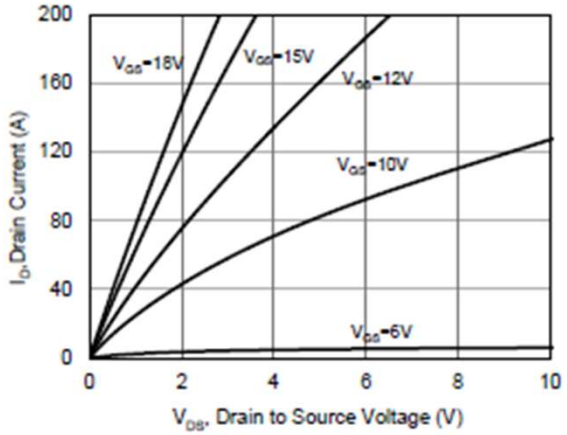


Fig 1. Output Characteristics, T_J=25°C

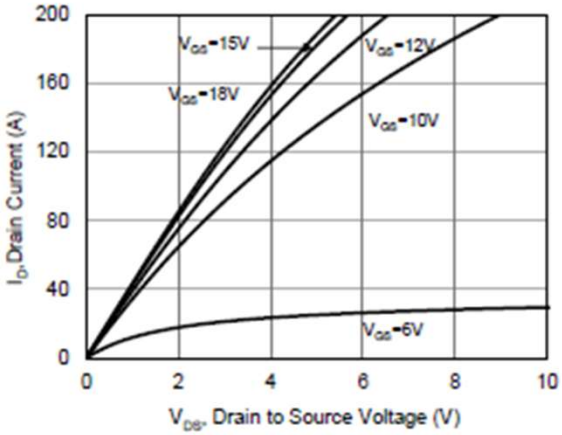


Fig 2. Output Characteristics, T_J=175°C

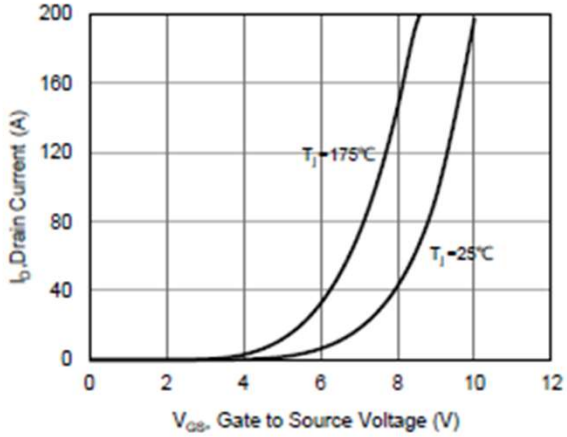


Fig 3. Transfer Characteristics

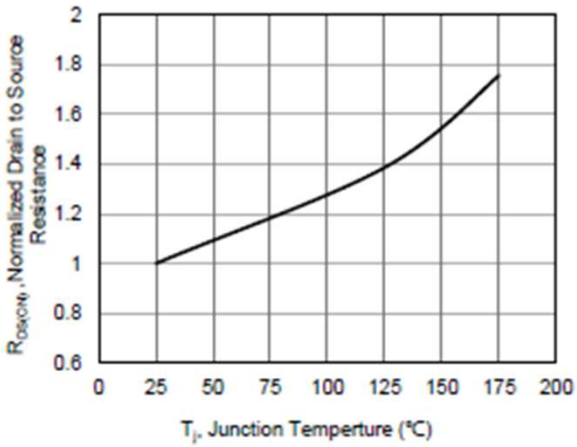


Fig 4. On-Resistance Variation vs. Temperature

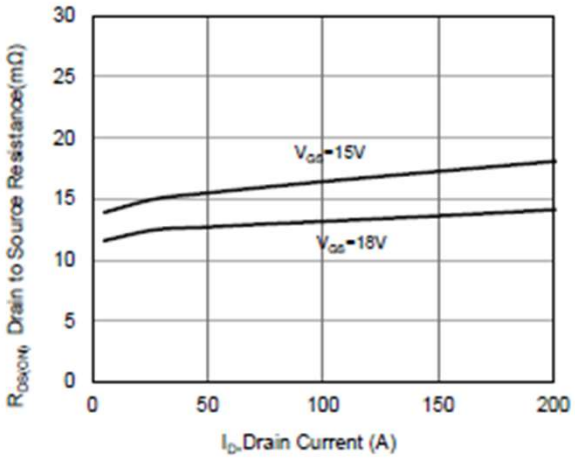


Fig 5. On-Resistance vs. Id

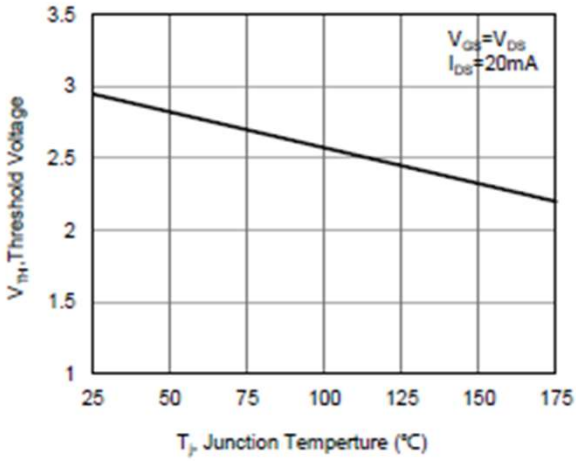


Fig 6. Gate Threshold vs. Temperature

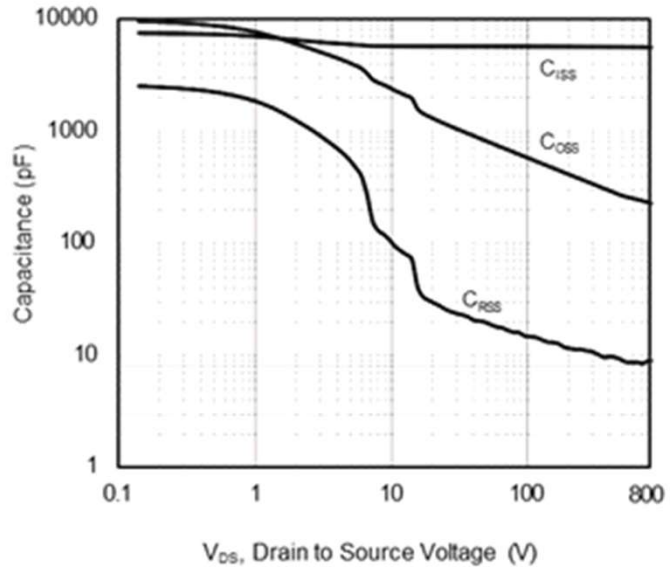


Fig 7. Capacitance Characteristics

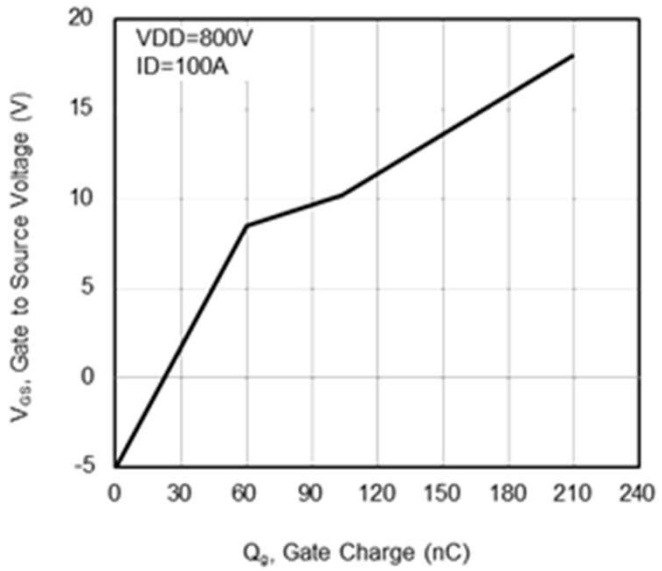


Fig 8. Gate Charge Characteristics

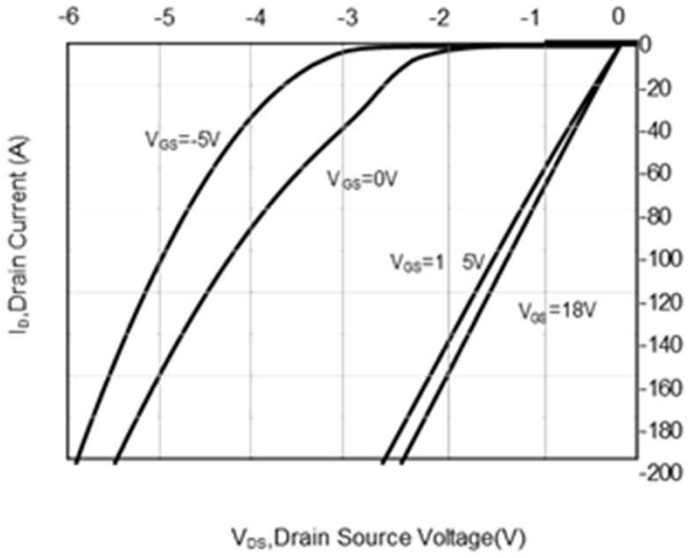


Fig 9. 3rd Quadrant Characteristic at 25℃

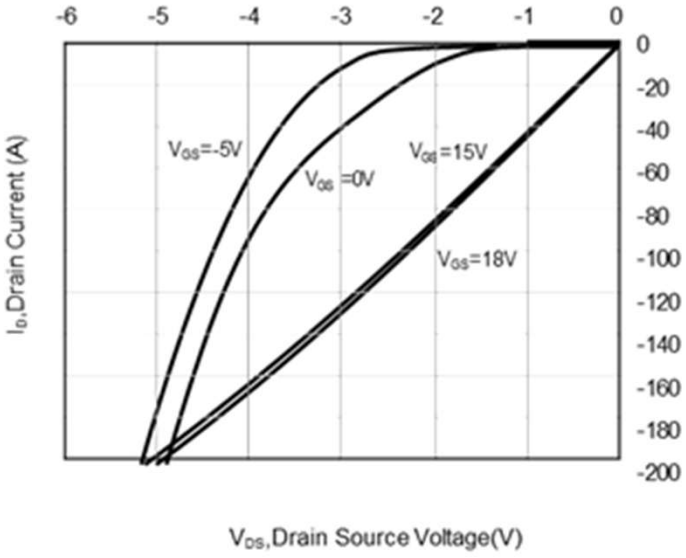
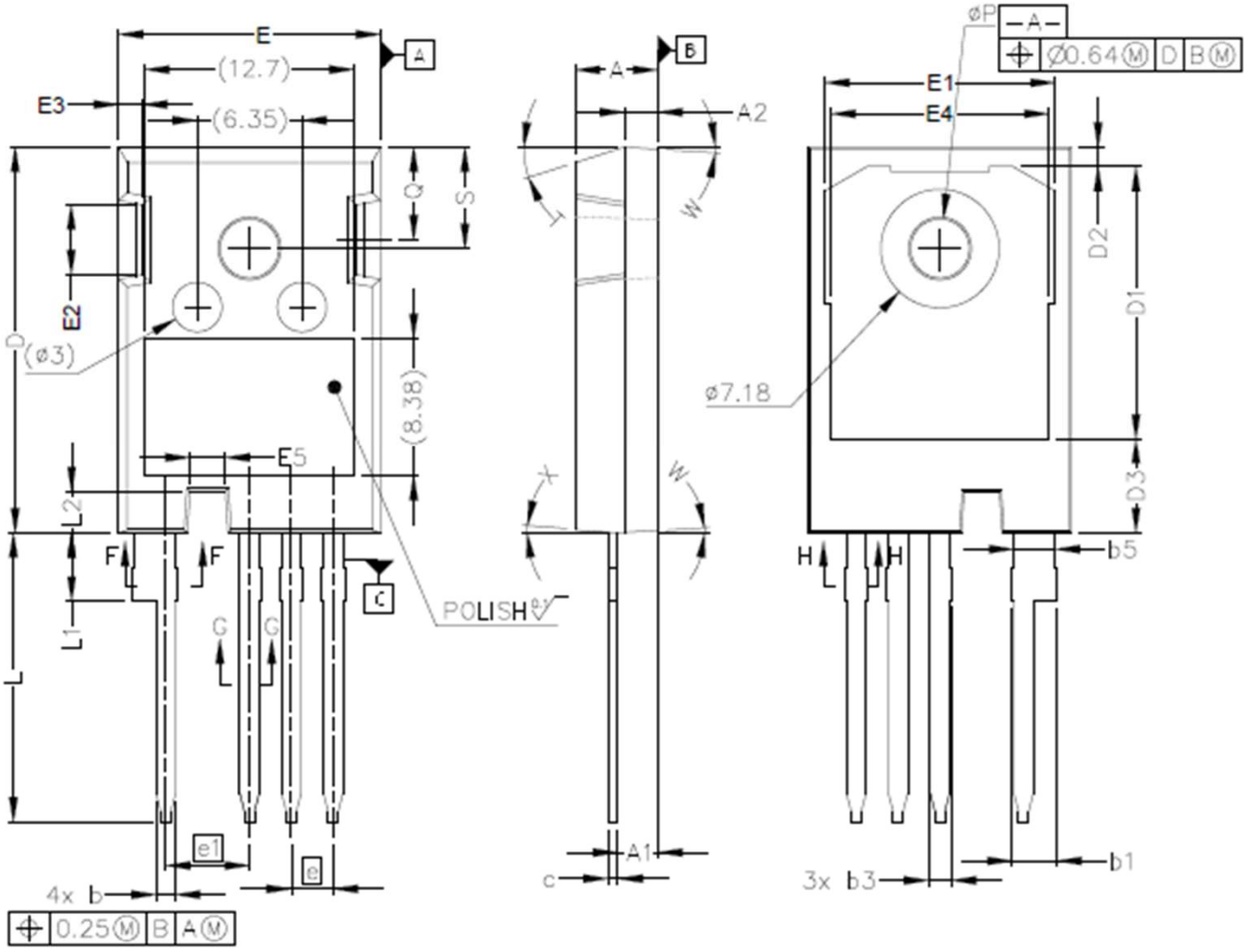
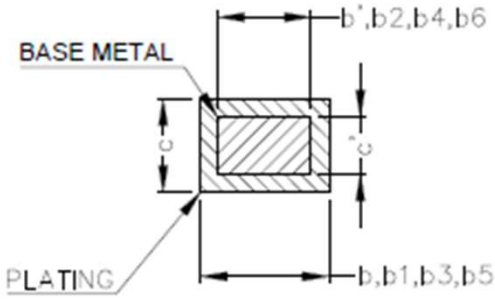


Fig 10. 3rd Quadrant Characteristic at 175℃

Package Outline: TO-247-4L





SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

Package Outline: TO-247-4L

NOTE ;
1. ALL METAL SURFACES: TIN PLATED,EXCEPT AREA OF CUT
2. DIMENSIONING & TOLERANCEING CONFIRM TO ASME Y14.5M-1994.
3. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.

SYMBOL	MILLIMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c'	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
D3	5.55	6.15
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	1.95	2.35
e	2.54 BSC	
e1	5.08 BSC	
N	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
øP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5 ° REF.	
X	4° REF.	

Marking Information

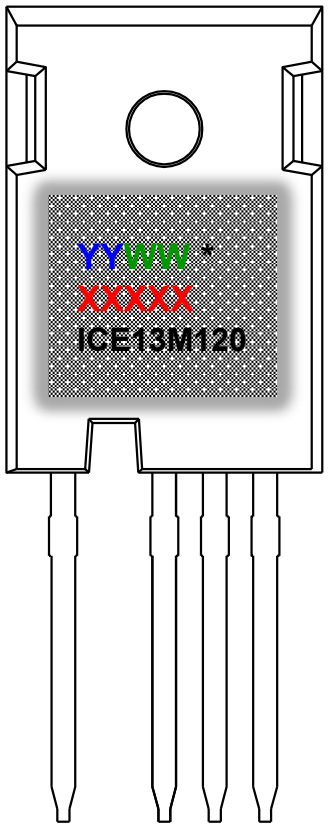
YY = Last two digits of the year

WW = Work week

* = Site ID

XXXXX = Lot ID

ICE13M120 = ICE is IceMOS logo and 13M120 is a designated device part number



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