

ICE31M120W4

Silicon Carbide

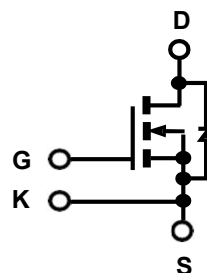
Power MOSFET

Features

- 1200V 30.4mohm 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



Lead Free



TO247-4L

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

Maximum ratings^a, at $T_j=25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_c=25^\circ\text{C}$	57	A
		$T_c=100^\circ\text{C}$	40	
Pulsed drain current	$I_{D, \text{pulse}}$		198	A
Maximum gate source voltage	$V_{GS(\text{max})}$		-10/+22	V
Operational gate source voltage	$V_{GS \text{ op}}$		-5/+18	V
Power dissipation	P_{tot}	$T_c=25^\circ\text{C}$	234	W
		$T_c=100^\circ\text{C}$	117	
Storage temperature	T_{stg}		-55 to +150	$^\circ\text{C}$
Operating temperature	T_j		-55 to +175	$^\circ\text{C}$

^a Pulse width limited by $T_{j\text{max}}$

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Thermal characteristics

Thermal resistance, junction-case	R_{thJC}		-	-	0.64	°C/W
Soldering temperature, wave soldering only allowed at leads	T_{solder}	1.6mm (0.063in.) from case for 10 s	-	-	260	°C

Electrical characteristics^a, at $T_j=25^{\circ}\text{C}$, unless otherwise specified

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	1200	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=11mA, T_j=25^{\circ}\text{C}$	2	3.0	4	
		$V_{DS}=V_{GS}, I_D=11mA, T_j=175^{\circ}\text{C}$	-	2.2	-	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=1200V, V_{GS}=0V, T_j=25^{\circ}\text{C}$	-	0.1	50	μA
		$V_{DS}=1200V, V_{GS}=0V, T_j=175^{\circ}\text{C}$	-	1	-	
Gate source leakage current	I_{GSS}	$V_{GS}=-10/+22V, V_{DS}=0V$	-	-	± 100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=18V, I_D=40A, T_j=25^{\circ}\text{C}$	-	30.4	40	m Ω
		$V_{GS}=18V, I_D=40A, T_j=175^{\circ}\text{C}$	-	54	-	
Gate resistance	R_G	$f=1\text{ MHz}, V_{AC}=30mV$	-	2.4	-	Ω

Dynamic characteristics

Input capacitance	C_{iss}	$V_{DS}=800V, V_{GS}=0V, f=100\text{ kHz}, V_{AC}=30mV$	-	2338	-	pF
Output capacitance	C_{oss}		-	96	-	
Reverse transfer capacitance	C_{rss}		-	4.1	-	
C_{OSS} stored energy	E_{oss}		-	37	-	μJ
Forward transconductance	g_{FS}	$V_{DS}=20V, I_D=40A$	-	28	-	S
Turn-on delay time	$t_{d(on)}$	$V_{DS}=800V, V_{GS}=-5/+18V, I_D=40A, R_G=4.7\Omega$ (External), $T_j=25^{\circ}\text{C}$	-	10	-	ns
Rise time	t_r		-	15	-	
Turn-off delay time	$t_{d(off)}$		-	19	-	
Fall time	t_f		-	10	-	
Turn-on switching energy	E_{ON}		-	293	-	μJ
Turn-off switching energy	E_{OFF}		-	15	-	

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Dynamic characteristics

Turn-on delay time	$t_{d(on)}$	$V_{DS}=800V, V_{GS}=-5/+18V, I_D=40A, R_G=4.7\Omega$ (External), $T_j=175^\circ C$	-	9	-	ns
Rise time	t_r		-	19	-	
Turn-off delay time	$t_{d(off)}$		-	23	-	
Fall time	t_f		-	10	-	
Turn-on switching energy	E_{ON}		-	456	-	μJ
Turn-off switching energy	E_{OFF}		-	15	-	

Gate Charge Characteristics

Gate to source charge	Q_{gs}	$V_{DS}=800V, I_D=40A, V_{GS}=-5 \text{ to } +18V$	-	19	-	nC
Gate to drain charge	Q_{gd}		-	21	-	
Gate charge total	Q_g		-	63	-	

Reverse Diode

Continuous forward current	I_S	$V_{GS}=-5V$	-	-	57	A
Diode forward voltage	V_{SD}	$V_{GS}=-5V, I_{SD}=20A, T_j=25^\circ C$	-	4.0	-	V
		$V_{GS}=-5V, I_{SD}=20A, T_j=175^\circ C$	-	3.5	-	
Reverse recovery time	t_{rr}	$V_{GS}=-5V, V_{RR}=800V, I_{SD}=40A, d_iF/d_t=10.7 \text{ kA}/\mu s, T_j=25^\circ C$	-	8	-	ns
Reverse recovery charge	Q_{rr}		-	217	-	nC
Peak reverse recovery current	I_{rm}		-	42	-	A
Reverse recovery time	t_{rr}	$V_{GS}=-5V, V_{RR}=800V, I_{SD}=40A, d_iF/d_t=12.6 \text{ kA}/\mu s, T_j=175^\circ C$	-	15	-	ns
Reverse recovery charge	Q_{rr}		-	806	-	nC
Peak reverse recovery current	I_{rm}		-	78	-	A

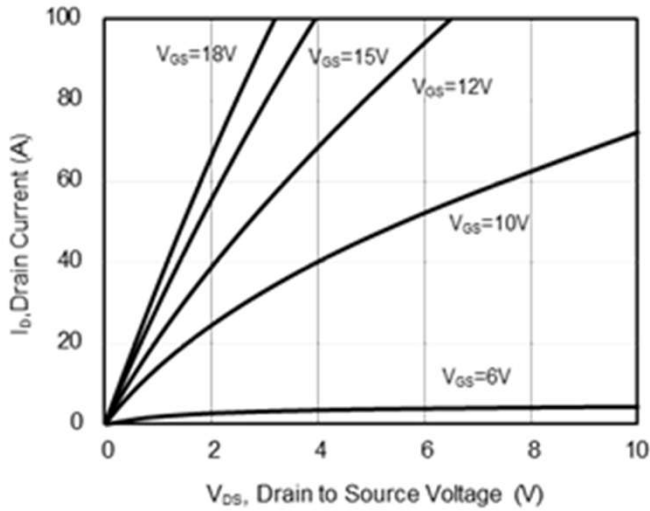


Fig 1. Output Characteristics, $T_j=25^\circ\text{C}$

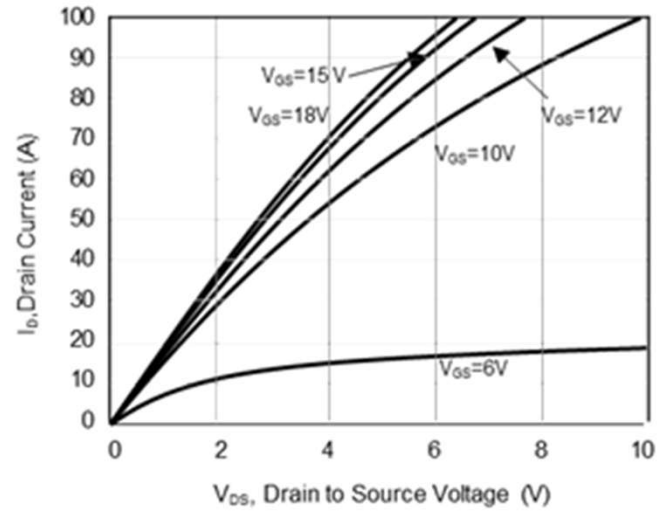


Fig 2. Output Characteristics, $T_j=175^\circ\text{C}$

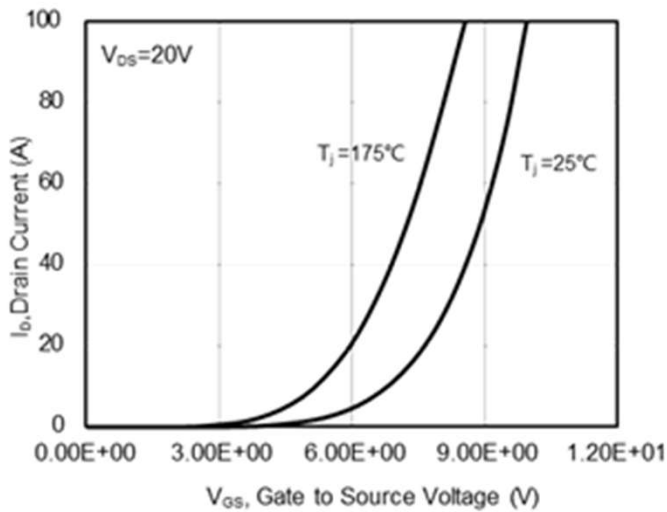


Fig 3. Transfer Characteristics

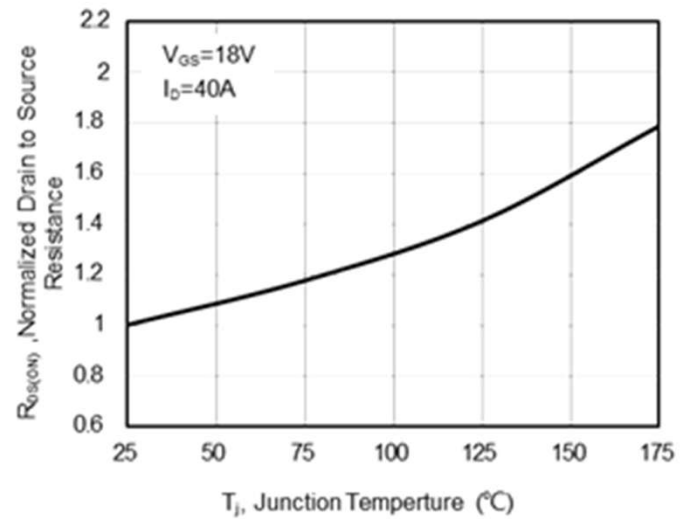


Fig 4. On-Resistance Variation with Temperature

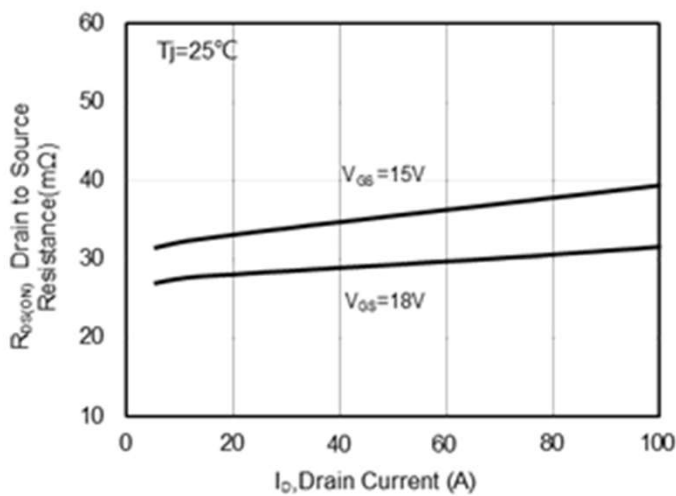


Fig 5. On-Resistance vs Drain Current

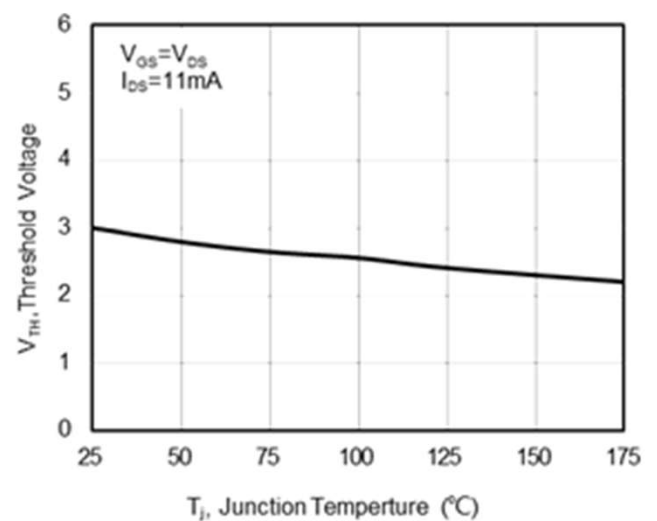


Fig 6. Gate Threshold vs Temperature

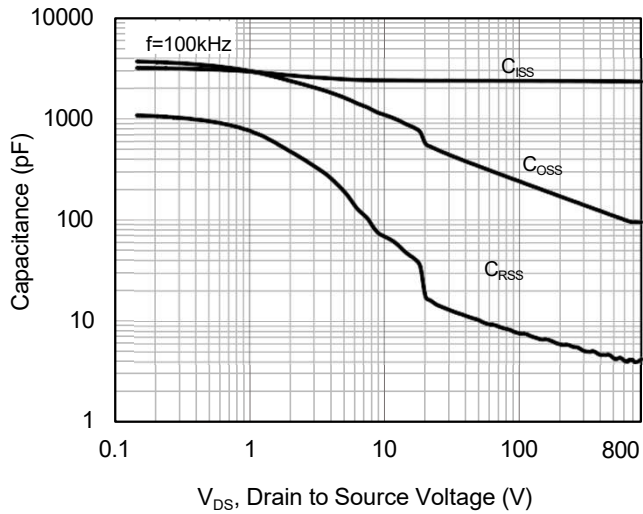


Fig 7. Capacitance Characteristics

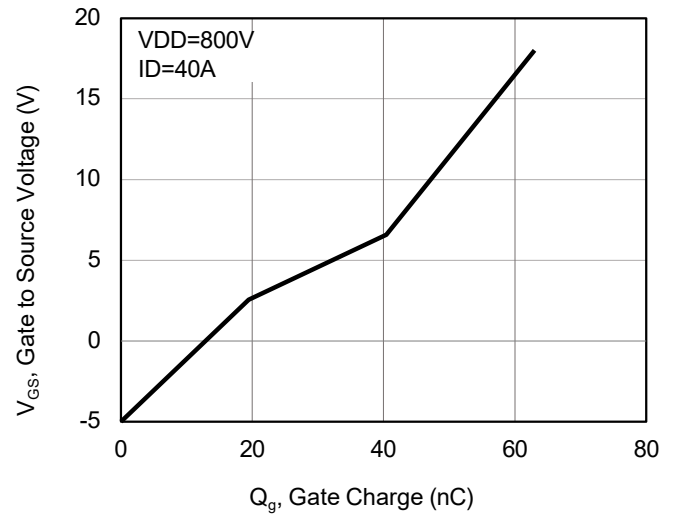


Fig 8. Gate Charge Characteristics

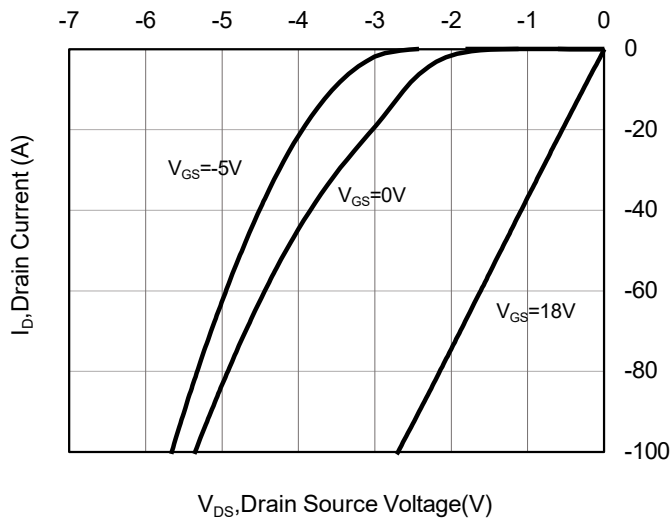


Fig 9. 3rd Quadrant Characteristic at 25 °C

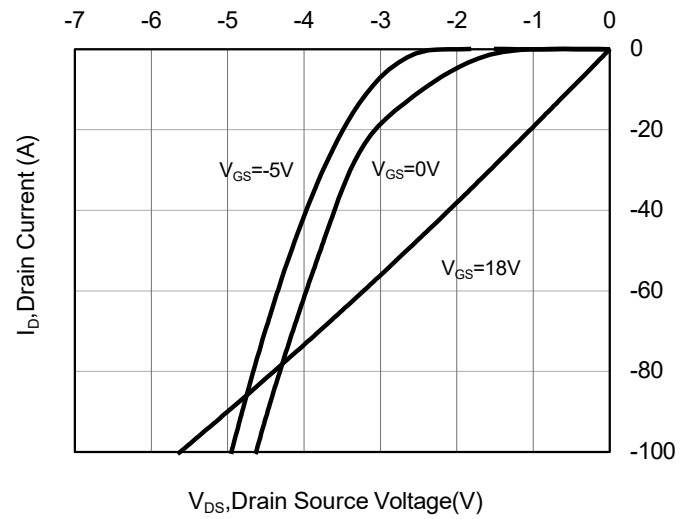
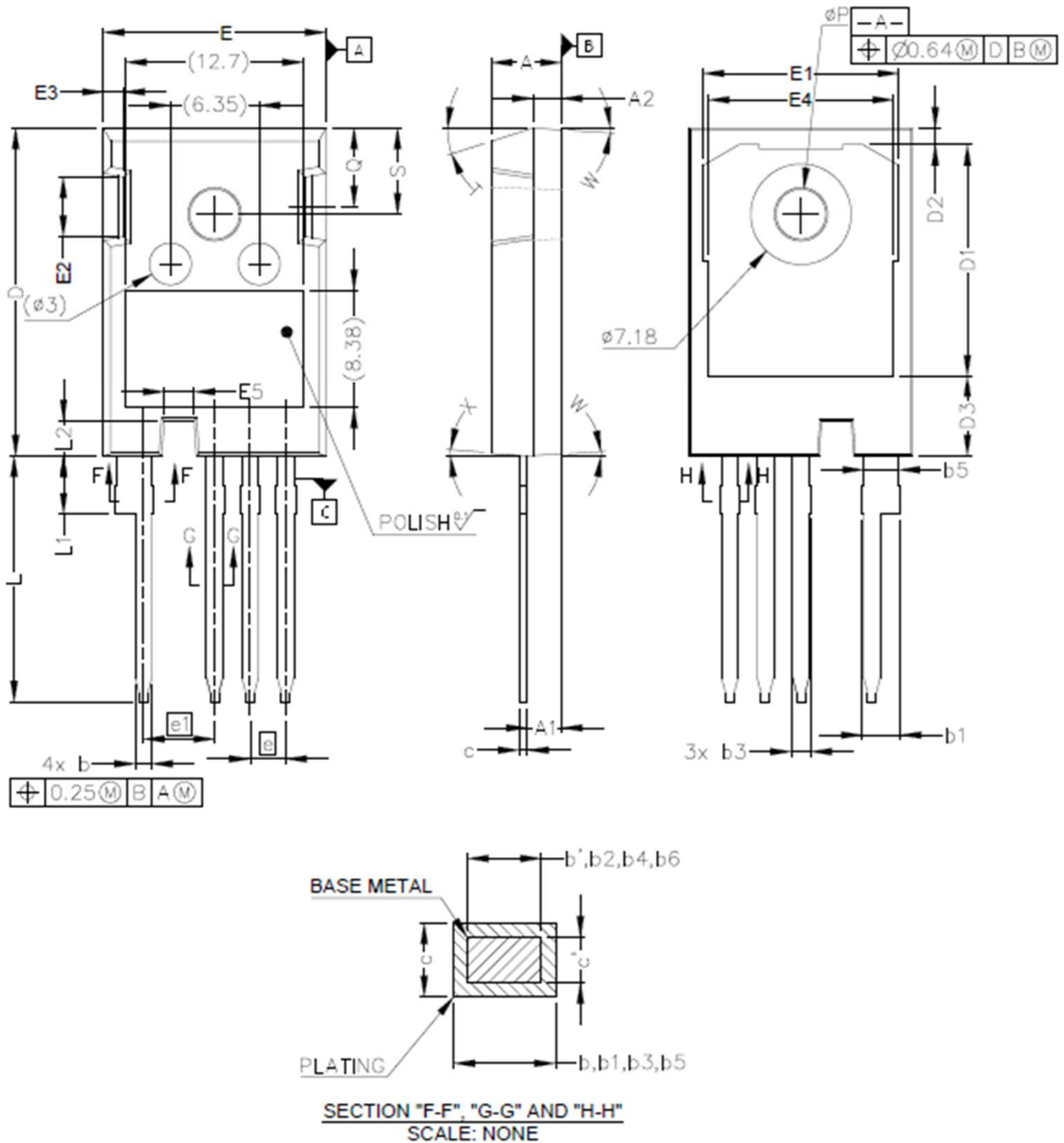


Fig 10. 3rd Quadrant Characteristic at 175 °C

Package Outline: TO-247-4L



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NOTE :

1. ALL METAL SURFACES: TIN PLATED, EXCEPT AREA OF CUT
2. DIMENSIONING & TOLERANCING 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

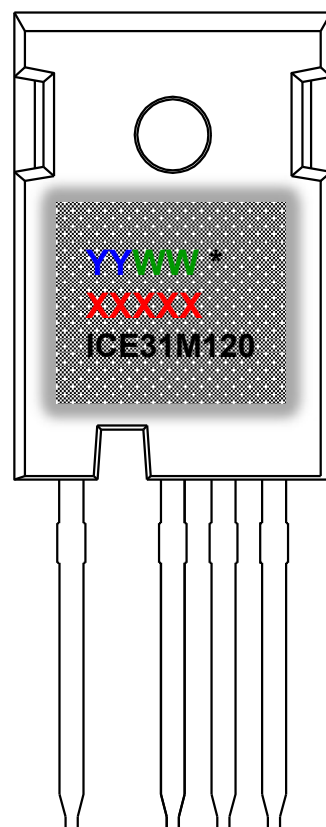
YY = Last two digits of the year

WW = Work week

***** = Site ID

XXXXXX = Lot ID

ICE31M120 = ICE is IceMOS logo and 31M120 is a designated device part number



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