Preliminary

ICE12M140W4

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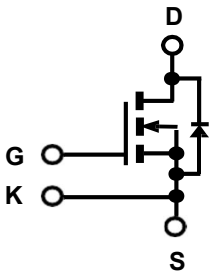
Silicon Carbide Power MOSFET

Product Summary			
I_D	T_A=25°C	124A	Max
$V_{(BR)DSS}$	T_C=25°C	1400V	Min
$r_{DS(on)}$	V_{GS}=18V	11.8mΩ	Typ
Q_g	V_{DS}=900V	177nC	Typ

Features

- 1400V 11.8mohm 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	124	A
		T_c=100°C	88	
Pulsed drain current	$I_{D, pulse}$		419	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	469	W
		T_c=100°C	234	
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}		-	-	0.32	°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	1400	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=22mA, T_j=25°C	2	2.7	4	V
		V_{DS}=V_{GS}, I_D=22mA, T_j=175°C	-	2.0	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=1400V, V_{GS}=0V, T_j=25°C	-	0.2	50	µA
		V_{DS}=1400V, 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	-	11.8	15.4	mΩ
		V_{GS}=18V, I_D=100A, T_j=175°C	-	23.5	-	mΩ
Gate resistance	R_G	f=1 MHz, V_{AC}=30mV	-	6.7	-	Ω

Dynamic characteristics

Input capacitance	C_{iss}	V_{DS}=900V, V_{GS}=0V, f=100 kHz, V_{AC}=30mV	-	6154	-	pF
Output capacitance	C_{oss}		-	242	-	pF
Reverse transfer capacitance	C_{rss}		-	14	-	pF
C_{OSS} stored energy	E_{oss}		-	13	-	µJ
Forward transconductance	g_{FS}	V_{DS}=20V, I_D=100A	-	84	-	S
Turn-on delay time	$t_{d(on)}$	V_{DS}=900V, V_{GS}=-5/+18V, I_D=100A, R_G=4.7Ω (External), T_j=25°C	-	47	-	ns
Rise time	t_r		-	50	-	ns
Turn-off delay time	$t_{d(off)}$		-	113	-	ns
Fall time	t_f		-	23	-	ns
Turn-on switching energy	E_{ON}		-	2.9	-	mJ
Turn-off switching energy	E_{OFF}		-	1.0	-	mJ

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	
Dynamic characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DS}=900V, V_{GS}=-5/+18V, I_D=100A, R_G=4.7Ω (External), T_j=175°C	-	43	-	ns
Rise time	t_r		-	55	-	
Turn-off delay time	$t_{d(off)}$		-	146	-	
Fall time	t_f		-	25	-	
Turn-on switching energy	E_{ON}		-	4.0	-	mJ
Turn-off switching energy	E_{OFF}		-	1.1	-	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DS}=900V, I_D=100A, V_{GS}=-5 to +18V	-	52	-	nC
Gate to drain charge	Q_{gd}		-	47	-	
Gate charge total	Q_g		-	177	-	
Reverse Diode						
Continuous forward current	I_S	V_{GS}=-5V	-	108	-	A
Diode forward voltage	V_{SD}	V_{GS}=-5V, I_{SD}=50A, T_j=25°C	-	4.2	-	V
		V_{GS}=-5V, I_{SD}=50A, T_j=175°C	-	3.7	-	
Reverse recovery time	t_{rr}	V_{GS}=-5V, V_{RR}=900V, I_{SD}=100A, d_{iF}/d_t=4910 A/µs, T_j=25°C	-	19	-	ns
Reverse recovery charge	Q_{rr}		-	368	-	nC
Peak reverse recovery current	I_{rm}		-	36	-	A
Reverse recovery time	t_{rr}	V_{GS}=-5V, V_{RR}=900V, I_{SD}=100A, d_{iF}/d_t=5020 A/µs, T_j=175°C	-	40	-	ns
Reverse recovery charge	Q_{rr}		-	1881	-	nC
Peak reverse recovery current	I_{rm}		-	70	-	A

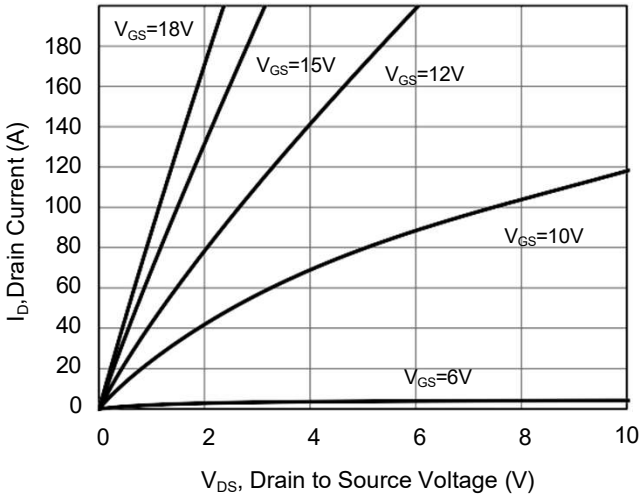


Fig 1. Output Characteristics, T_j=-55°C

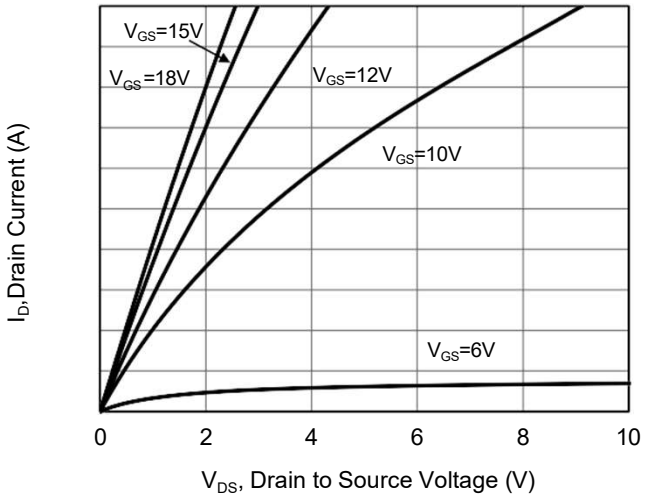


Fig 2. Output Characteristics, T_j=25°C

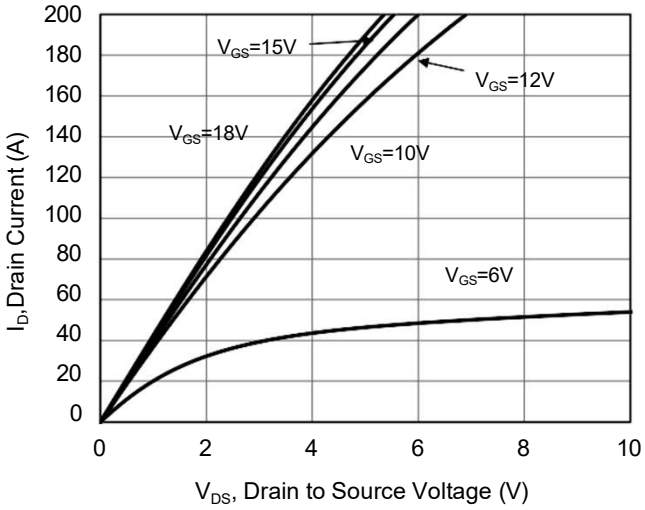


Fig 3. Output Characteristics, T_j=175°C

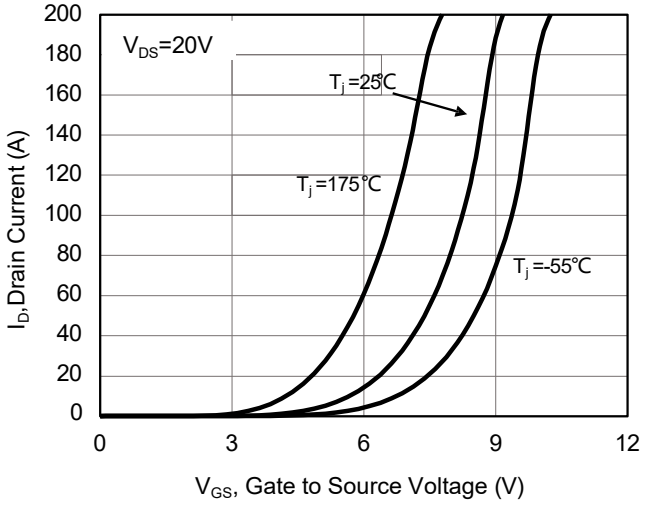


Fig 4. Transfer Characteristics

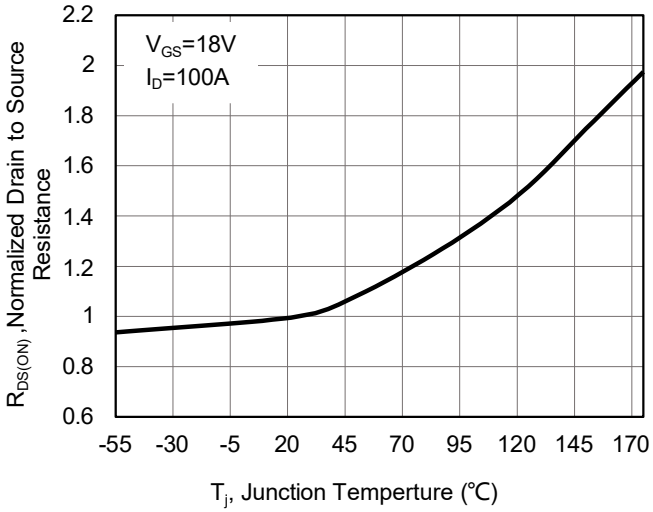


Fig 5. On−Resistance Variation with Temperature

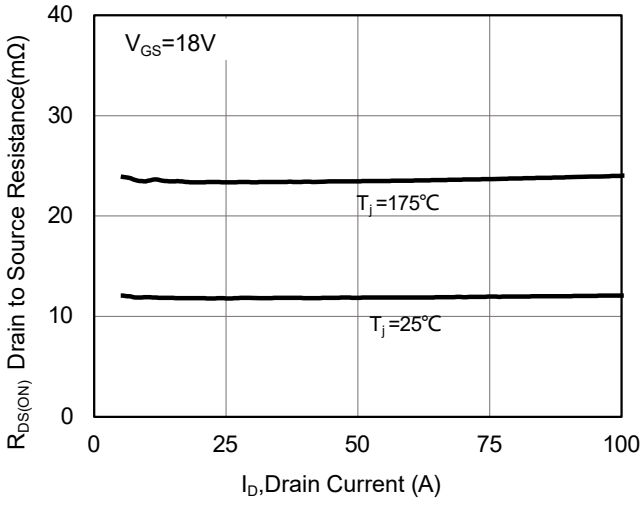


Fig 6. On-Resistance vs Drain Current

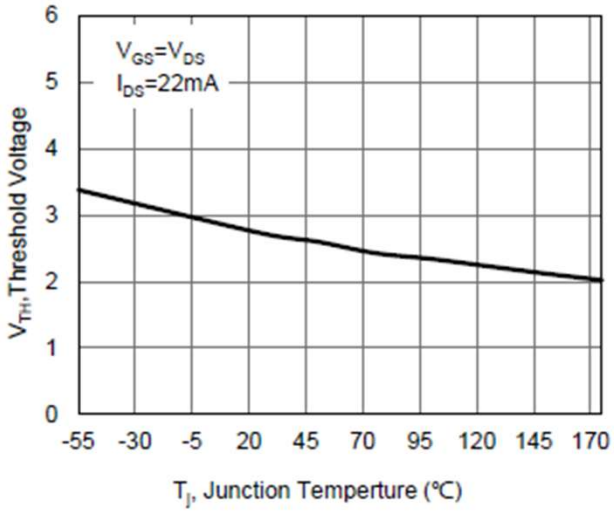


Fig 7. Gate Threshold vs Temperature

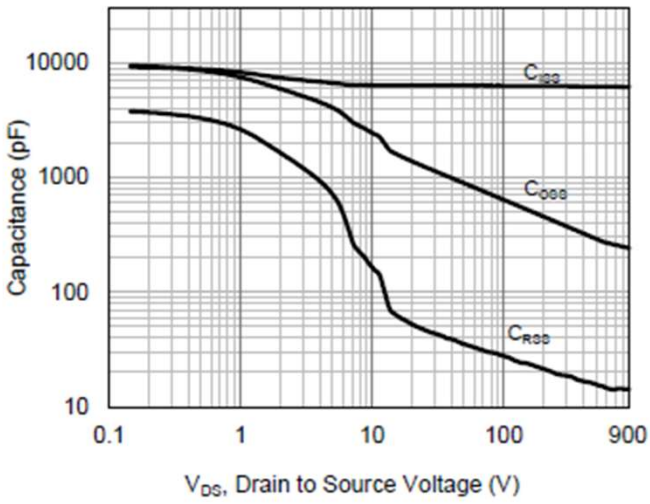


Fig 8. Capacitance Characteristics

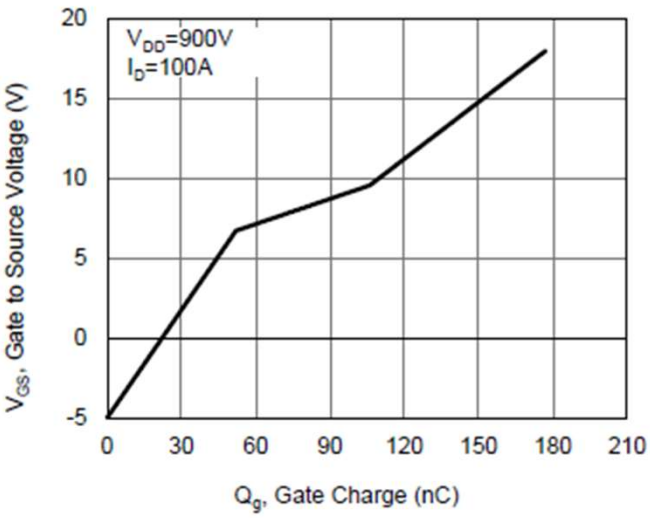


Fig 9. Gate Charge Characteristics

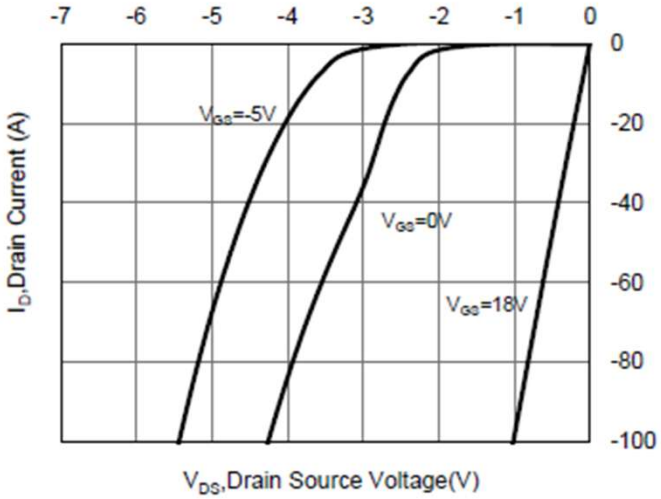


Fig 10. 3rd Quadrant Characteristic at -55 ℃

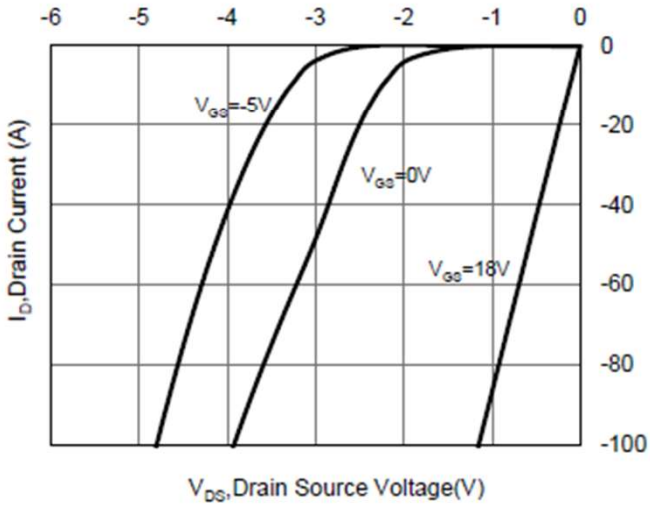


Fig 11. 3rd Quadrant Characteristic at 25 ℃

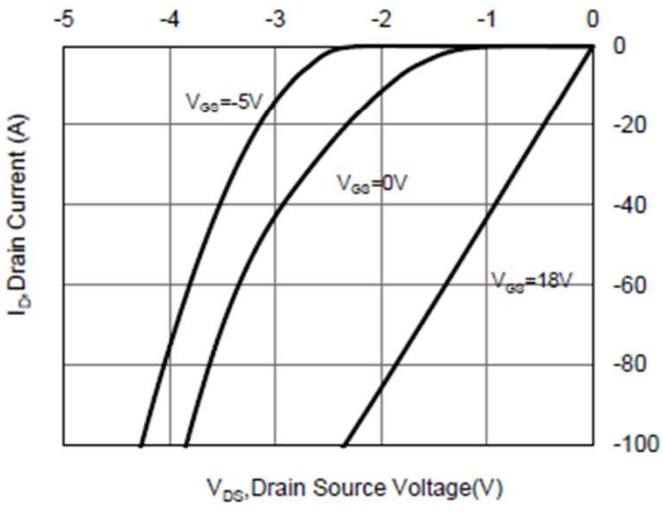
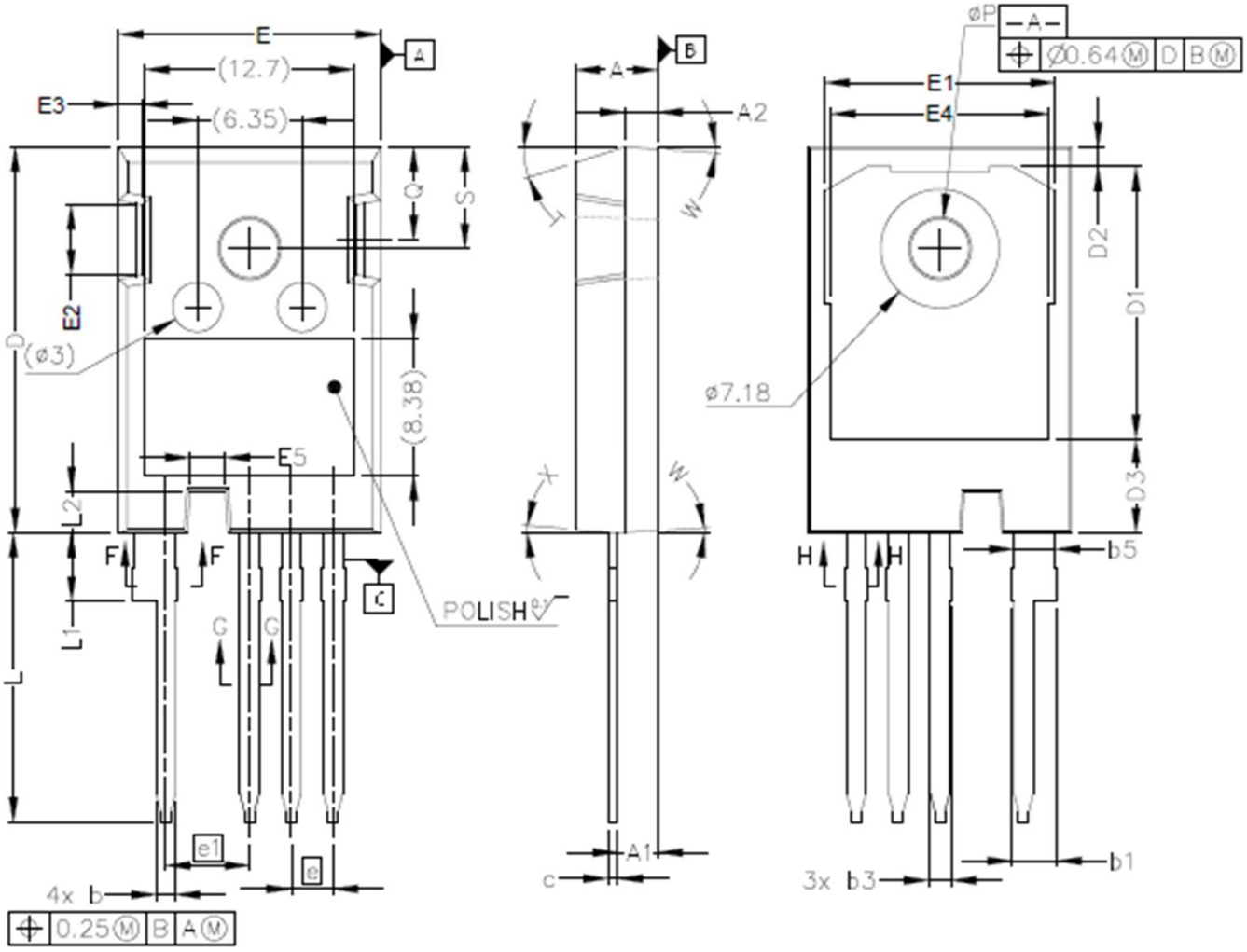
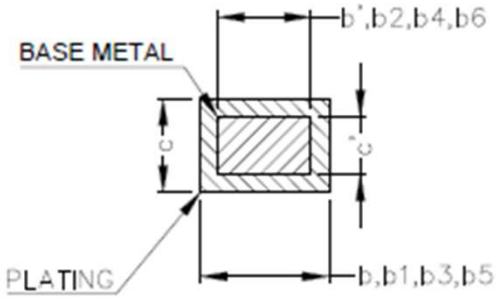


Fig 12. 3rd Quadrant Characteristic at 175 ℃

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

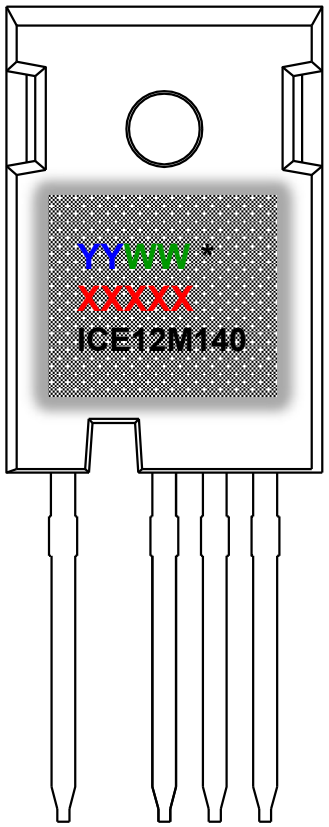
YY = Last two digits of the year

WW = Work week

* = Site ID

XXXXX = Lot ID

ICE12M140 = ICE is IceMOS logo and 12M140 is a designated device part number



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