

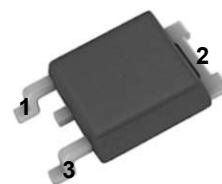
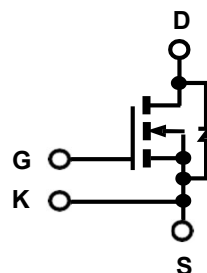
ICE650M80D Silicon Carbide Power MOSFET

Features

- 800V 650mohm SiC MOSFET
- Optimized switching performance
- Fast body diode with low Q_{rr} ensures robust commutation
- Superior thermal performance
- Low $R_{DS(on)}$ and weak temperature dependence of pulse current
- Compatible with Si-MOSFET drive
- Optimized design for high performance power systems



Product Summary			
I_D	$T_A=25^\circ\text{C}$	7A	Max
$V_{(BR)DSS}$	$T_C=25^\circ\text{C}$	800V	Min
$r_{DS(on)}$	$V_{GS}=18\text{V}$	650m Ω	Typ
Q_g	$V_{DS}=400\text{V}$	6nC	Typ



T0252

Standard Metal Heatsink

1=Gate, 2=Drain, 3=Source.

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_c=25^\circ\text{C}$	7	A
		$T_c=100^\circ\text{C}$	4.9	
Pulsed drain current	$I_{D, \text{pulse}}$		21	A
Maximum gate source voltage	$V_{GS(max)}$		-10/+22	V
Operational gate source voltage	$V_{GS \text{ op}}$		-5/+18	V
Single pulsed Avalanche energy	E_{AS}	$L=10\text{mH}$, $V_{DD}=50\text{V}$, $I_{AS}=1.7\text{A}$, $R_G=50\Omega$	14	mJ
Power dissipation	P_{tot}		45.4	W
Storage temperature	T_{stg}		-55 to +175	$^\circ\text{C}$
Operating temperature	T_j			

^a Pulse width limited by T_{jmax}

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Thermal characteristics

Thermal resistance, junction-case	R_{thJC}		-	-	3.3	°C/W
Thermal resistance, junction-ambient	R_{thJA}	leaded	-	-	60	
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 $T_j=25^{\circ}\text{C}$, unless otherwise specified

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=100\mu A$	800	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=0.65mA, T_j=25^{\circ}\text{C}$	2.6	3.8	4.6	
		$V_{DS}=V_{GS}, I_D=0.65mA, T_j=175^{\circ}\text{C}$	-	2.7	-	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=800V, V_{GS}=0V$	-	5	100	μA
Gate source leakage current	I_{GSS}	$V_{GS}=+18V, V_{DS}=0V$	-	-	250	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=18V, I_D=1.8A, T_j=25^{\circ}\text{C}$	-	650	850	m Ω
		$V_{GS}=18V, I_D=1.8A, T_j=175^{\circ}\text{C}$	-	705	-	
Gate resistance	R_G	$f=1\text{ MHz}, V_{AC}=25mV$	-	25	-	Ω

Dynamic characteristics

Input capacitance	C_{iss}	$V_{DS}=400V, V_{GS}=0V, f=100\text{ kHz}, V_{AC}=25mV$	-	124	-	pF
Output capacitance	C_{oss}		-	10	-	
Reverse transfer capacitance	C_{rss}		-	1	-	
Turn-on delay time	$t_{d(on)}$	$V_{DS}=400V, V_{GS}=-4/+18V, I_D=1.8A, R_G=20\Omega$ (External), $L=100\mu H, T_j=25^{\circ}\text{C}$	-	6.4	-	ns
Rise time	t_r		-	14.5	-	
Turn-off delay time	$t_{d(off)}$		-	8	-	
Fall time	t_f		-	7.3	-	
Turn-on switching energy	E_{ON}		-	25	-	μJ
Turn-off switching energy	E_{OFF}		-	3.8	-	

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Dynamic characteristics

Turn-on delay time	$t_{d(on)}$	$V_{DS}=400V$, $V_{GS}=-4/+18V$, $I_D=1.8A$, $R_G=20\Omega$ (External), $L=100\mu H$, $T_j=175^\circ C$	-	5	-	ns
Rise time	t_r		-	14.5	-	
Turn-off delay time	$t_{d(off)}$		-	10.6	-	
Fall time	t_f		-	7	-	
Turn-on switching energy	E_{ON}		-	28	-	μJ
Turn-off switching energy	E_{OFF}		-	5.8	-	

Gate Charge Characteristics

Gate to source charge	Q_{gs}	$V_{DS}=400V$, $I_D=1.8A$, $V_{GS}=-4$ to $+18V$	-	1.6	-	nC
Gate to drain charge	Q_{gd}		-	3.5	-	
Gate charge total	Q_g		-	6	-	

Reverse Diode

Continuous forward current	I_S	$V_{GS}=-4V$	-	-	7	A
Diode forward voltage	V_{SD}	$V_{GS}=-4V$, $I_{SD}=0.9A$, $T_j=25^\circ C$	-	4.2	-	V
		$V_{GS}=-4V$, $I_{SD}=0.9A$, $T_j=175^\circ C$	-	3.7	-	
Reverse recovery time	t_{rr}	$V_{GS}=-4V$, $V_{RR}=400V$, $I_{SD}=1.8A$, $dI_F/dt=1000 A/\mu s$	-	13	-	ns
Reverse recovery charge	Q_{rr}		-	15	-	nC
Peak reverse recovery current	I_{rm}		-	3.3	-	A

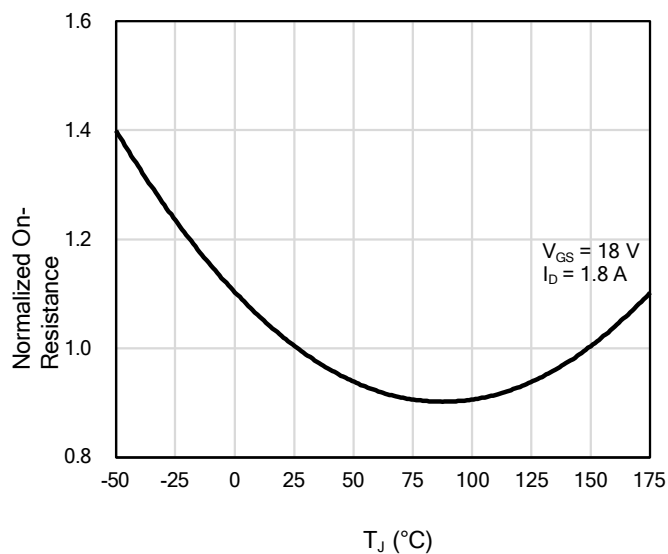


Figure 1: Normalized On-Resistance vs. Temperature

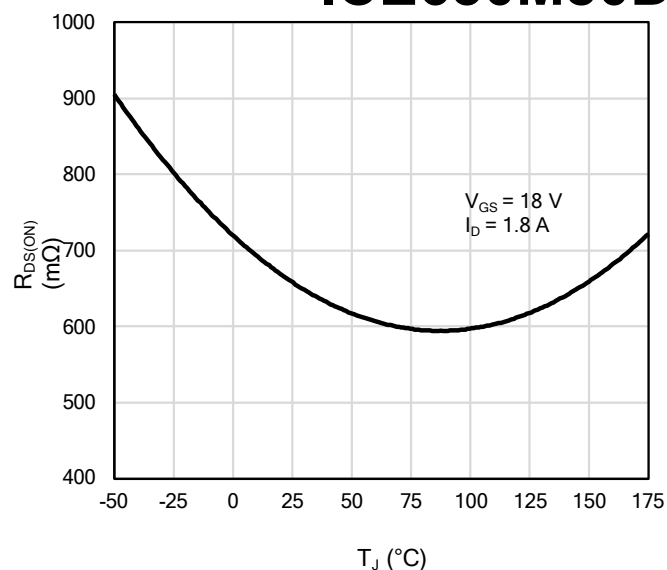


Figure 2: On-Resistance vs. Temperature

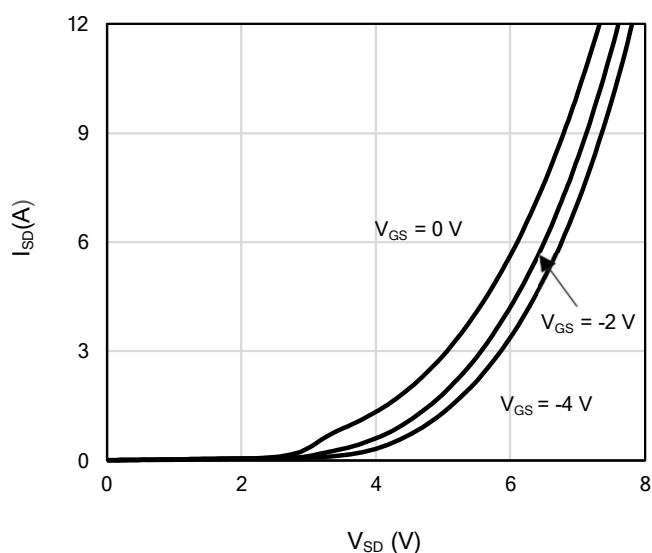


Figure 3: Body Diode Characteristics at -40°C

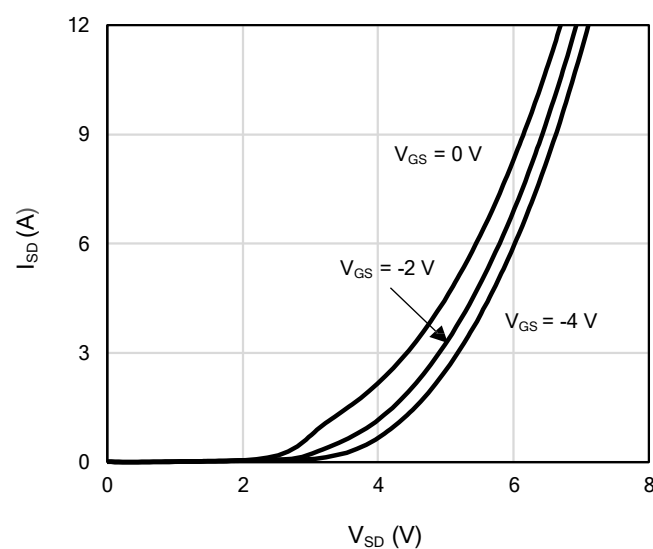


Figure 4: Body Diode Characteristics at 25°C

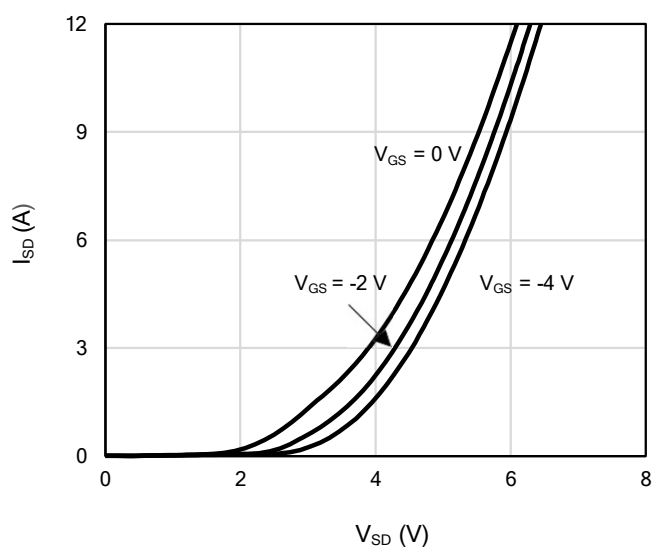


Figure 5: Body Diode Characteristics at 175°C

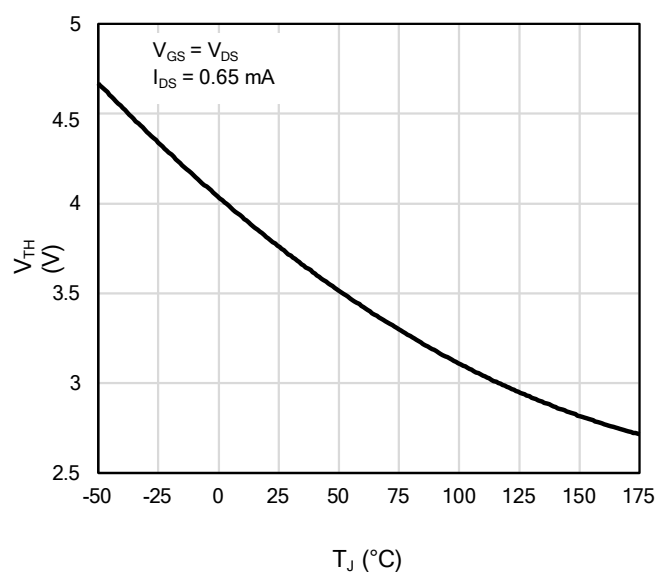


Figure 6: Threshold Voltage vs. Temperature

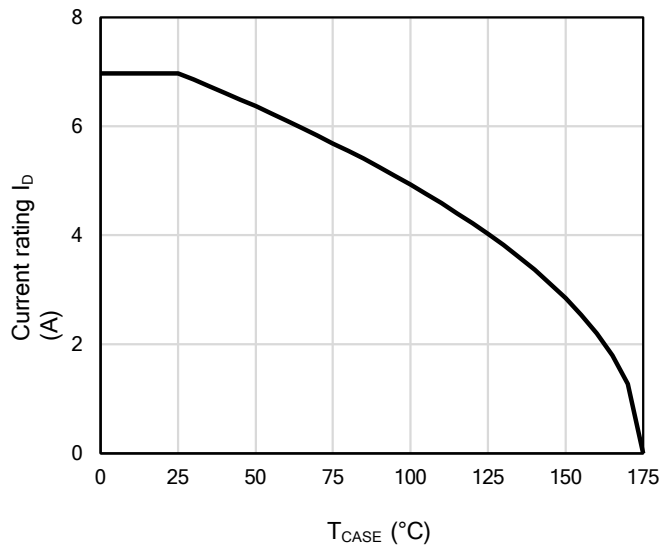


Figure 7: Current De-rating

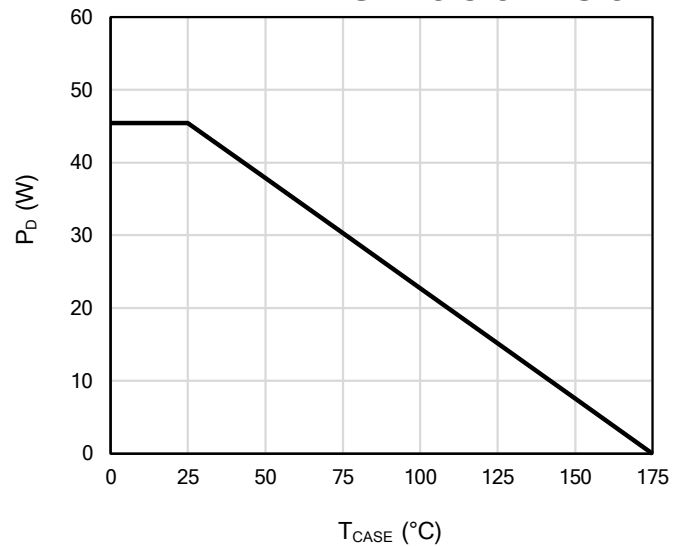


Figure 8: Maximum Power Dissipation Derating vs. Case Temperature

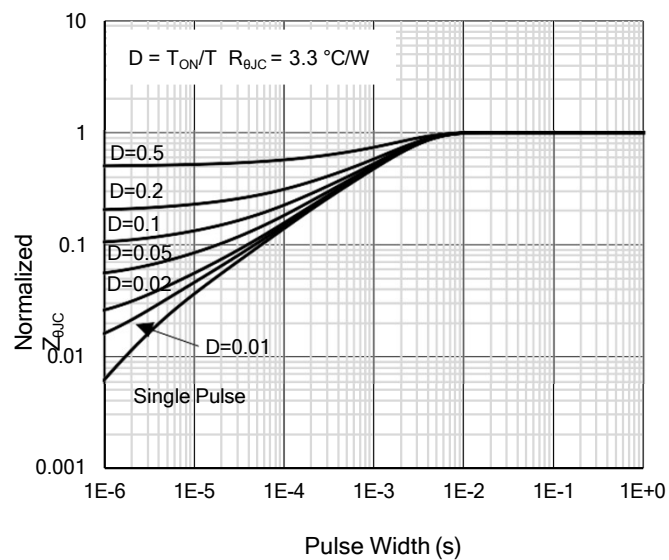


Figure 9: Normalized Maximum Transient Thermal Impedance

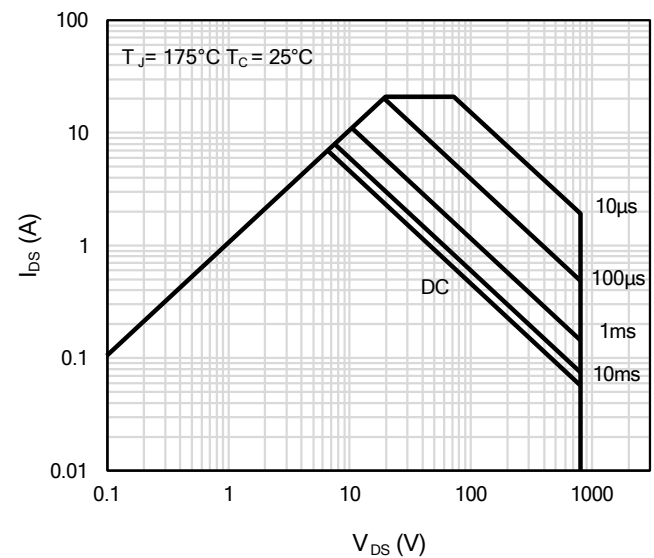


Figure 10: Maximum Forward Biased Safe Operating Area

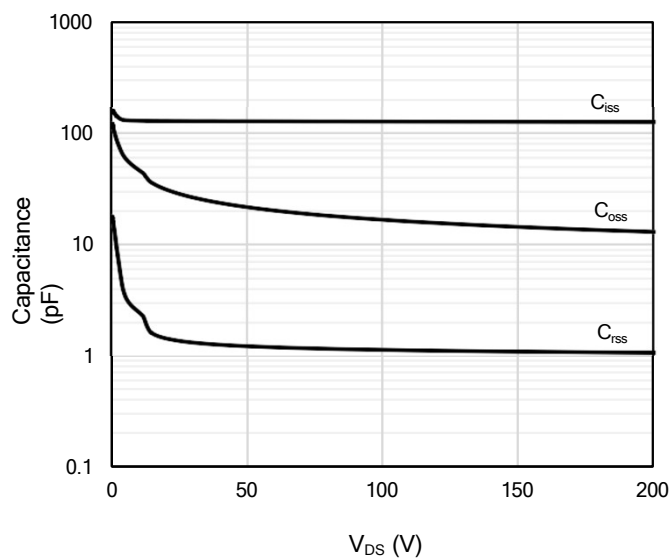


Figure 12: Capacitance Characteristics (0 - 200 V)

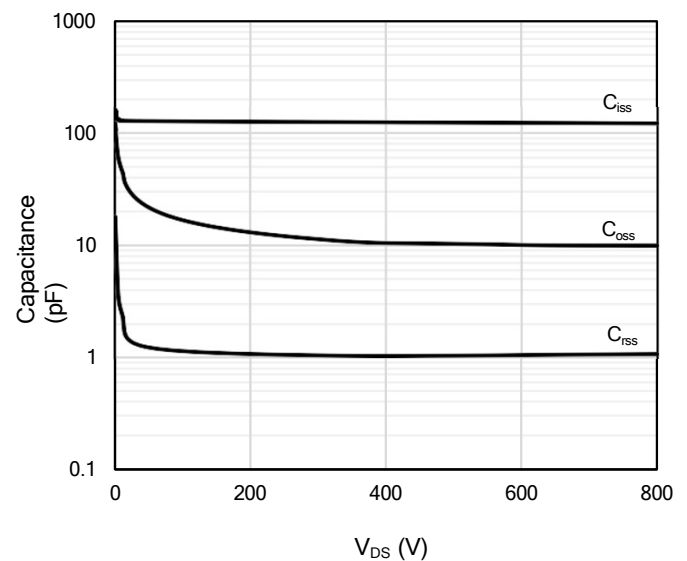
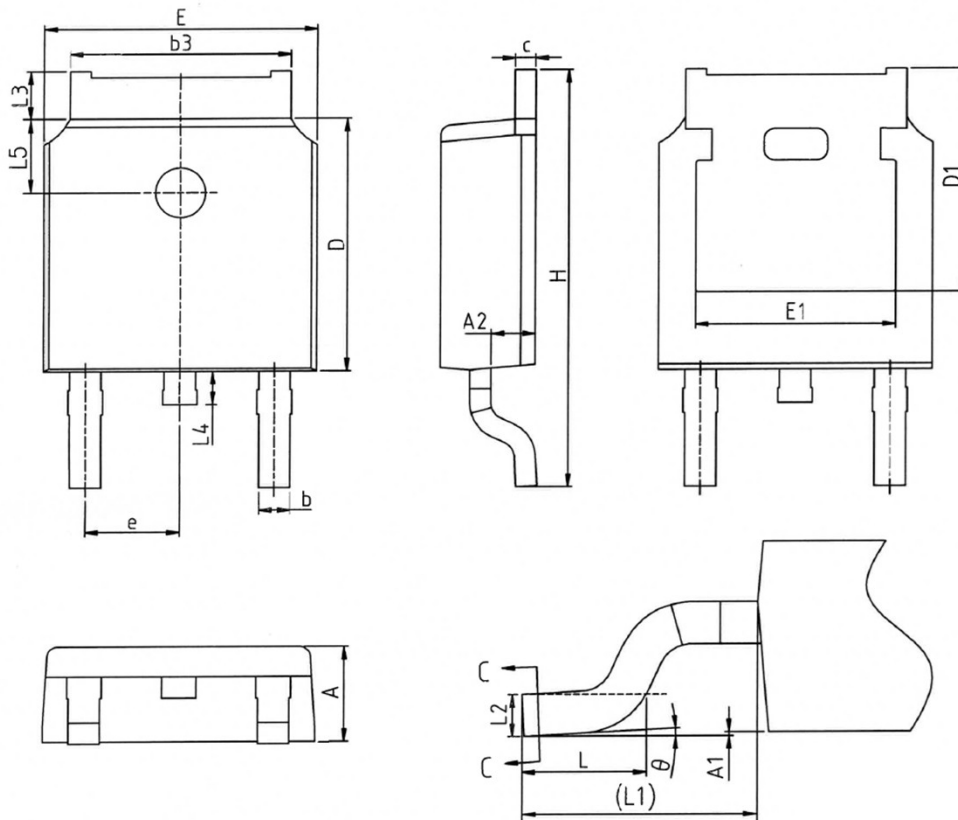


Figure 13: Capacitance Characteristics (0 - 800 V)

Package Outline: TO252 (DPAK)



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	–	0.12
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	–	–
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	–	1.28
L4	0.50	–	1.00
L5	1.65	1.80	1.95
θ	0°	–	8°

NOTES

1. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-252 AA,
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

Marking Information

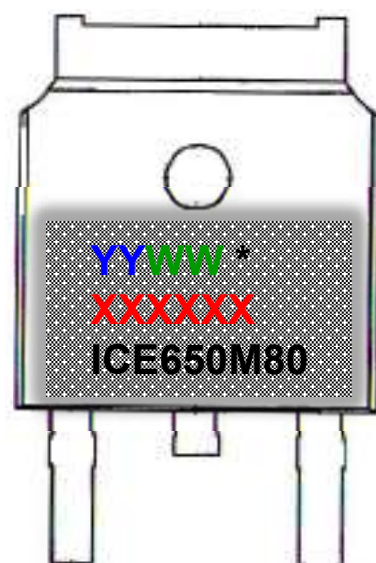
YY = Last two digits of the year

WW = Work week

***** = Site ID

XXXXXX = Lot ID

ICE650M80 = ICE is IceMOS logo and 650M80 is a designated device part number



Disclaimer

Information contained in this data sheet shall in no event be regarded as a guarantee of conditions or characteristics. All product, data sheet are subject to change without notice to improve reliability. ICEMOS technology will not be responsible for damages of any nature resulting from the use or reliance upon the information contained in this data sheet.