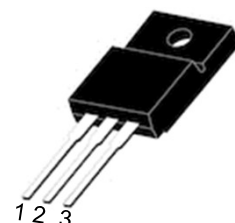
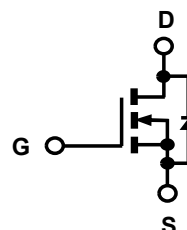


ICEK9NF65FP N-Channel Enhancement Mode MOSFET

Features

- Good FOM performance
- EMI-Friendly
- Optimized design for High Frequency Switching, and Quick Charging and Adapter

Product Summary			
I_D	$T_A=25^\circ\text{C}$	9.1A	Max
$V_{(BR)DSS}$	$I_D=250\mu\text{A}$	650V	Min
$r_{DS(on)}$	$V_{GS}=10\text{V}$	0.302	Typ
Q_g	$V_{DS}=480\text{V}$	20nC	Typ



Lead Free

T0220FP

Isolated (T0-220)

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 ^b	I_D	$T_c=25^\circ\text{C}$	9.1	A
		$T_c=100^\circ\text{C}$	5.7	
Pulsed drain current ^b	$I_{D, \text{pulse}}$	$T_c=25^\circ\text{C}$	34	A
Avalanche energy, single pulse	E_{AS}	$L = 75 \text{ mH}, V_{DD} = 100 \text{ V}, I_D=1.2\text{A}, R_G = 50 \Omega$	54	mJ
Avalanche current, repetitive ^b	I_{AR}	limited by $T_{j\text{max}}$	1.2	A
MOSFET dv/dt ruggedness	dv/dt	$V_{DS}=480\text{V}$	50	V/ns
Reverse diode dv/dt ruggedness			50	
Gate source voltage	V_{GS}	Static	± 30	V
		AC ($f>1\text{Hz}$)		
Power dissipation	P_{tot}	$T_c=25^\circ\text{C}$	43.1	W
Operating and storage temperature	T_j, T_{stg}		-55 to +150	$^\circ\text{C}$

^a Preliminary data sheet - Specifications subject to change.

^b limited by $T_{j\text{max}}$

^c when mounted on 1-inch square 2oz copper-clad FR-4

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Thermal characteristics

Thermal resistance, junction-case	R_{thJC}		-	-	2.9	°C/W
Thermal resistance, junction-ambient °	R_{thJA}	lead	-	-	55	
Soldering temperature, wave soldering only allowed at leads	T_{solder}	1.6mm (0.063in.) from case for 10 s	-	-	260	°C

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

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=250\mu\text{A}$	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.5	3.4	4.5	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=650\text{V}, V_{GS}=0\text{V}$	-	-	10	μA
Gate source leakage current	I_{GSS}	$V_{GS}=\pm 30\text{ V}, V_{DS}=0\text{V}$	-	-	± 100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{V}, I_D=5\text{A}$	-	0.302	0.36	Ω
Gate resistance	R_G	$f=1\text{ MHz}$, open drain	-	16	-	Ω

Dynamic characteristics

Input capacitance	C_{iss}	$V_{DS}=400\text{ V}, V_{GS}=0\text{ V}, f=1\text{ MHz}$	-	530	-	pF
Output capacitance	C_{oss}		-	15	-	
Reverse transfer capacitance	C_{rss}		-	5.5	-	
Turn-on delay time	$t_{d(on)}$	$V_{DS}=400\text{V}, V_{GS}=10\text{V}, I_D=5\text{A}, R_G=5\Omega$ (External)	-	52	-	ns
Rise time	t_r		-	7	-	
Turn-off delay time	$t_{d(off)}$		-	37	-	
Fall time	t_f		-	10	-	

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Gate charge characteristics

Gate to source charge	Q_{gs}	$V_{DS}=480\text{ V}, I_D=9.1\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	4	-	nC
Gate to drain charge	Q_{gd}		-	11	-	
Gate charge total	Q_g		-	20	-	

Reverse Diode

Continuous forward current	I_S	$V_{GS}=0\text{ V}$	-	-	9.1	A
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_S=5\text{ A}$	-	1.05	-	V
Reverse recovery time	t_{rr}	$V_{RR}=400\text{ V}, I_S=5\text{ A},$ $d_{iF}/d_t=100\text{ A}/\mu\text{S}$	-	59	-	ns
Reverse recovery charge	Q_{rr}		-	0.35	-	μC
Peak reverse recovery current	I_{rm}		-	13	-	A

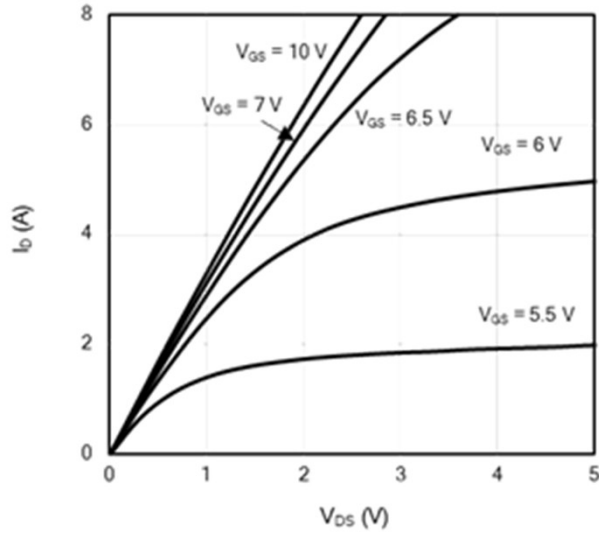


Figure 1: On-Region Characteristics

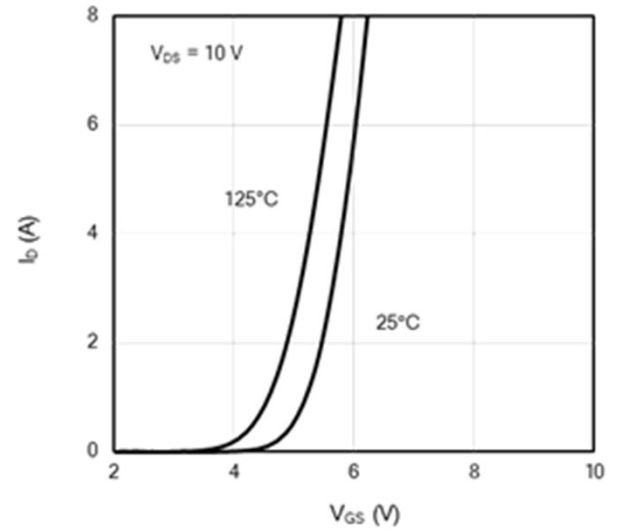


Figure 2: Transfer Characteristics

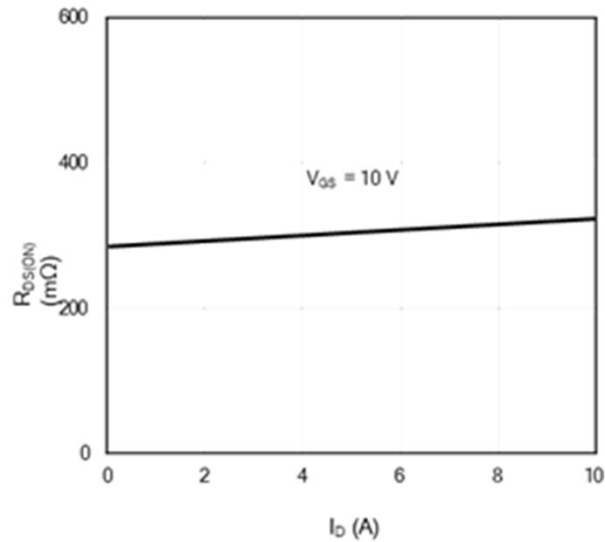


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

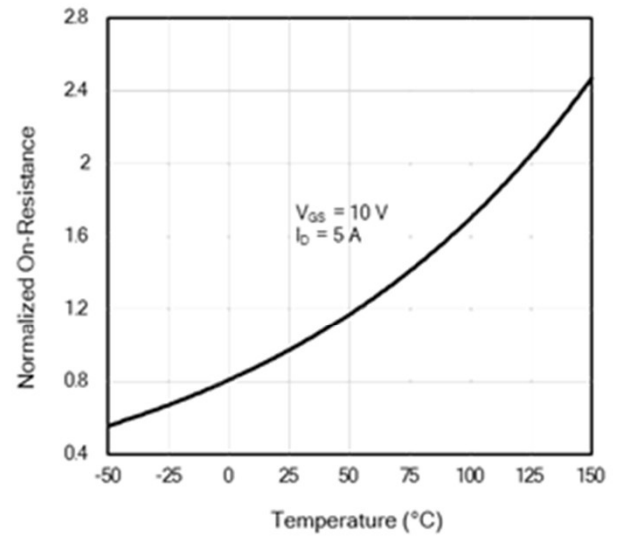


Figure 4: On-Resistance vs. Junction Temperature

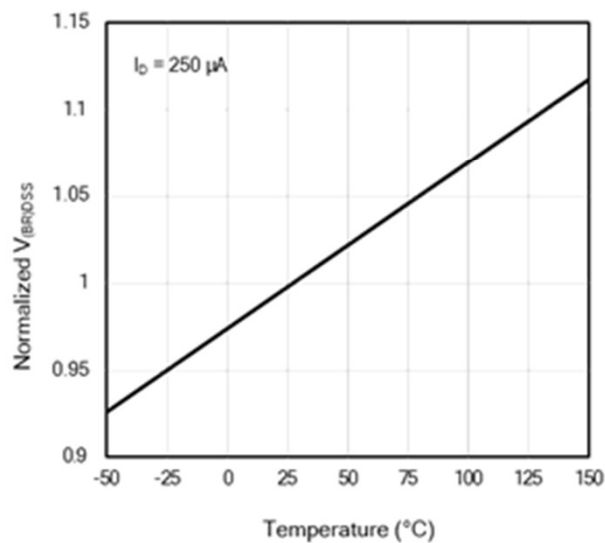


Figure 5: Breakdown Voltage vs. Junction Temperature

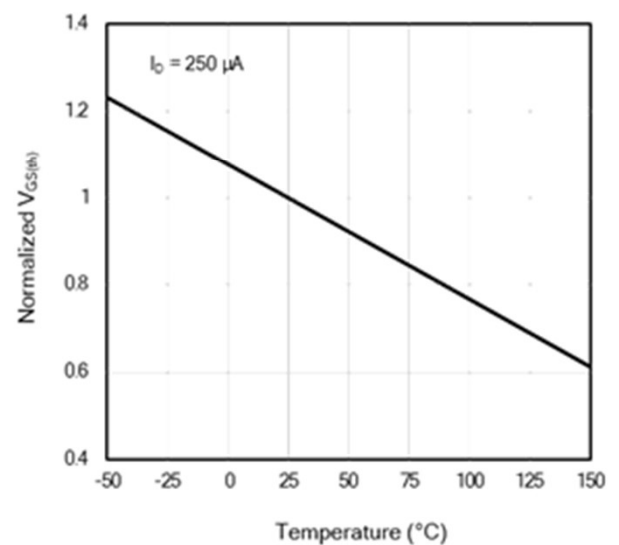


Figure 6: Threshold Voltage vs. Junction Temperature

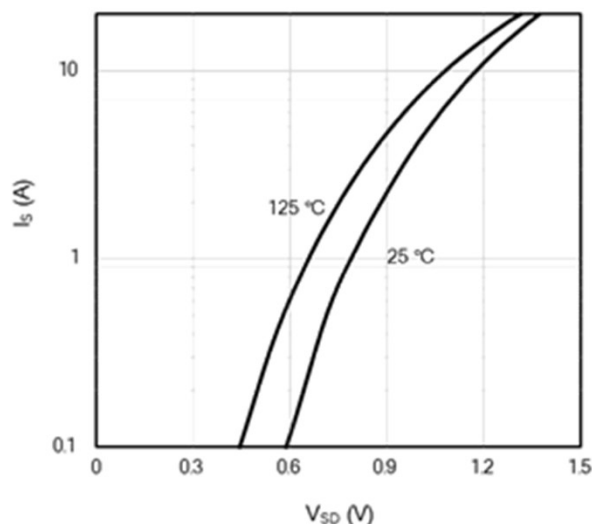


Figure 7: Body-Diode Characteristics

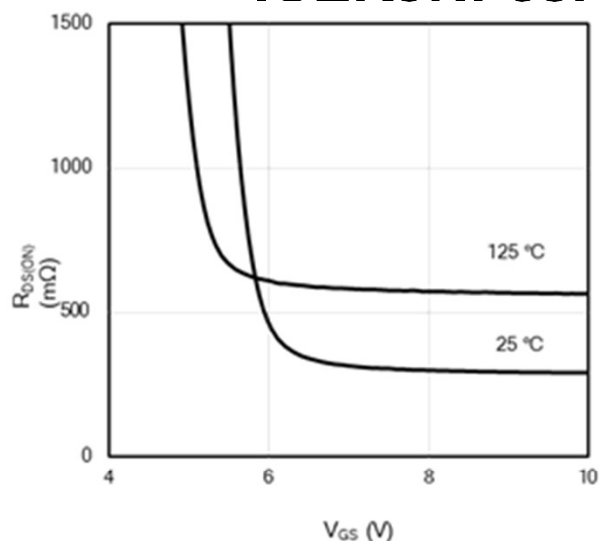


Figure 8: On-Resistance vs. Gate-Source Voltage

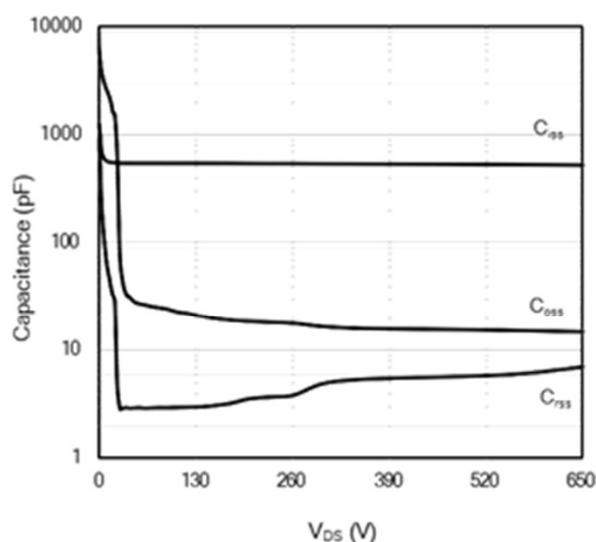


Figure 9: Capacitance Characteristics

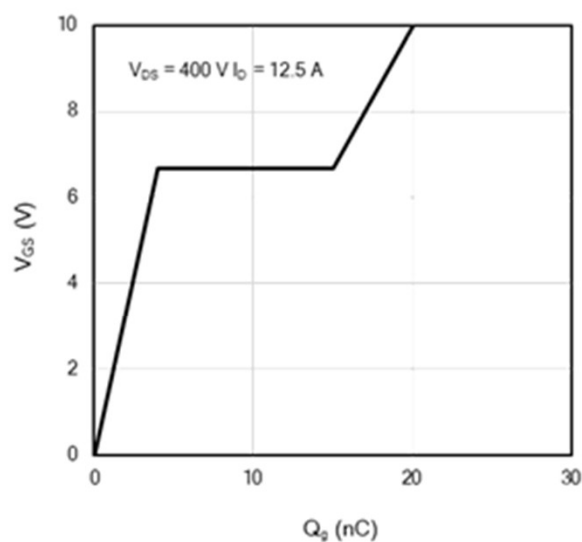


Figure 10: Gate-Charge Characteristics

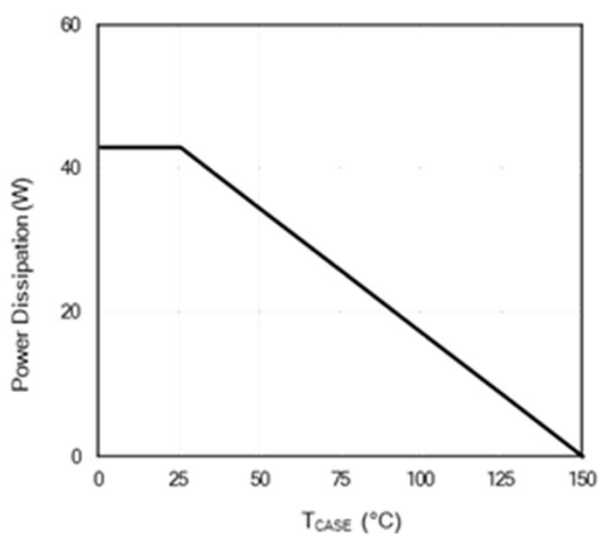


Figure 11: Power De-rating

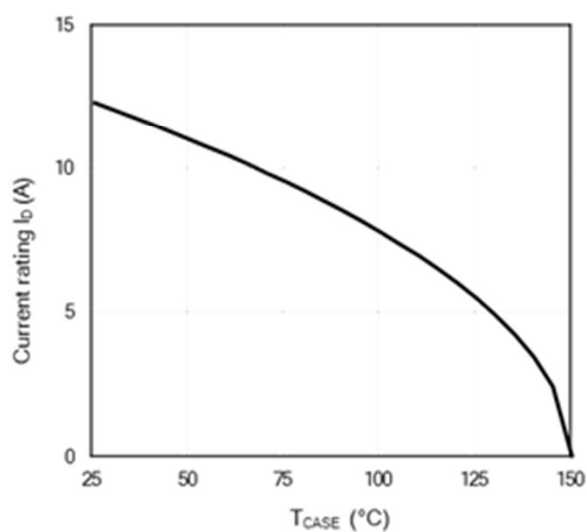


Figure 12: Current De-rating

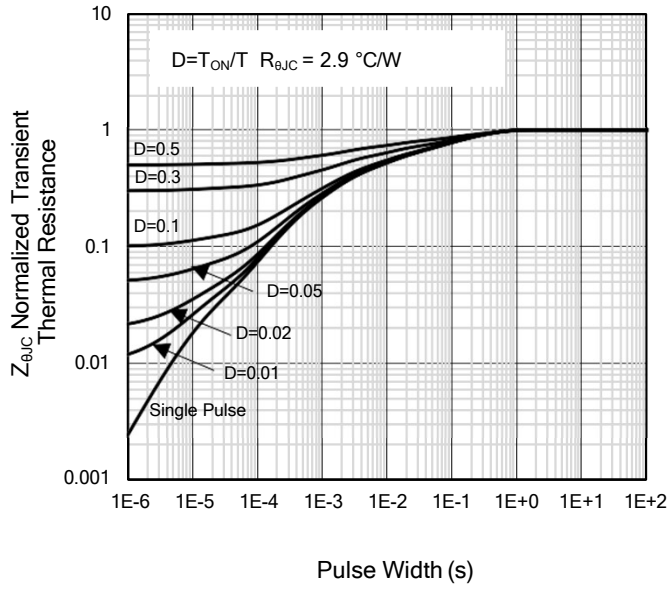


Figure 13: Normalized Maximum Transient Thermal Impedance

Preliminary ICEK9NF65FP

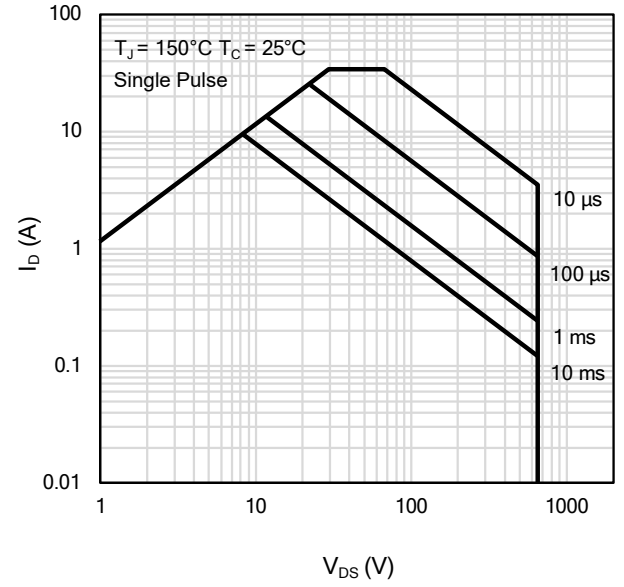
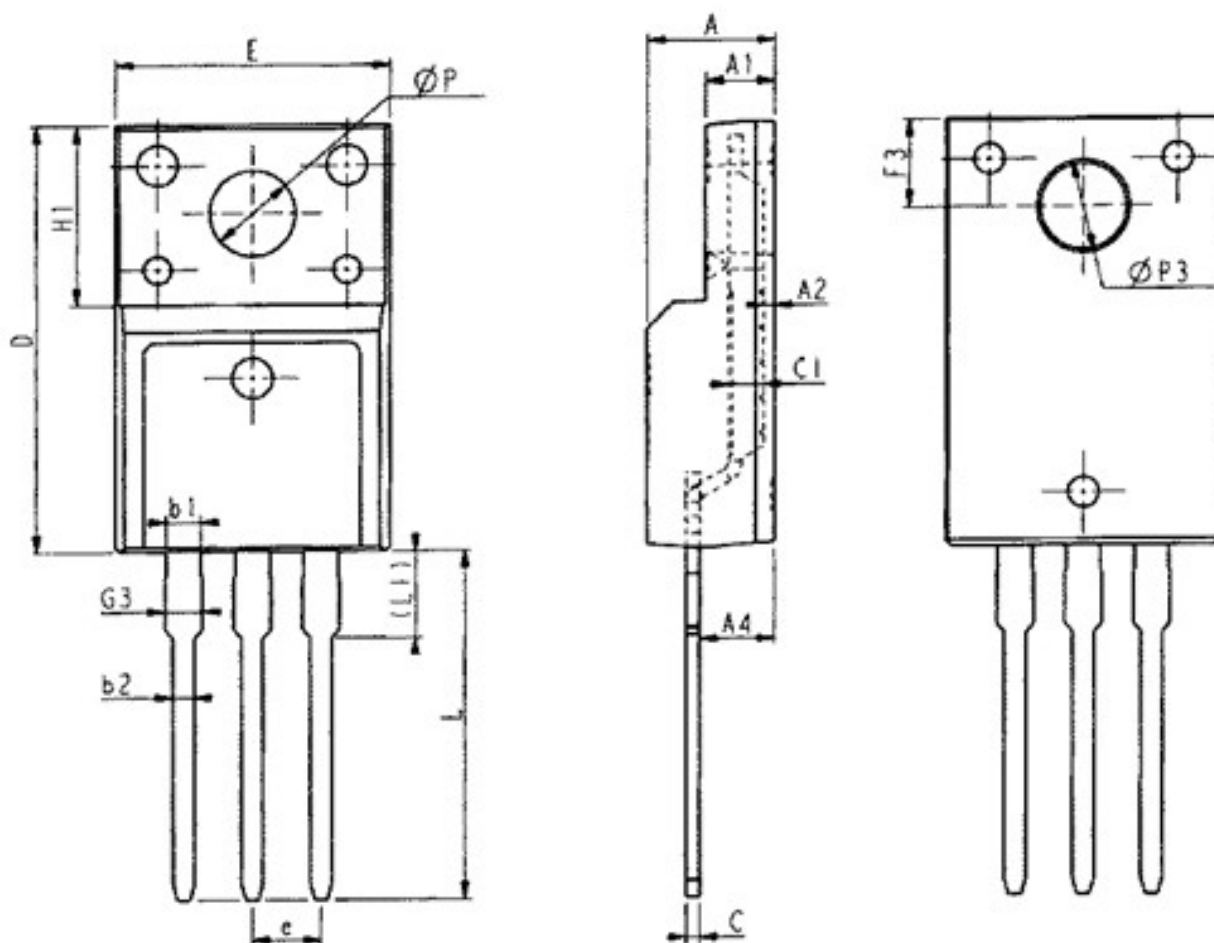


Figure 14: Maximum Forward Biased Safe Operating Area

Package Outline: TO-220MF-DG-3L



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.30	0.45	0.60
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
c1	1.20	1.30	1.35
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
L	12.68	12.98	13.28
L1	3.03	3.23	3.43
ØP	3.03	3.18	3.38
ØP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35	1.55
b1	1.18	1.28	1.43
b2	0.70	0.80	0.95

Marking Information

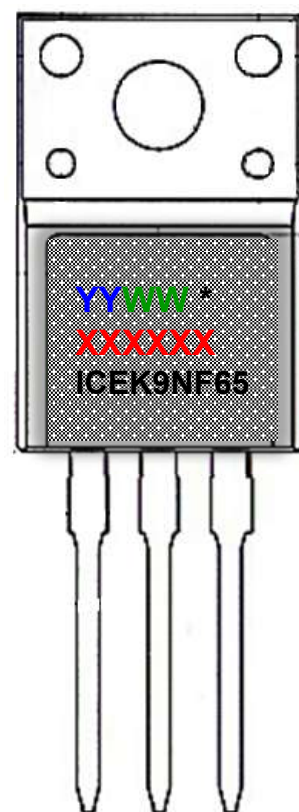
YY = Last two digits of the year

WW = Work week

***** = Site ID

XXXXXX = Lot ID

ICEK9NF65 = ICE is IceMOS logo and
K9NF65 is a designated device part
number



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