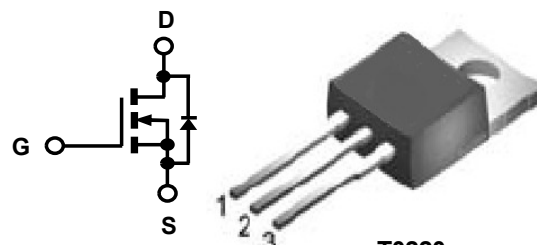


ICEK024G4 N-Channel Enhancement Mode MOSFET

Features

- Low FOM $r_{DS(on)} \times Q_g$
- Ultra-low on-resistance
- Low switching loss with good E_{AS} performance
- 100% UIS Tested
- Optimized design for Motor Drivers and DC-DC Converter

Product Summary			
I_D	$T_A=25^\circ\text{C}$	120A	Max
$V_{(BR)DSS}$	$I_D=250\mu\text{A}$	40V	Min
$r_{DS(on)}$	$V_{GS}=10\text{V}$	2m Ω	Typ
Q_g	$V_{DS}=20\text{V}$	57nC	Typ



T0220

Standard Metal
Heatsink

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



Lead Free

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current ^b	I_D	$T_c=25^\circ\text{C}$ silicon limit	222	A
		$T_c=25^\circ\text{C}$ package limit	120	
		$T_c=100^\circ\text{C}$ package limit	120	
Pulsed drain current ^b	$I_{D, \text{pulse}}$	$T_c=25^\circ\text{C}$	440	A
Avalanche energy, single pulse	E_{AS}	$L=0.5\text{mH}$, $V_{DD}=20\text{V}$, $I_D=38\text{A}$, $R_G=25\Omega$	361	mJ
Avalanche current, repetitive ^b	I_{AR}	limited by $T_{j\text{max}}$	38	A
Gate source voltage	V_{GS}	Static	± 20	V
		AC ($f>1\text{Hz}$)		
Power dissipation	P_{tot}	$T_c=25^\circ\text{C}$	178.5	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}		-	-	0.7	°C/W
Thermal resistance, junction-ambient °	R_{thJA}	leaded	-	-	50	
Soldering temperature, wave soldering only allowed at leads	T_{sold}	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	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3.2	4	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$	-	-	1	μA
Gate source leakage current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$	-	2	2.4	m Ω
Gate resistance	R_G	$f=1\text{ MHz}$, open drain	-	6	-	Ω

Dynamic characteristics

Input capacitance	C_{iss}	$V_{DS}=20V, V_{GS}=0V, f=1\text{ MHz}$	-	3244	-	pF
Output capacitance	C_{oss}		-	1077	-	
Reverse transfer capacitance	C_{rss}		-	52	-	
Turn-on delay time	$t_{d(on)}$	$V_{DS}=20V, R_L=1\Omega, V_{GS}=10V, R_G=6\Omega$ (External)	-	22	-	ns
Rise time	t_r		-	45	-	
Turn-off delay time	$t_{d(off)}$		-	68	-	
Fall time	t_f		-	25	-	

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Gate charge characteristics

Gate to source charge	Q_{gs}	$V_{DS}=20V, I_D=20A,$ $V_{GS}=0 \text{ to } 10V$	-	20	-	nC
Gate to drain charge	Q_{gd}		-	8	-	
Gate charge total	Q_g		-	57	-	

Reverse Diode

Continuous forward current	I_S	$V_{GS}=0V$	-	-	120	A
Diode forward voltage	V_{SD}	$V_{GS}=0V, I_S=1A$	-	0.7	1	V
Reverse recovery time	t_{rr}	$V_{RR}=20V, I_S=15A,$ $d_{iF}/d_t=100 \text{ A}/\mu\text{S}$	-	54	-	ns
Reverse recovery charge	Q_{rr}		-	60	-	nC
Peak reverse recovery current	I_{rm}		-	1.8	-	A

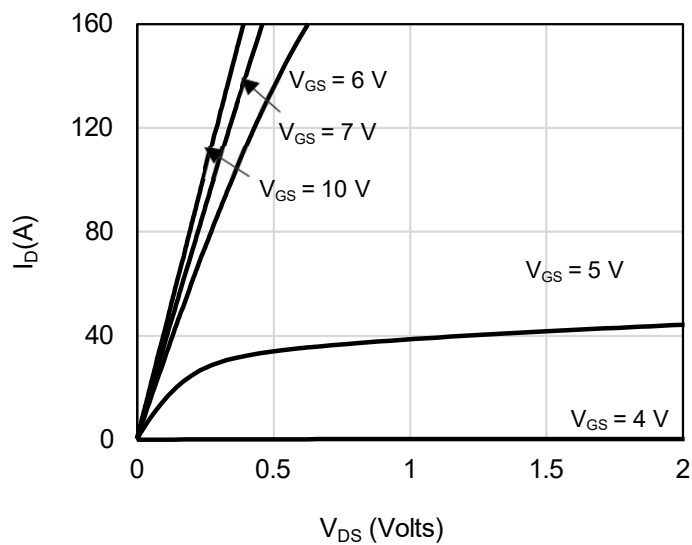


Figure 1: On-Region Characteristics

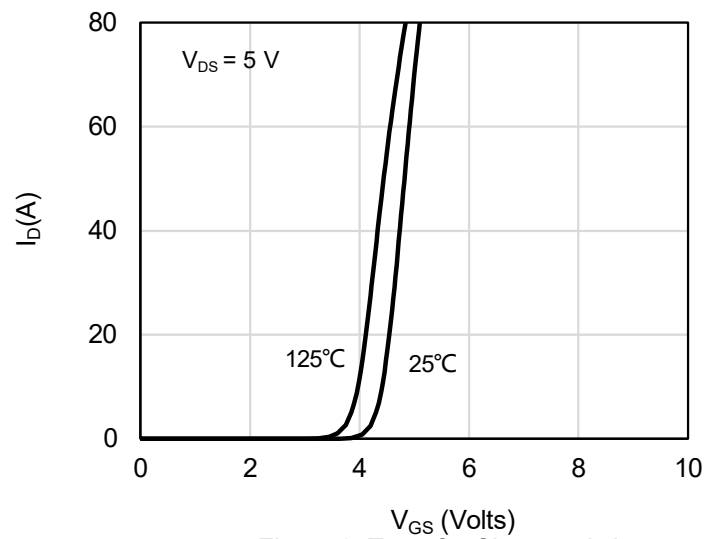


Figure 2: Transfer Characteristics

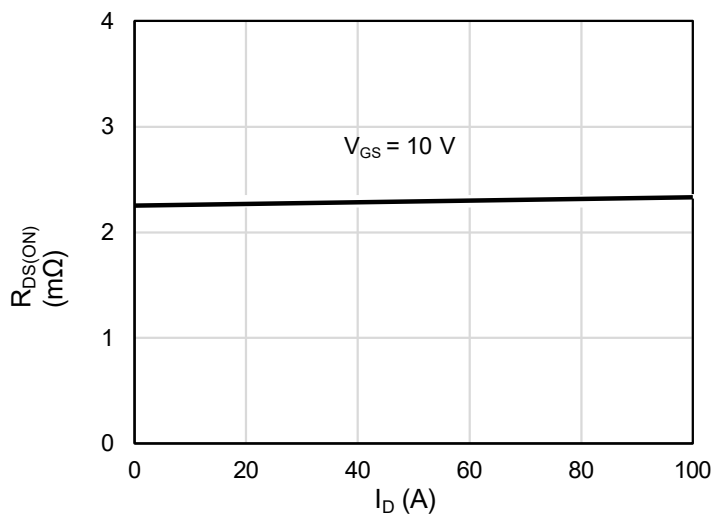


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

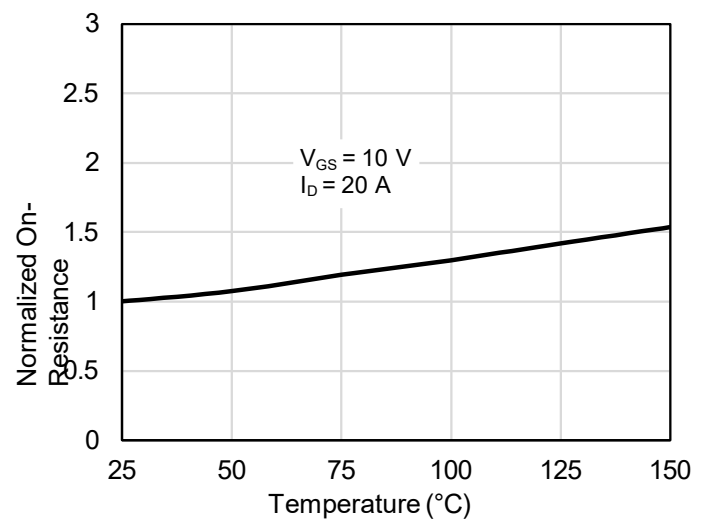


Figure 4: On-Resistance vs. Junction Temperature

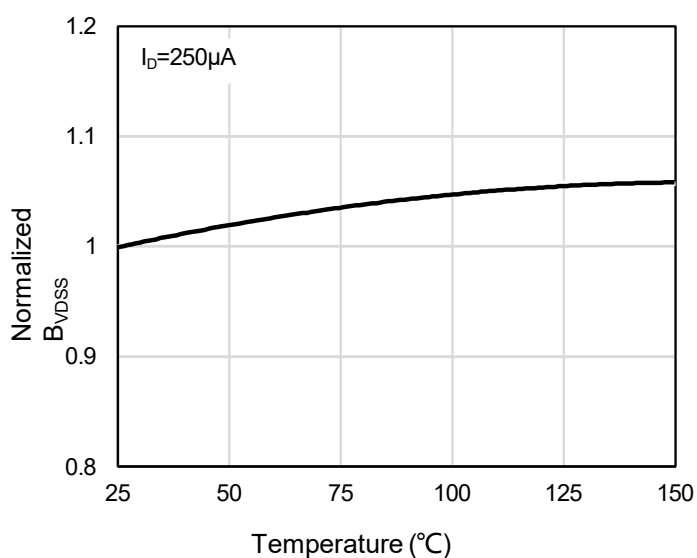


Figure 5: Breakdown Voltage vs. Junction Temperature

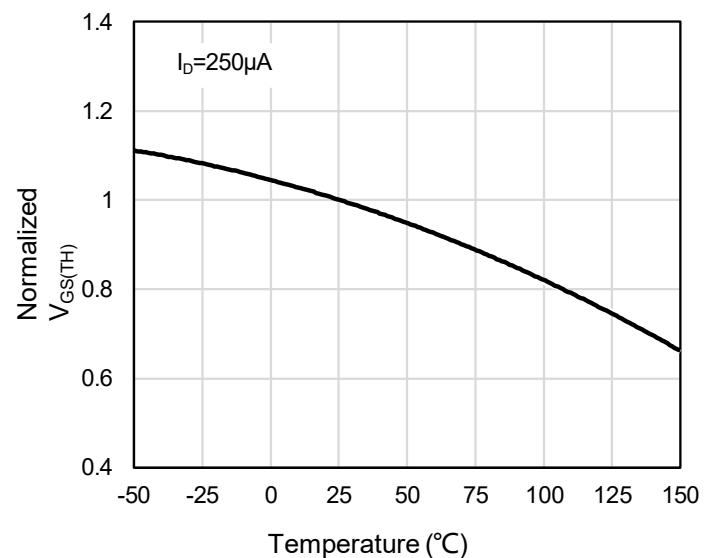


Figure 6: Threshold Voltage vs. Junction Temperature

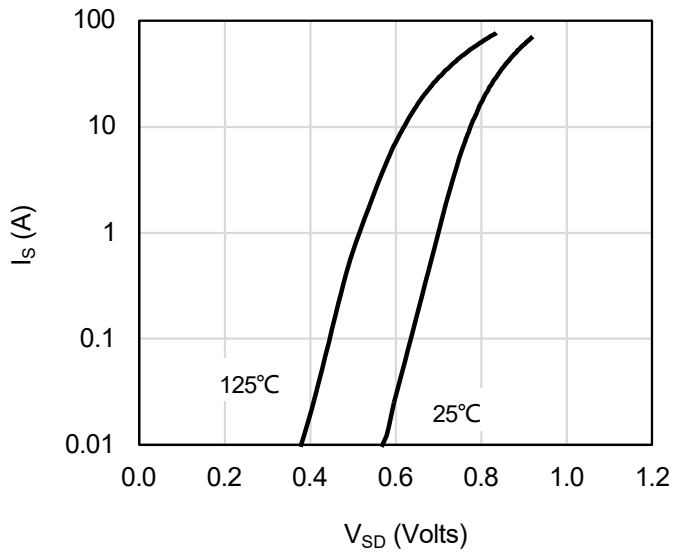


Figure 7: Body-Diode Characteristics

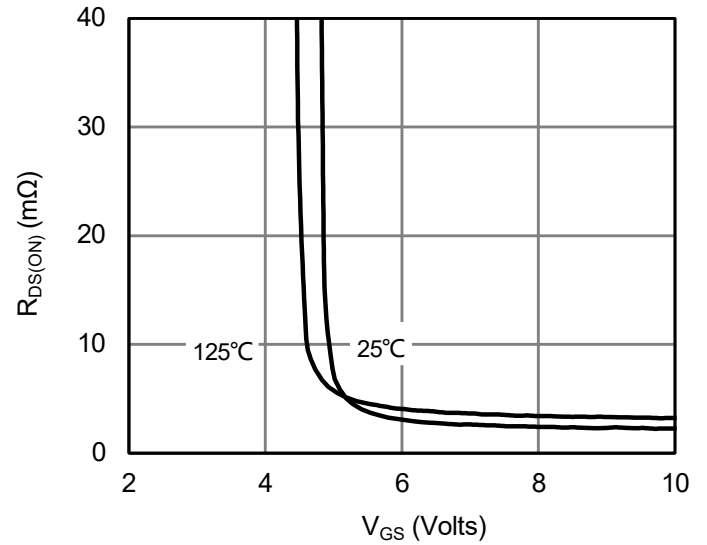


Figure 8: On-Resistance vs. Gate-Source Voltage

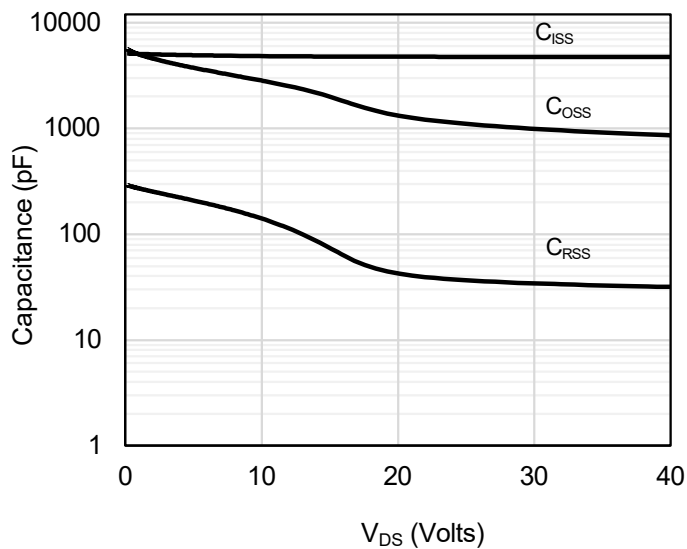


Figure 9: Capacitance Characteristics

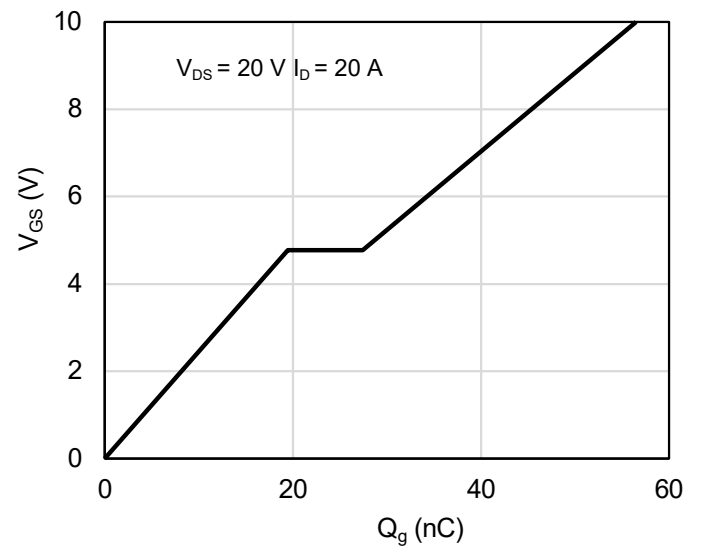


Figure 10: Gate-Charge Characteristics

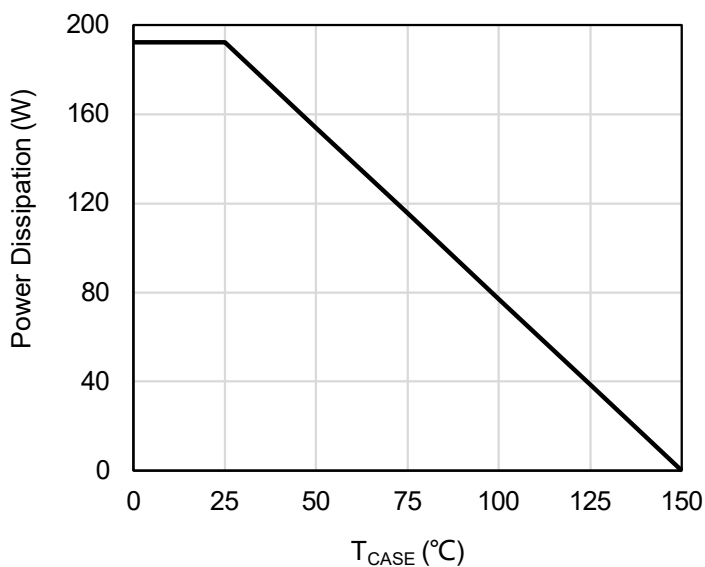


Figure 11: Power De-rating

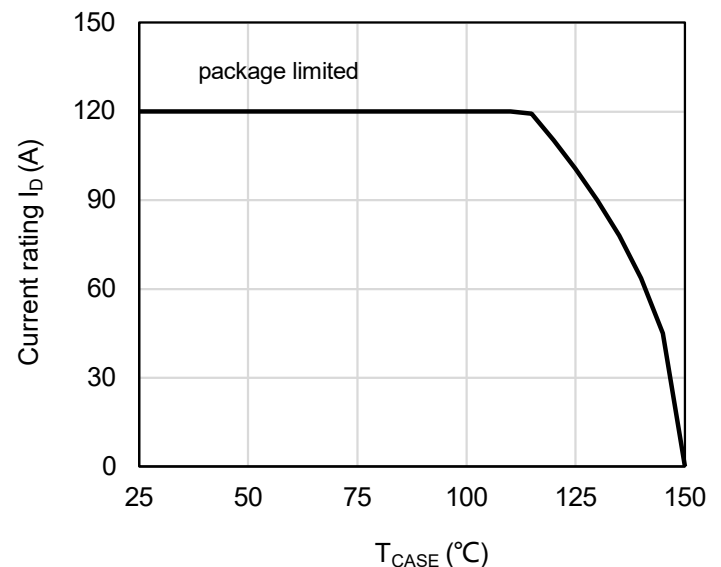


Figure 12: Current De-rating

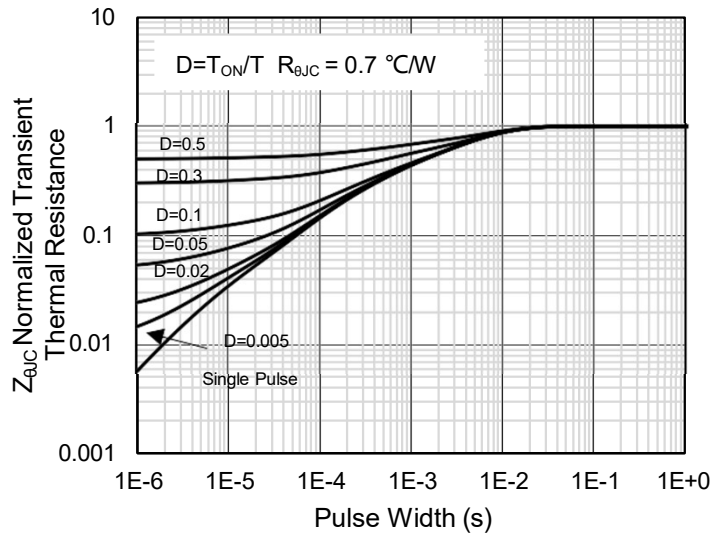


Figure 13: Normalized Maximum Transient Thermal Impedance

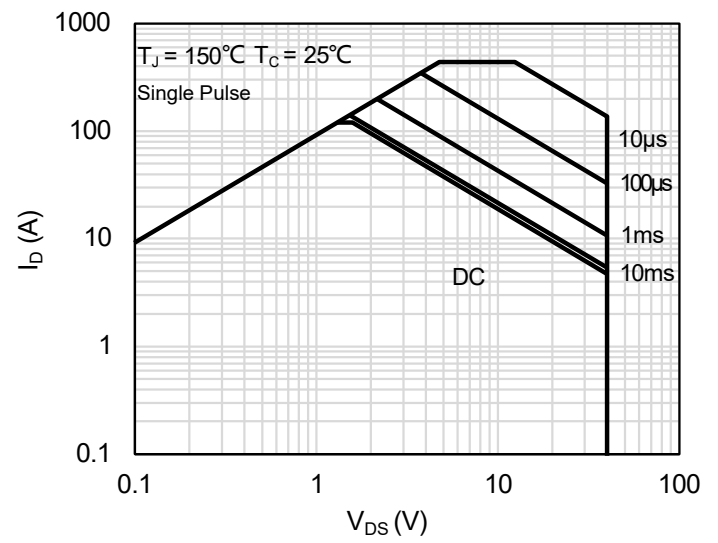
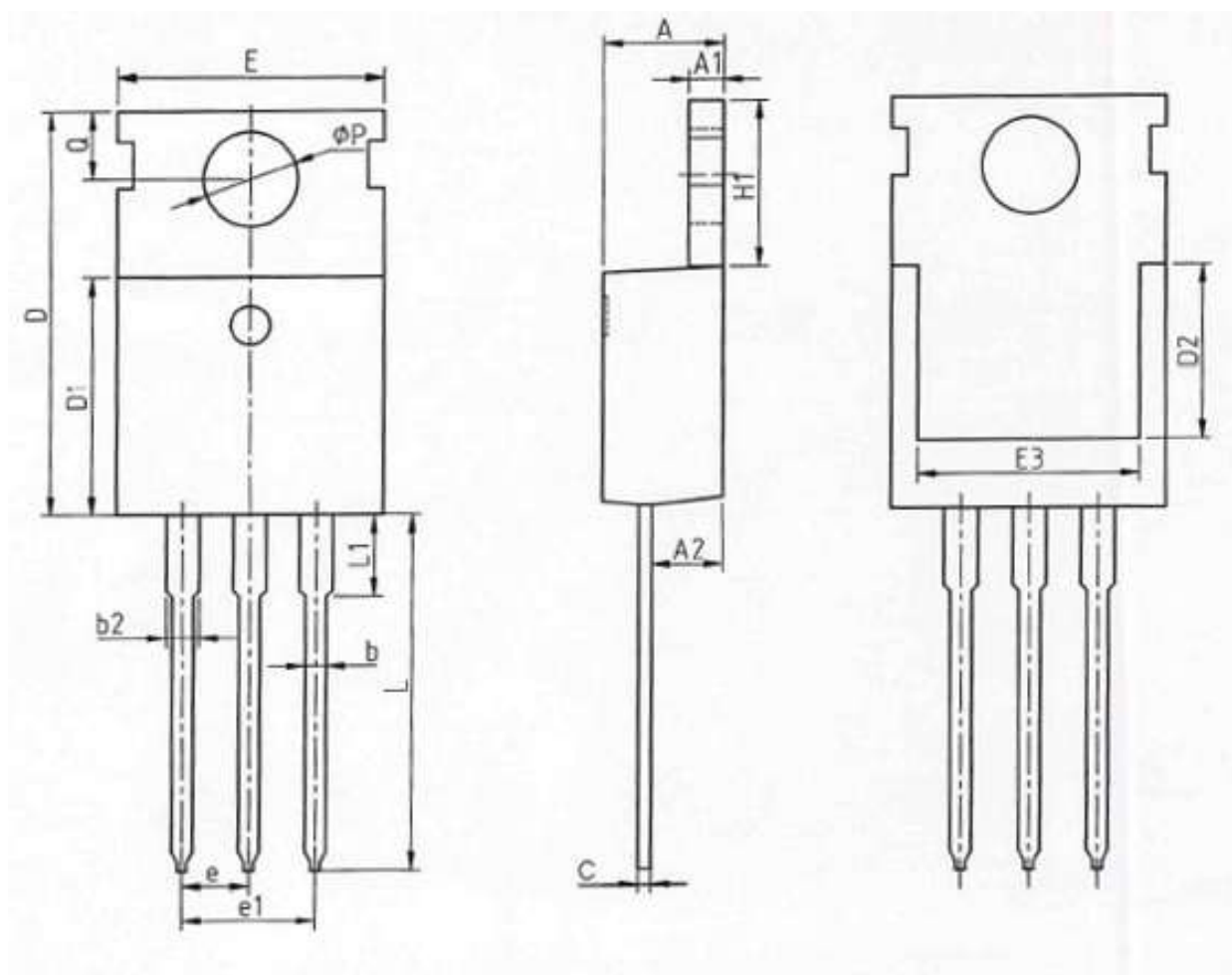


Figure 14: Maximum Forward Biased Safe Operating Area

Package Outline: TO-220



Package Outline: TO-220

COMMON DIMENSIONS

SYMBOL	MIN	NOM	MAX
A	4.37	4.57	4.70
A1	1.25	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	—	—
E	9.70	10.00	10.30
E3	7.00	—	—
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	—	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00

Marking Information

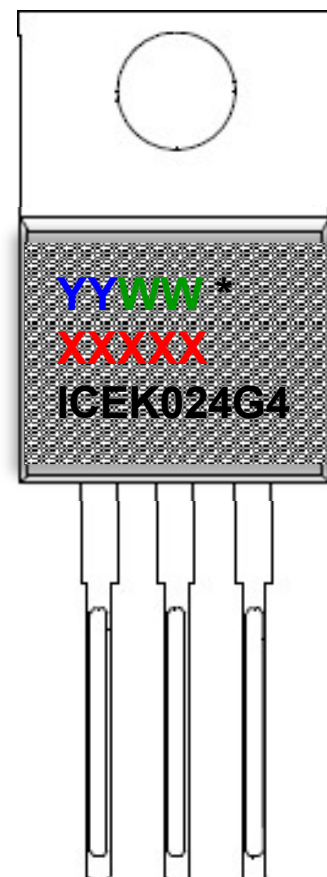
YY = Last two digits of the year

WW = Work week

***** = Site ID

XXXXXX = Lot ID

ICEK024G4 = ICE is IceMOS logo and
K024G4 is a designated device part
number



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