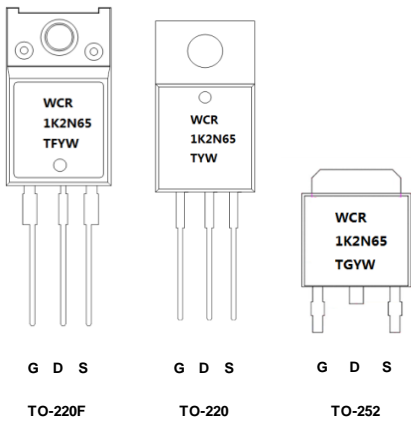


**WCR1K2N65T/TF/TG**  
**650V N-Channel Super Junction MOSFET****Description**

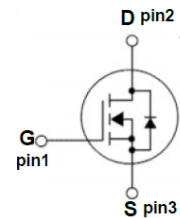
The WCR1K2N65 series is new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance. This advanced technology has been tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy. This device is suitable for various AC/DC power conversion in switching mode operation for higher efficiency.

**Features**

- 700V @ $T_J=150^{\circ}\text{C}$
- Typ.  $R_{DS(on)}=1.05\Omega$
- Low gate charge
- 100% avalanche tested
- 100%  $R_g$  tested

**Order Information**

Device	Package	Marking	Units/Tube	Units/Real
WCR1K2N65T-3/T	TO-220	WCR1K2N65TYW <sup>(1)</sup>	50	
WCR1K2N65TF-3/T	TO-220F	WCR1K2N65TFYW <sup>(2)</sup>	50	
WCR1K2N65TG-3/TR	TO-252E-2L	WCR1K2N65TGYW <sup>(3)</sup>		3000



Note 1: WCR1K2N65T=Device code ;Y=Year ;W=Week (A~z);  
 Note 2: WCR1K2N65TF=Device code ;Y=Year ;W=Week (A~z);  
 Note 3: WCR1K2N65TG=Device code ;Y=Year ;W=Week (A~z);

Absolusion Maximum Ratings $T_A=25^{\circ}\text{C}$ unless otherwise noted				
Parameter	Symbol	WCR1K2N65T WCR1K2N65TG	WCR1K2N65TF	Unit
Drain-Source Voltage	$V_{DS}$	650		V
Gate-Source Voltage	$V_{GS}$	$\pm 30$		
Continuous Drain Current <sup>A</sup>	$T_C=25^{\circ}\text{C}$	4.0	3	A
	$T_C=100^{\circ}\text{C}$	2.5	1.9	
Pulsed Drain Current	$I_{DM}$	16		A
Single Pulsed Avalanche Energy <sup>B</sup>	$E_{AS}$	41		mJ
Power Dissipation	$T_C=25^{\circ}\text{C}$	50	30	W
	Derate above $25^{\circ}\text{C}$	0.5	0.22	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55~150		$^{\circ}\text{C}$
Lead Temperature	$T_L$	260		$^{\circ}\text{C}$
Thermal Resistance Ratings				
Maximum Junction-to-Ambient	$R_{th(ch-A)}$	62 <sup>D</sup>	80	$^{\circ}\text{C/W}$
Maximum Junction-to-Case	$R_{th(ch-c)}$	2.5	4.6	

Electronics Characteristics ( $T_A=25^\circ\text{C}$ , unless otherwise noted)

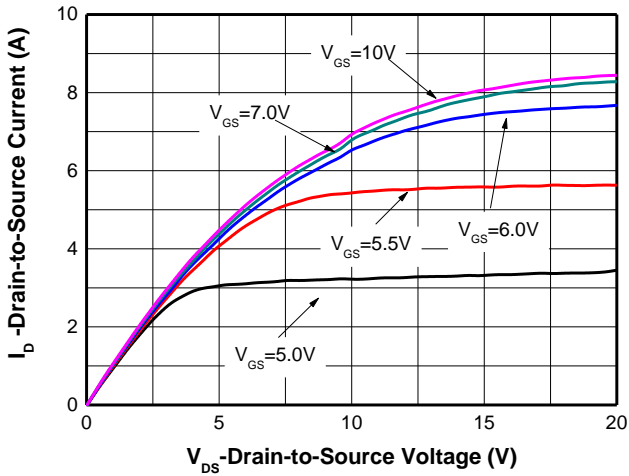
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\mu\text{A}, T_J=25^\circ\text{C}$	650			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=650\text{V}, V_{GS} = 0\text{V}, T_J=25^\circ\text{C}$			1	$\mu\text{A}$
Gate-to-source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 30\text{V}$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 150\mu\text{A}$	2	3	4	V
Drain-to-source On-resistance	$R_{DS(on)}^C$	$V_{GS} = 10\text{V}, I_D = 2.6\text{A}$		1.05	1.22	$\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}, V_{DS} = 400\text{ V}$		272		pF
Output Capacitance	$C_{OSS}$			8.3		
Reverse Transfer Capacitance	$C_{RSS}$			0.3		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 400\text{ V},$ $I_D = 5.2\text{A}$		10.4		nC
Gate-to-Source Charge	$Q_{GS}$			2.2		
Gate-to-Drain Charge	$Q_{GD}$			5.1		
Gate resistance	$R_g$	$V_{GS}=0\text{V}, F=1\text{MHz}, \text{drain open}$		10		$\Omega$
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{V},$ $V_{DS} = 400\text{ V},$ $I_D = 2.6\text{A}, R_G=10\ \Omega$		8.5		ns
Rise Time	$t_r$			12.7		
Turn-Off Delay Time	$t_{d(off)}$			22.4		
Fall Time	$t_f$			16.7		
<b>Drain to Source Diode Characteristics and Maximum Ratings</b>						
Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 5.2\text{A}$			1.5	V
Body-Diode Continuous Current	$I_S$			5.2		A
Body-Diode Pulsed Current	$I_{SM}$			20.8		A
Body Diode Reverse Recovery Time	$T_{rr}$	$I_F=2.6\text{A}, dI/dt=100\text{A}/\mu\text{s}, V_{DS}=400\text{V}$		171		nS
Body Diode Reverse Recovery Charge	$Q_{rr}$			0.75		$\mu\text{C}$
Peak reverse recovery Current	$I_{rrm}$			8.8		A

**NOTES:**

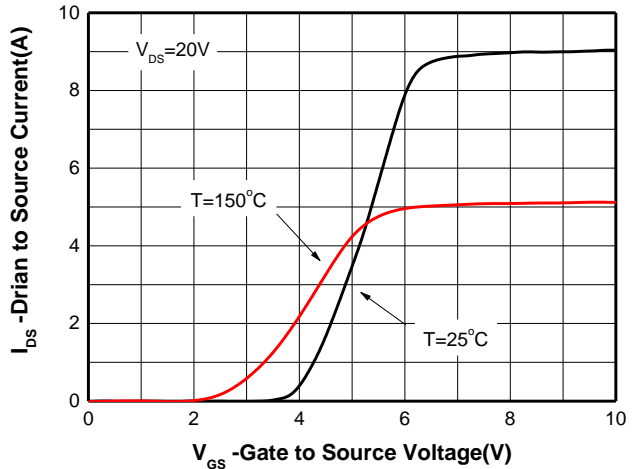
- Drain current limited by maximum junction temperature. Maximum duty cycle  $D=0.75$
- $L=100\text{mH}, I_{AS}=0.9\text{A}, V_{DD}=50\text{V}, \text{Starting } T_J=25^\circ\text{C}$
- Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$  sensitively Independent of Operating Temperature Typical Characteristics
- These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ .



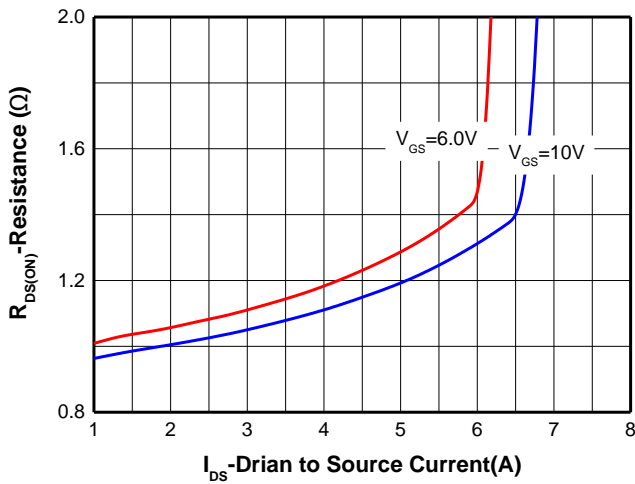
Typical Characteristics ( $T_A=25^\circ\text{C}$ , unless otherwise noted)



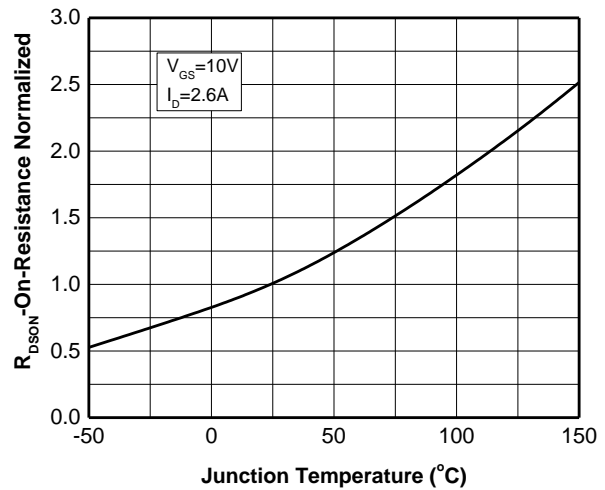
Output characteristics



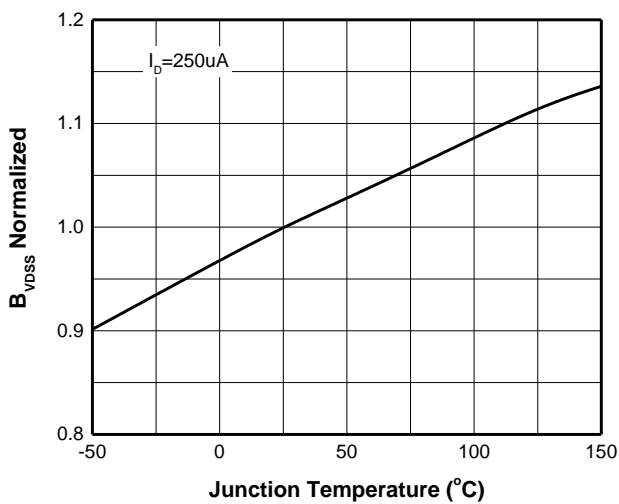
Transfer characteristics



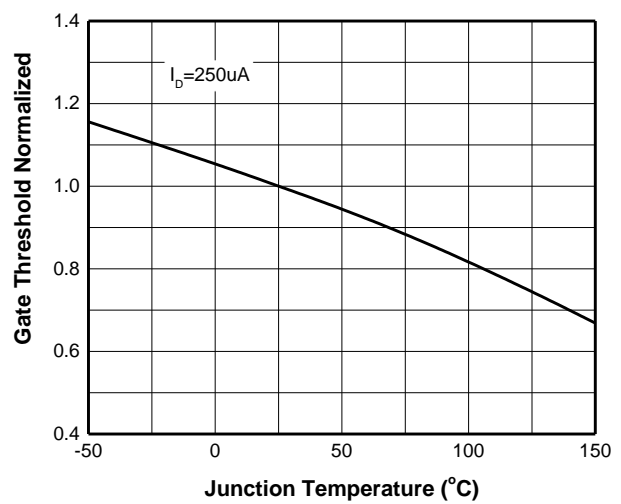
On-Resistance vs. Drain current



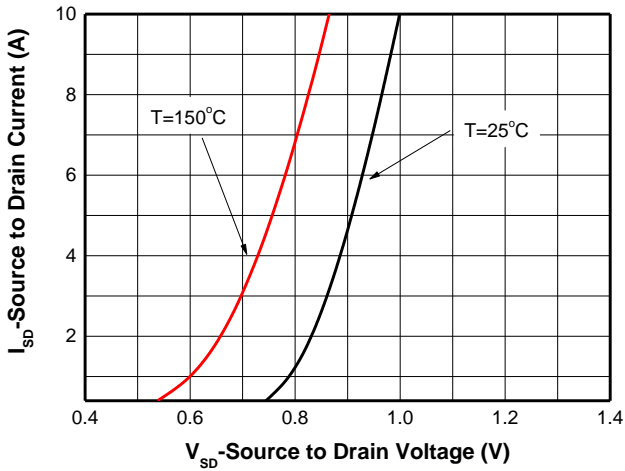
On-Resistance vs. Junction temperature



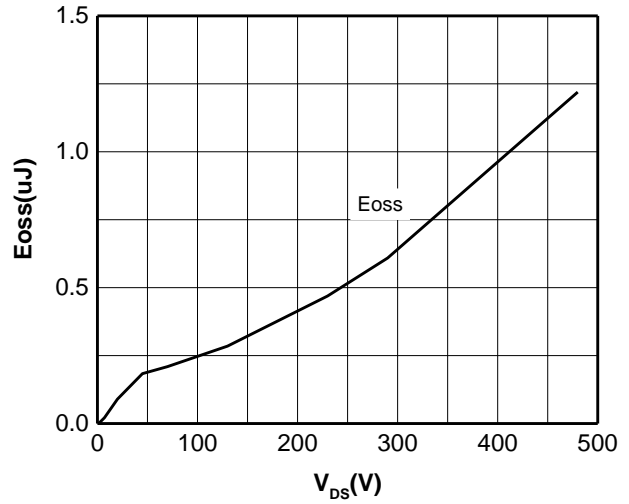
Breakdown Voltage vs. Junction temperature



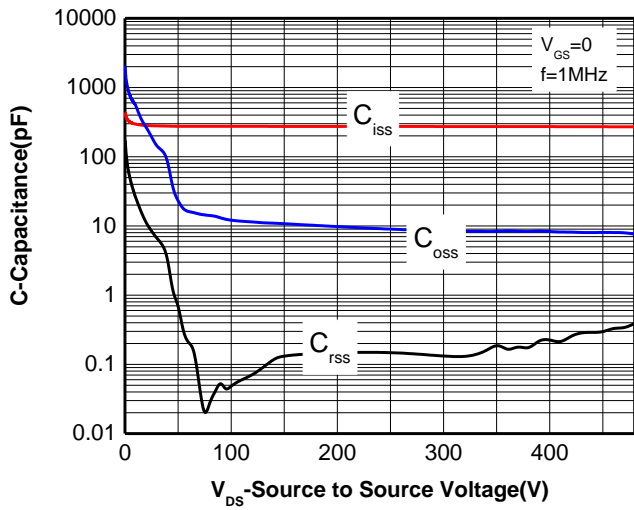
Threshold voltage vs. Junction temperature



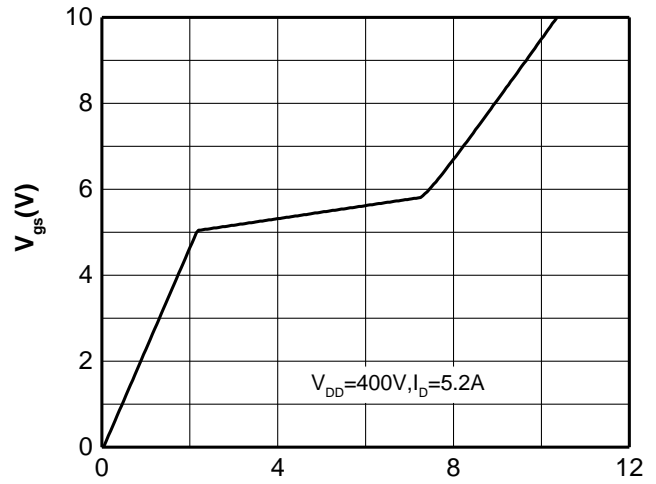
Body diode forward voltage



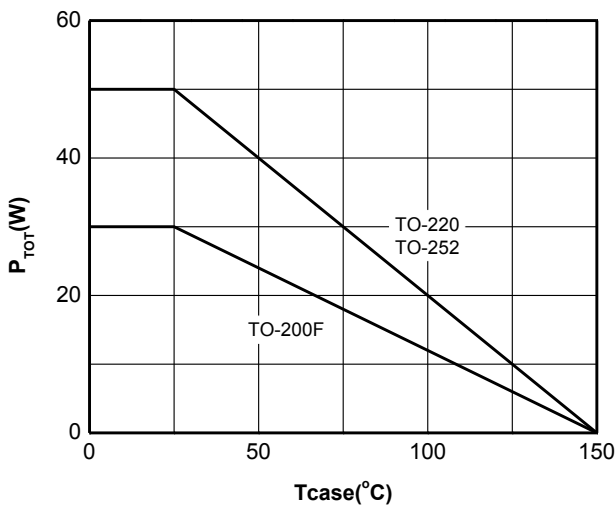
Cosstored Energy



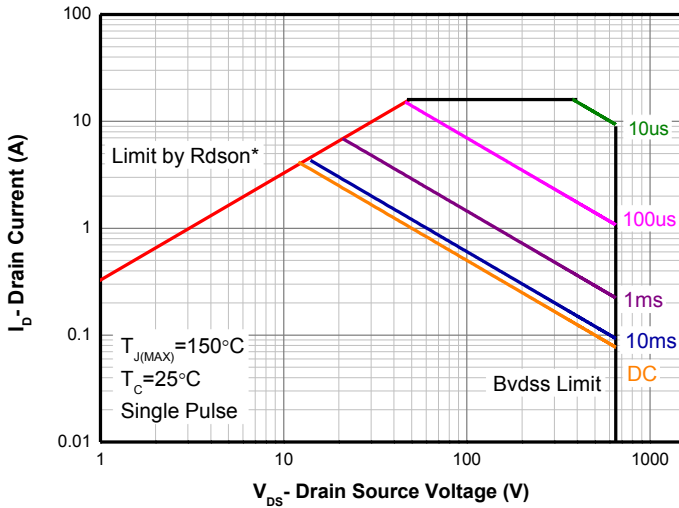
Capacitance



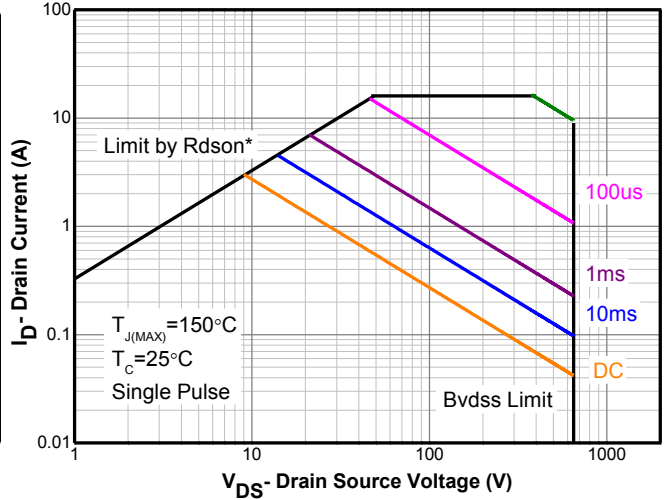
Gate charge Characteristics



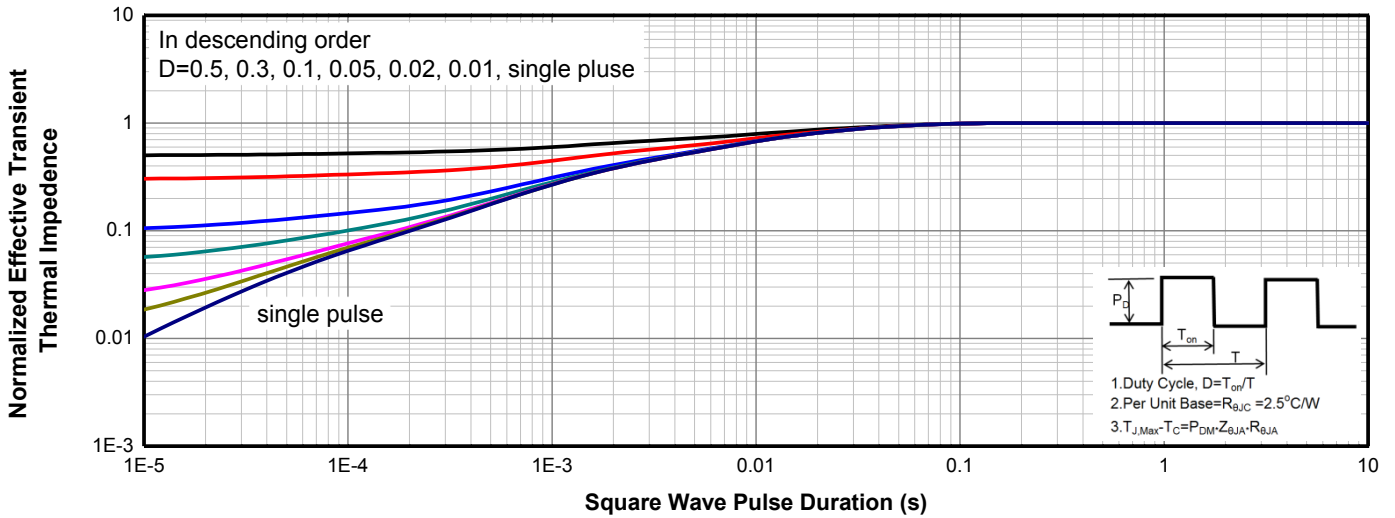
Power dissipation



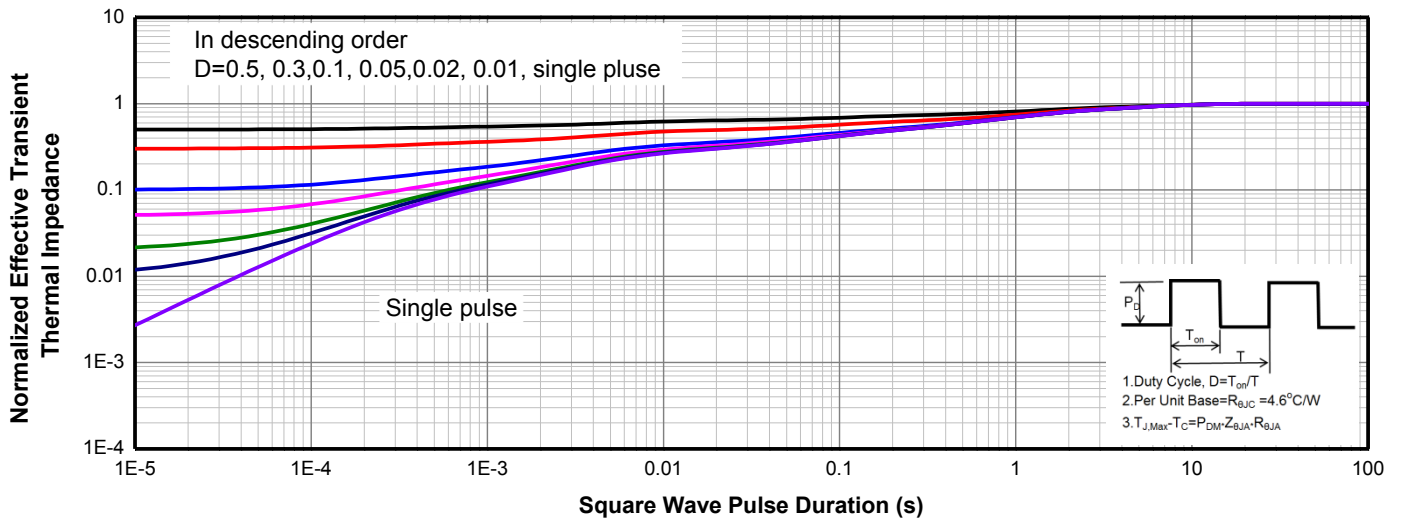
**TO-220&TO-252E-2**  
Safe operating area



**TO-220F**  
Safe operating area



**TO-220&TO-252E-2 Transient thermal response(Junction to case)**

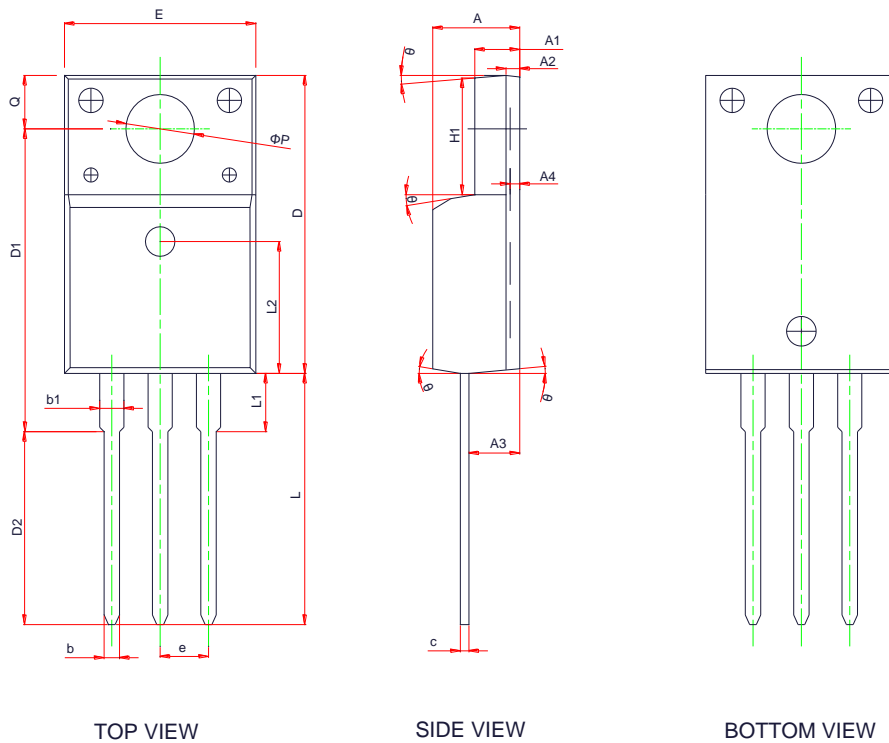


**TO-220F Transient thermal response(Junction to case)**



PACKAGE OUTLINE DIMENSIONS

TO-220F-3L

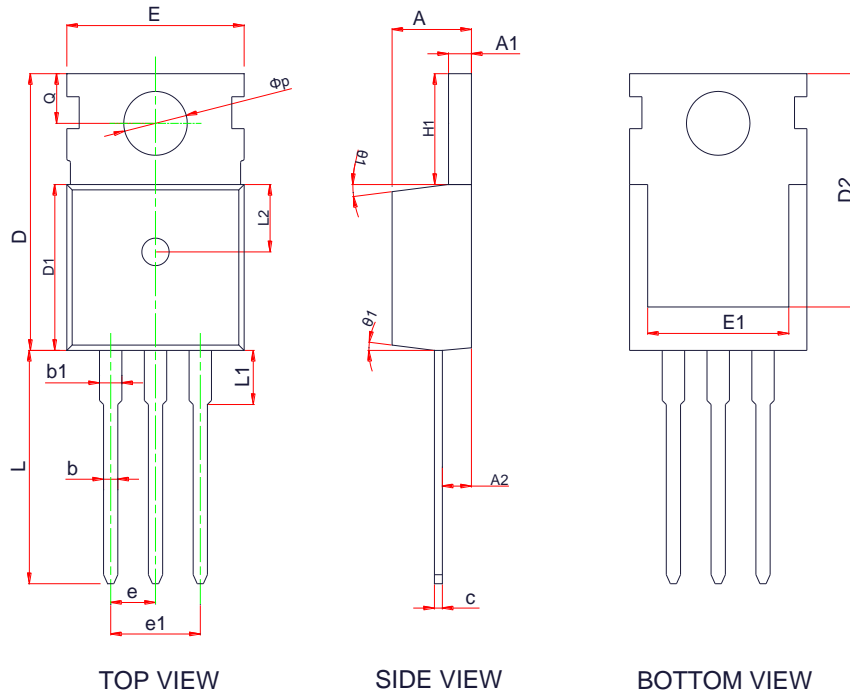


Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	4.50	4.72	4.90
A1	2.45	2.56	2.65
A2	0.72Ref		
A3	2.68	2.78	2.88
A4	-	-	0.45
b	0.70	0.80	0.90
b1	1.18	1.28	1.38
c	0.45	0.52	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
E	9.96	10.16	10.36
e	2.45BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	3.50
L2	2.54BSC		
$\phi P$	3.08	3.18	3.28
Q	3.20	-	3.40
$\theta$	3°	5°	7°



PACKAGE OUTLINE DIMENSIONS

TO-220-3L

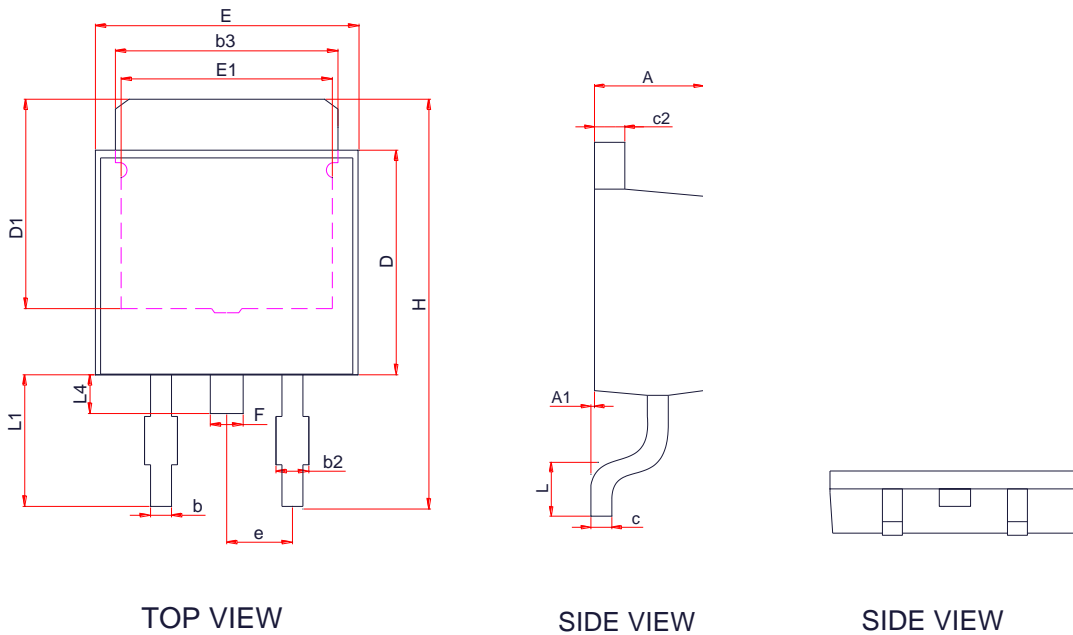


Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	4.40	4.50	4.60
A1	1.27	1.30	1.33
A2	2.30	2.40	2.50
b	0.70	0.80	0.90
b1	1.30	-	1.37
c	0.45	0.50	0.60
D	15.30	15.70	16.10
D1	9.10	9.20	9.30
D2	12.90	13.10	13.30
E	9.70	9.90	10.20
E1	7.70	7.90	8.10
e	2.45Ref		
e1	5.08Ref		
H1	6.30	6.50	6.70
L	12.78	13.08	13.38
L1	-	-	3.50
L2	4.06Ref		
ØP	3.55	3.60	3.65
Q	2.73	-	2.87
θ1	3°	5°	7°



PACKAGE OUTLINE DIMENSIONS

TO-252E-2L



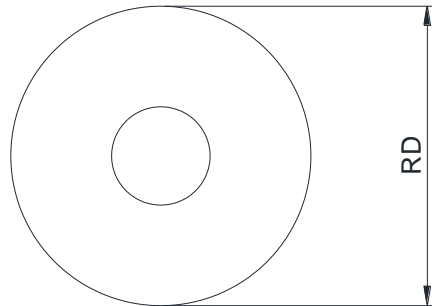
Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	2.20	2.30	2.40
A1	0	0.08	0.15
b	0.50	0.60	0.70
b2	0.60	0.75	0.90
b3	5.20	5.35	5.50
c2	0.45	0.50	0.55
c	0.51Ref		
D	5.40	5.60	5.80
D1	4.57	-	-
E	6.40	6.60	6.80
E1	3.81	-	-
e	2.30Ref		
F	0.70	0.80	0.90
H	9.40	9.80	10.20
L	1.40	1.59	1.77
L1	2.40	2.70	3.00
L4	0.80	1.00	1.20



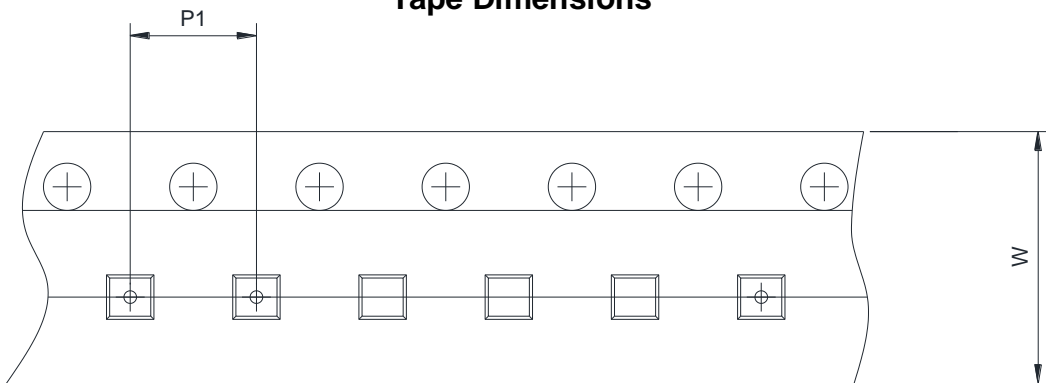


**TAPE AND REEL INFORMATION**

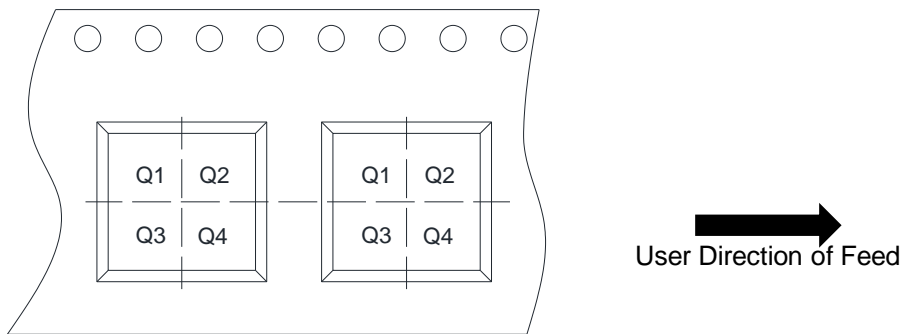
**Reel Dimensions**



**Tape Dimensions**



**Quadrant Assignments For PIN1 Orientation In Tape**



RD	Reel Dimension	<input type="checkbox"/> 7inch	<input checked="" type="checkbox"/> 13inch
W	Overall width of the carrier tape	<input type="checkbox"/> 8mm	<input type="checkbox"/> 12mm <input checked="" type="checkbox"/> 16mm
P1	Pitch between successive cavity centers	<input type="checkbox"/> 2mm	<input type="checkbox"/> 4mm <input checked="" type="checkbox"/> 8mm
Pin1	Pin1 Quadrant	<input type="checkbox"/> Q1	<input checked="" type="checkbox"/> Q2 <input type="checkbox"/> Q3 <input type="checkbox"/> Q4