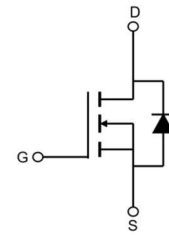


AP9565K

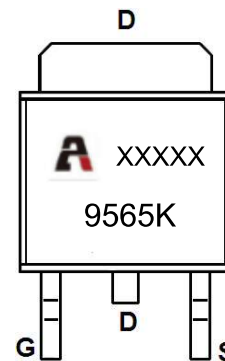
P-Channel Enhancement Mosfet

Feature

- -40V,-24A
 $R_{DS(ON)} < 33m\Omega @ V_{GS} = -10V$ TYP:27 m Ω
 $R_{DS(ON)} < 47m\Omega @ V_{GS} = -4.5V$ TYP:34 m Ω
- Advanced Trench Technology
- Lead free product is acquired
- Excellent $R_{DS(ON)}$ and Low Gate Charge



Schematic Diagram



Marking and pin assignment

Application

- PWM applications
- Load Switch
- Power management

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
9565K	AP9565K	TO-252	13 inch	-	2500

ABSOLUTE MAXIMUM RATINGS ($T_a=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_C=25^\circ\text{C}$)	I_D	-24	A
Continuous Drain Current ($T_C=100^\circ\text{C}$)	I_D	-15	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	-72	A
Single Pulsed Avalanche Energy ⁽²⁾	E_{AS}	54	mJ
Power Dissipation	P_D	39	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.2	$^\circ\text{C}/\text{W}$
Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55~ +150	$^\circ\text{C}$

MOSFET ELECTRICAL CHARACTERISTICS($T_a=25^{\circ}\text{C}$ unless otherwise noted)

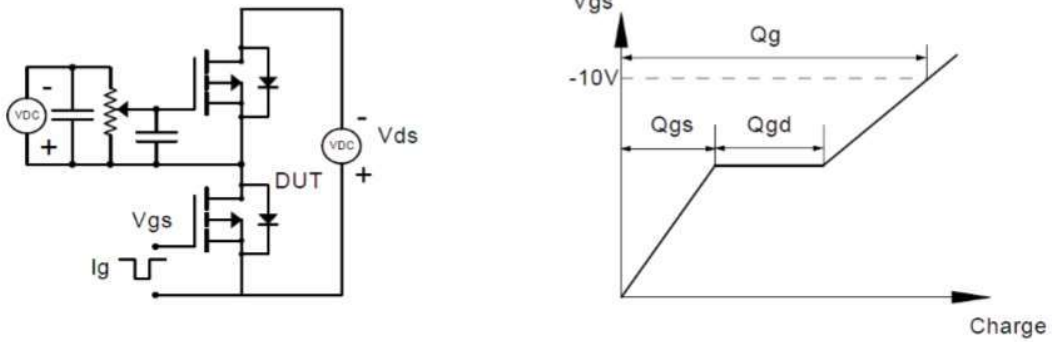
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-40	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -40V, V_{GS} = 0V$	-	-	1	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 100	nA
Gate threshold voltage ⁽³⁾	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1	-1.6	-2.5	V
Drain-source on-resistance ⁽³⁾	$R_{DS(on)}$	$V_{GS} = -10V, I_D = -20A$	-	27	33	m Ω
		$V_{GS} = -4.5V, I_D = -10A$	-	34	47	
Dynamic characteristics						
Input Capacitance	C_{iss}	$V_{DS} = -20V, V_{GS} = 0V, f = 1MHz$	-	1512	-	pF
Output Capacitance	C_{oss}		-	115	-	
Reverse Transfer Capacitance	C_{rss}		-	104	-	
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -20V, I_D = -20A, R_L = 1\Omega$ $V_{GS} = -10V, R_G = 2.5\Omega$	-	4	-	ns
Turn-on rise time	t_r		-	27	-	
Turn-off delay time	$t_{d(off)}$		-	39	-	
Turn-off fall time	t_f		-	10	-	
Total Gate Charge	Qg	$V_{DS} = -20V, I_D = -10A,$ $V_{GS} = -10V$	-	27	-	nC
Gate-Source Charge	Qgs		-	4.5	-	
Gate-Drain Charge	Qgd		-	5.4	-	
Source-Drain Diode characteristics						
Diode Forward voltage ⁽³⁾	V_{DS}	$V_{GS} = 0V, I_S = -20A$	-	-	-1.2	V
Diode Forward current ⁽⁴⁾	I_S		-	-	-24	A
Body Diode Reverse Recovery Time	t _{rr}	$T_J = 25^{\circ}, I_F = -15A, di/dt = 100A/\mu s$		11		ns
Body Diode Reverse Recovery Charge	Q _{rr}	$T_J = 25^{\circ}, I_F = -15A, di/dt = 100A/\mu s$		2.1		nc

Notes:

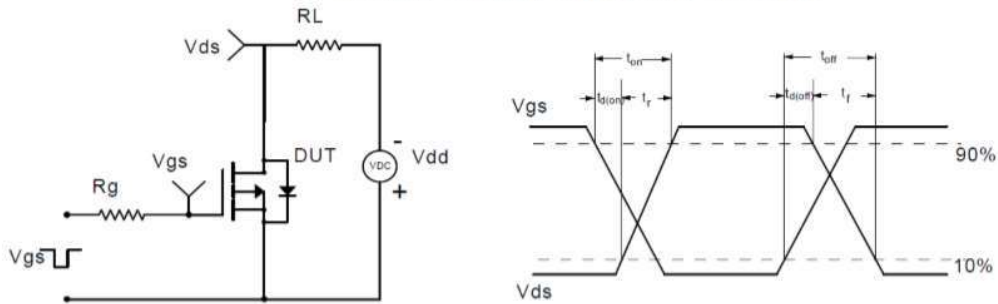
1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition: $T_J = 25^{\circ}\text{C}, V_{DD} = -20V, R_G = 25\Omega, L = 0.5\text{mH}$
3. Pulse Test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
4. Surface Mounted on FR4 Board, $t \leq 10\text{ sec}$

Test Circuit

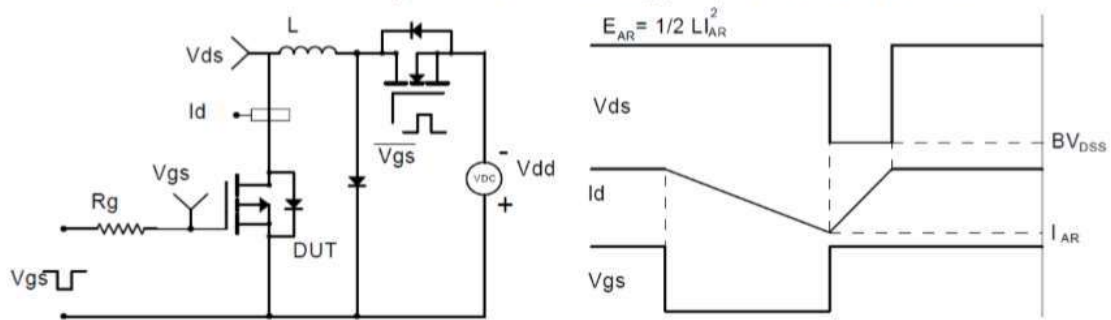
Gate Charge Test Circuit & Waveform



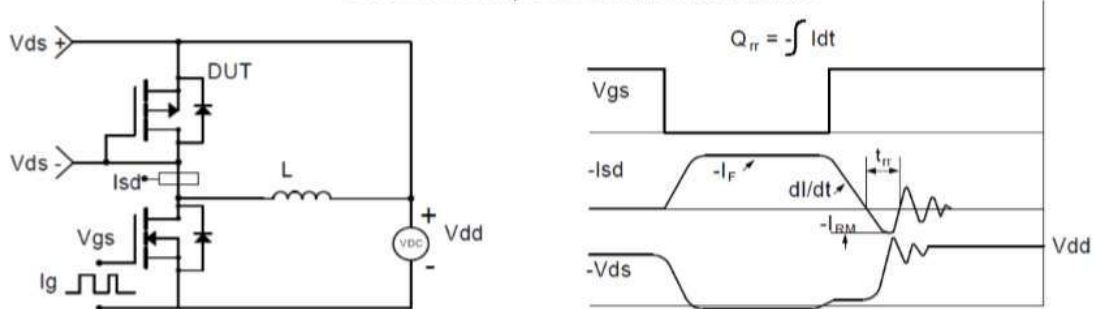
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Performance Characteristics

Fig1. Power Dissipation Derating Curve

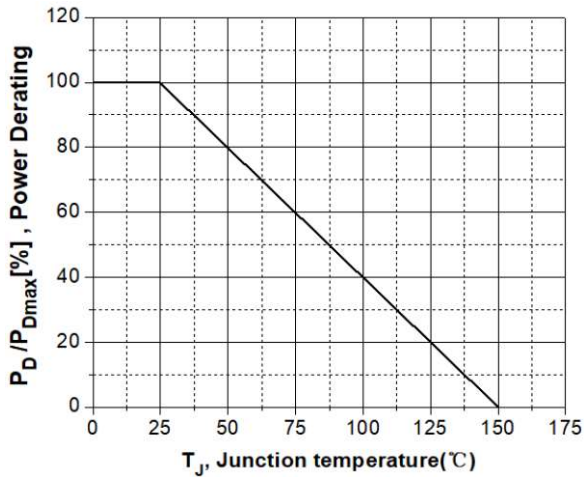


Fig2. Avalanche Energy Derating Curve vs. Junction Temperature

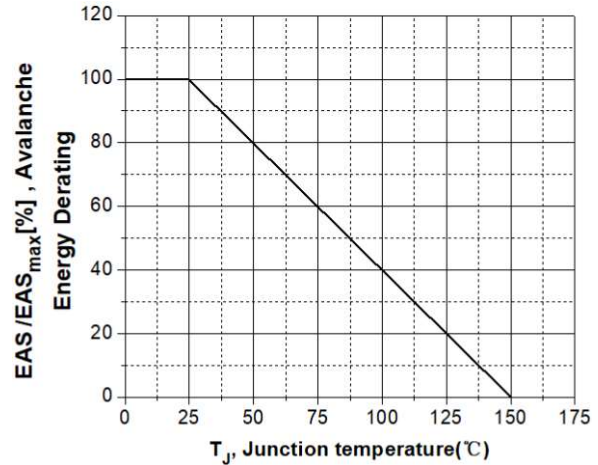


Fig3. Typical Output Characteristics @ $T_J = 125^\circ\text{C}$

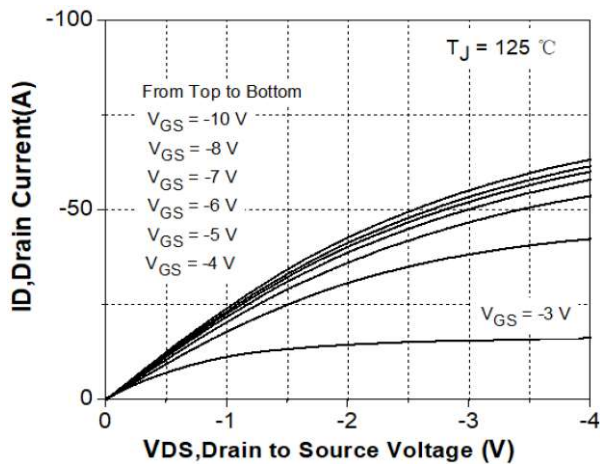


Fig4. Transconductance vs. Drain Current @ $T_J = -25/25/75/125^\circ\text{C}$

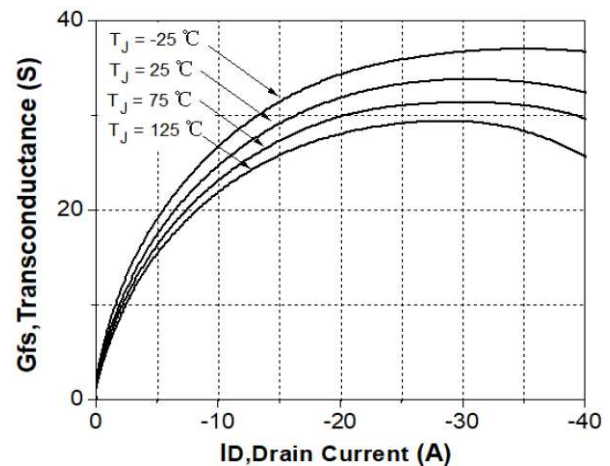


Fig5. Typical Transfer Characteristics @ $T_J = -25/25/75/125^\circ\text{C}$

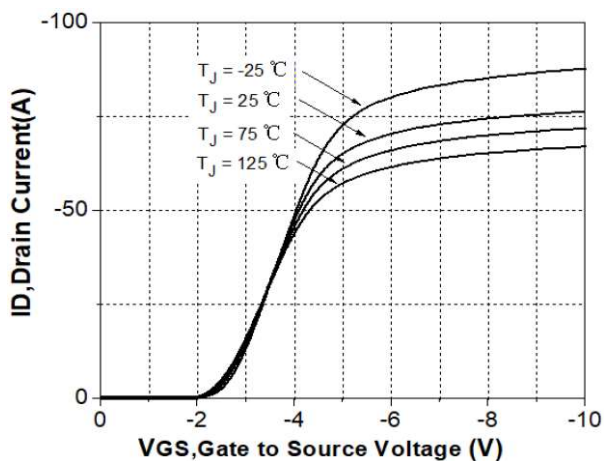


Fig6. Static Drain - Source On - State Resistance vs. Drain Current @ $T_J = -25^\circ\text{C}$

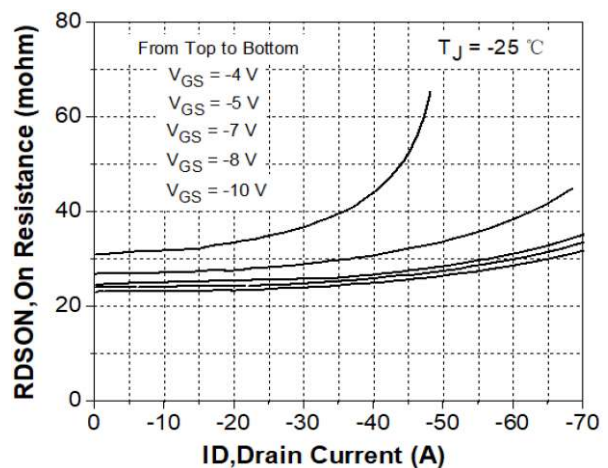


Fig7. Static Drain - Source On - State Resistance vs. Drain Current @T_J= 25°C

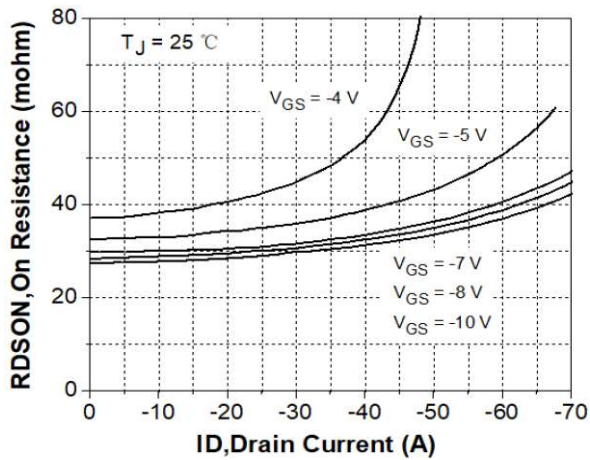


Fig8. Static Drain - Source On - State Resistance vs. Drain Current @T_J= 75°C

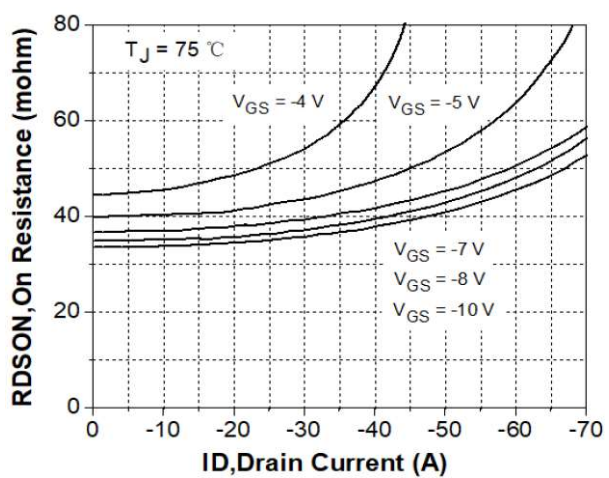


Fig9. Static Drain - Source On - State Resistance vs. Drain Current @T_J= 125°C

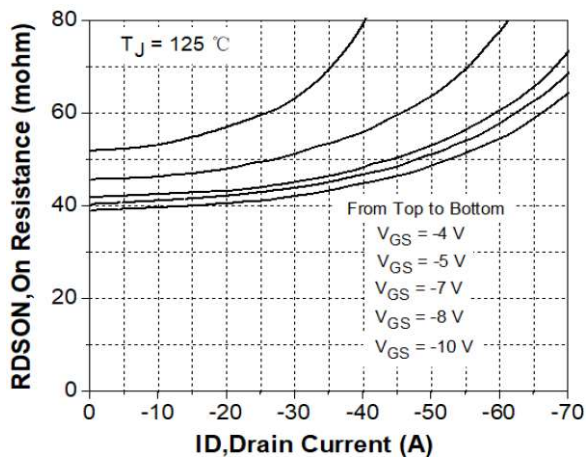


Fig10. Gate Charge Characteristics

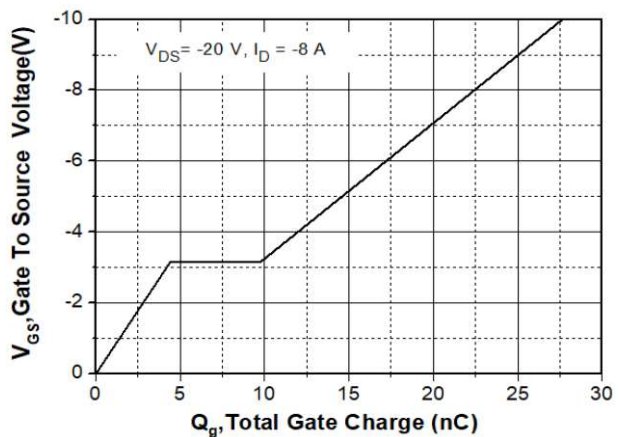


Fig11. Breakdown Voltage vs. Junction Temperature

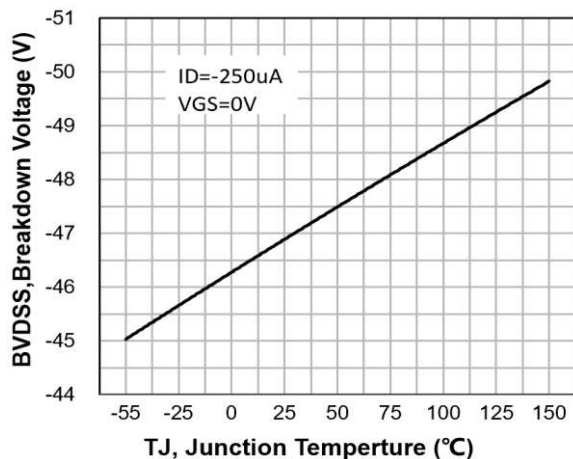


Fig12. Gate Threshold Voltage vs. Junction Temperature

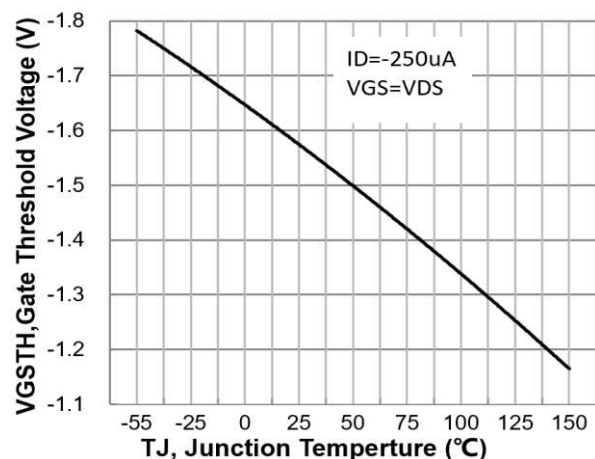


Fig13. On-Resistance Variation vs. Junction

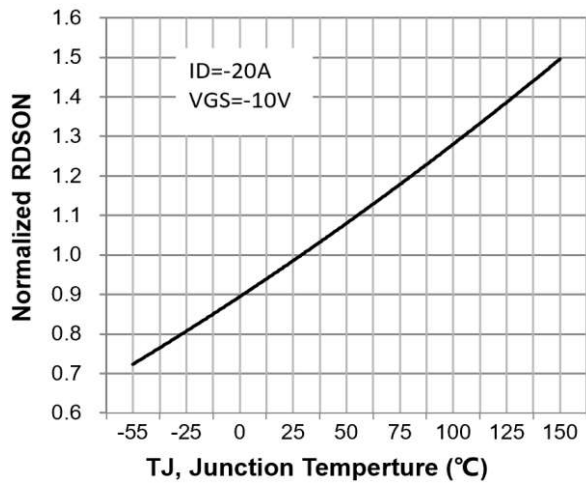


Fig14. Maximum Drain Current vs. Case Temperature

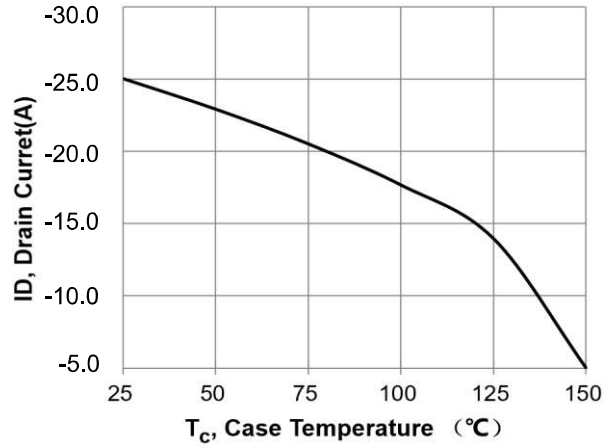


Fig15. Body Diode Forward Voltage vs. Reverse Drain Current

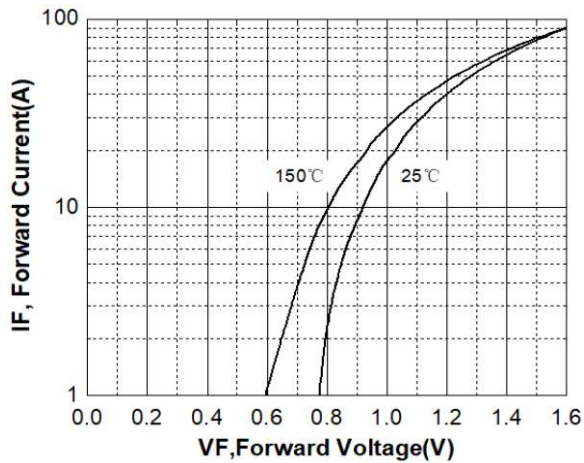


Fig16. Typical Output Characteristics @Tj= 25°C

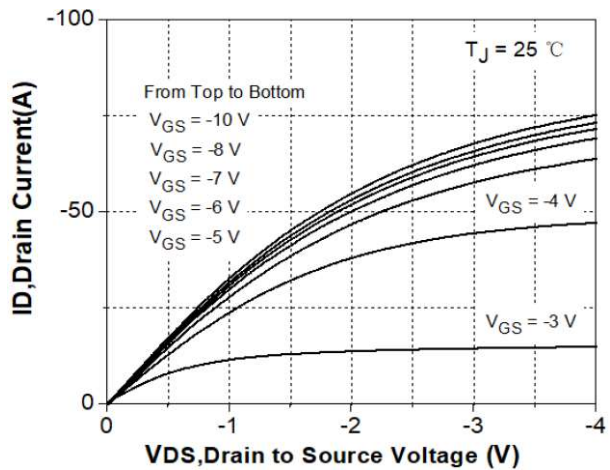


Fig17. Safe Operating Area

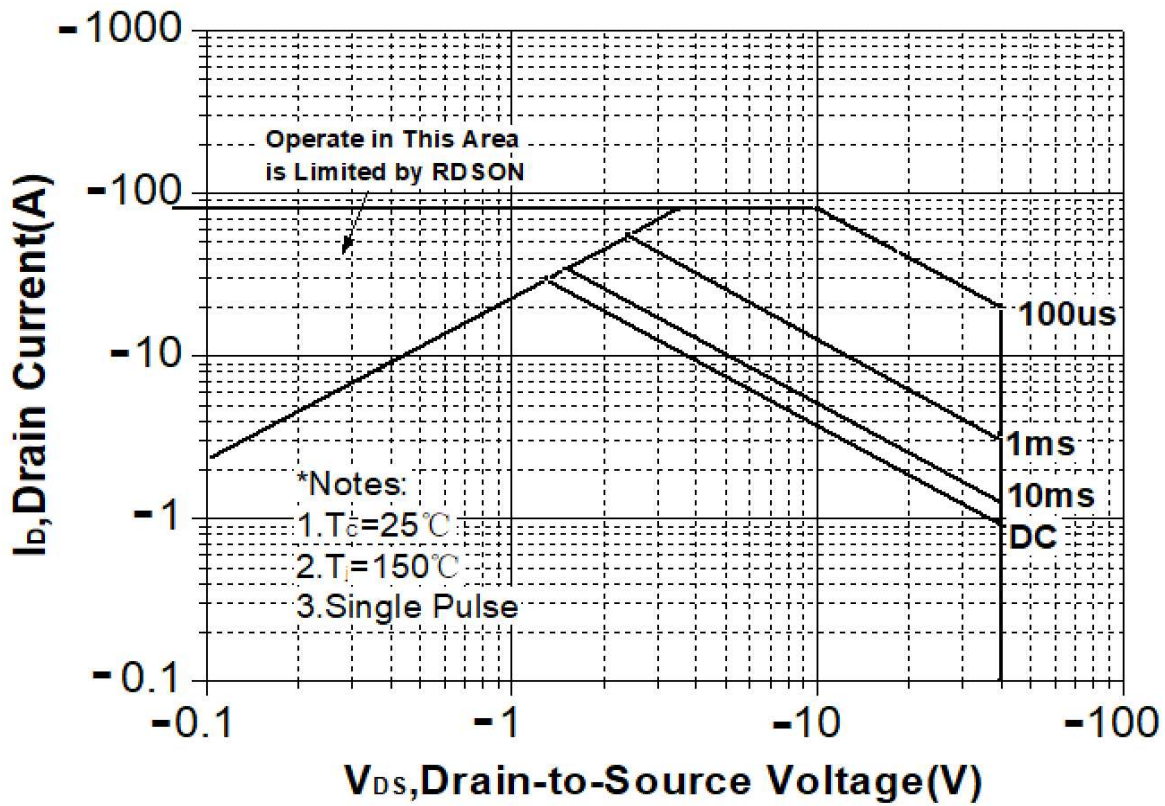
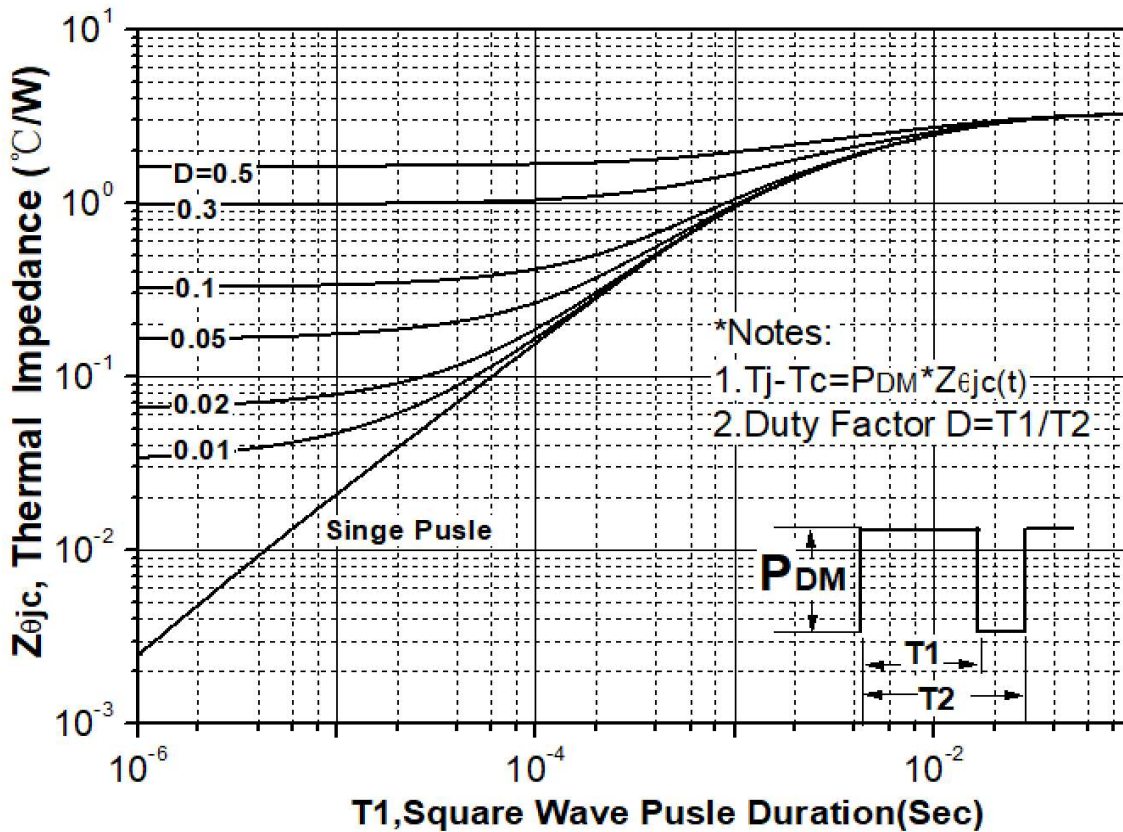
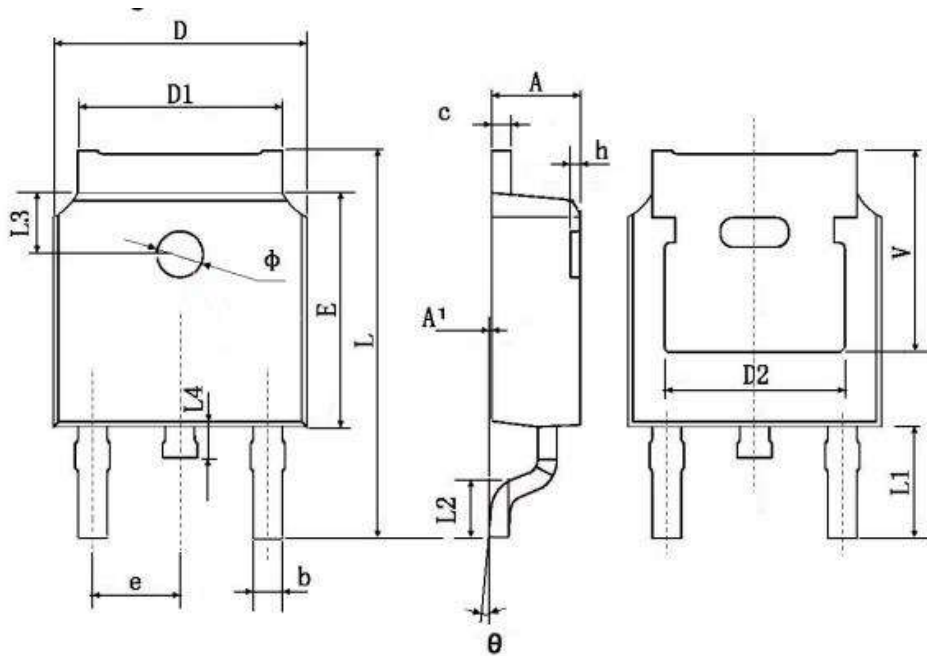


Fig18. Transient Thermal Response Curve



TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.250	2.350	0.089	0.093
A1	0.050	0.150	0.002	0.006
b	0.660	0.860	0.026	0.034
c	0.458	0.558	0.018	0.022
D	6.550	6.650	0.259	0.263
D1	5.234	5.434	0.207	0.215
D2	4.826 TYP.		0.191 TYP.	
E	6.050	6.150	0.239	0.243
e	2.236	2.336	0.088	0.092
L	9.820	10.220	0.388	0.404
L1	3.000 TYP.		0.119 TYP.	
L2	1.400	1.600	0.055	0.063
L3	1.800 TYP.		0.071 TYP.	
L4	0.700	0.900	0.028	0.036
φ	1.150	1.250	0.045	0.049
θ	0°	3°	0°	3°
h	0.000	0.300	0.000	0.012
V	5.399 TYP		0.213 TYP	