SP2024KCTW

20V Complementary MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
20V	380mΩ@4.5V	0.75A
	450mΩ@2.5V	
-20V	520mΩ@-4.5V	-0.66A
	700mΩ@-2.5V	

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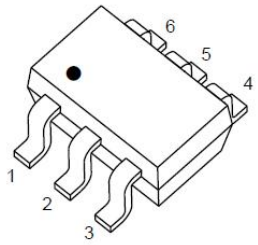
Feature

- High power and current handing capability
- Surface mount package
- ESD protected 2KV

Application

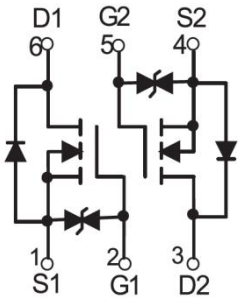
- Battery Switch
- DC/DC Converter

Package

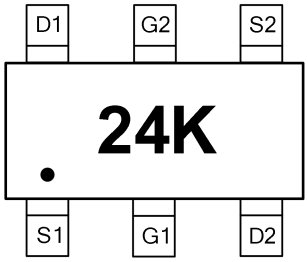


SOT-363

Circuit diagram



Marking



24K =Device Code

Order Information

Device	Package	Unit/Tape
SP2024KCTW	SOT-363	3000

Absolute maximum ratings (Ta=25℃ unless otherwise noted)

Parameter	Symbol	Value		Units
		N-Channel	P-Channel	
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	±10	±10	V
Continuous Drain Current (Ta=25°C)	I_D	0.75	-0.66	A
Continuous Drain Current (Ta=100°C)	I_D	0.5	-0.44	A
Pulsed Drain Current	I_{DM}	3	-2.64	A
Power Dissipation (Ta=25°C)	P_D	0.15		W
Power Dissipation (Ta=100°C)	P_D	0.06		W
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	833		℃/W
Storage Temperature Range	T_{STG}	-55 to 150		℃
Operating Junction Temperature Range	T_J	-55 to 150		℃

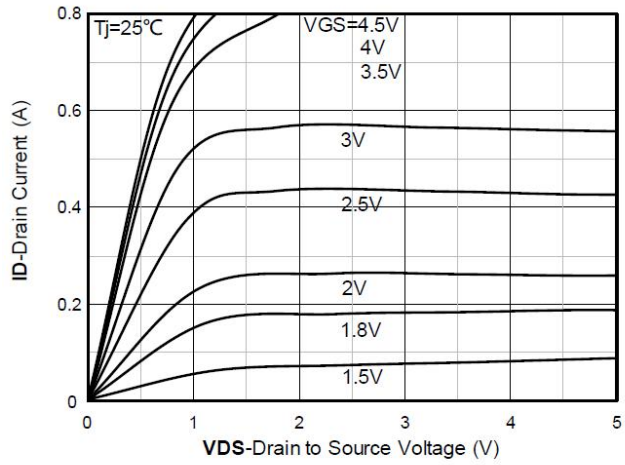
N-Channel Electrical characteristics (Ta=25℃, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0V, I_D =250μA	20	-	-	V
Drain-Source Leakage Current	I_{DSS}	V_{DS} =16V,V_{GS} = 0V	-	-	1	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS} =±10V, V_{DS} = 0V	-	-	±10	uA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA	0.35	0.65	1	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS} = 4.5V, I_D = 0.5A	-	0.25	0.38	Ω
		V_{GS} = 2.5V, I_D = 0.2A	-	0.35	0.45	
		V_{GS} = 1.8V, I_D = 0.1A	-	0.4	0.80	
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =16V,V_{GS} =0V, f=1MHz	-	79	-	pF
Output Capacitance	C_{oss}		-	13	-	
Reverse Transfer Capacitance	C_{rss}		-	9	-	
Total Gate Charge	Q_g	VDS=10V , VGS=10V , ID=0.5A	-	1.1	-	nC
Gate-Source Charge	Q_{gs}		-	0.23	-	
Gate-Drain Charge	Q_{gd}		-	0.31	-	
Gate Plateau Voltage	$V_{plateau}$		-	1	-	V
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	V_{GS}=4.5V,V_{DS}=10V,I_D=0.5A,R_{GEN}=10Ω	-	6.7	-	ns
Turn-on rise time	t_r		-	4.8	-	
Turn-off delay time	$t_{d(off)}$		-	17.3	-	
Turn-off fall time	t_f		-	7.4	-	
Source-Drain Diode characteristics						
Body Diode Voltage	V_{SD}	I_S=0.5A, V_{GS} = 0V	-	-	1.2	V

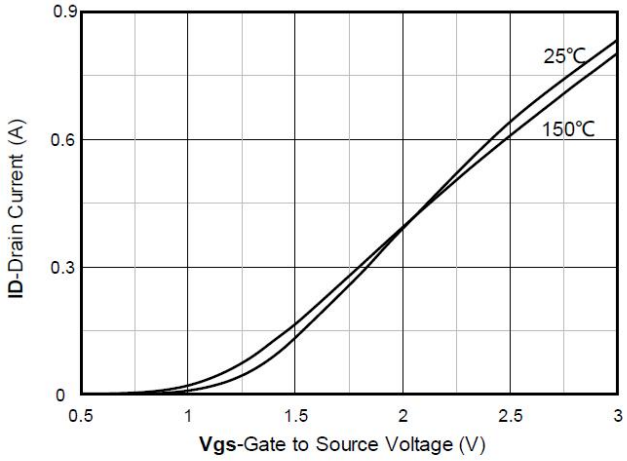
P-Channel Electrical characteristics (Ta=25℃, unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0V, I_D =-250μA	-20	-	-	V
Drain-Source Leakage Current	I_{DSS}	V_{DS} =-16V,V_{GS} = 0V	-	-	-1	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS} = ±10V， V_{DS} =0V	-	-	±10	μA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =-250μA	-0.35	-0.65	-1.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS} = -4.5V, I_D = -0.5A	-	0.43	0.52	Ω
		V_{GS} = -2.5V, I_D = -0.2A	-	0.62	0.7	
		V_{GS} = -1.8V, I_D = -0.1A	-	0.95	1.0	
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =-16V,V_{GS} =0V,f =1MHz	-	113	-	pF
Output Capacitance	C_{oss}		-	35	-	
Reverse Transfer Capacitance	C_{rss}		-	11	-	
Total Gate Charge	Q_g	VDS=-10V,VGS=-10V,ID=-0.4A	-	2.6	-	nC
Gate-Source Charge	Q_{gs}		-	0.3	-	
Gate-Drain Charge	Q_{gd}		-	0.4	-	
Gate Plateau Voltage	$V_{plateau}$		-	-	-	V
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DS}=-10V,I_D=-200mA, V_{GS}=-4.5V,R_G=10Ω		9		ns
Turn-on rise time	t_r			5.7		
Turn-off delay time	$t_{d(off)}$			32.6		
Turn-off fall time	t_f			20.3		
Source-Drain Diode characteristics						
Diode Forward voltage	V_{SD}	V_{GS} =0V, I_S=-0.5 A			-1.2	V

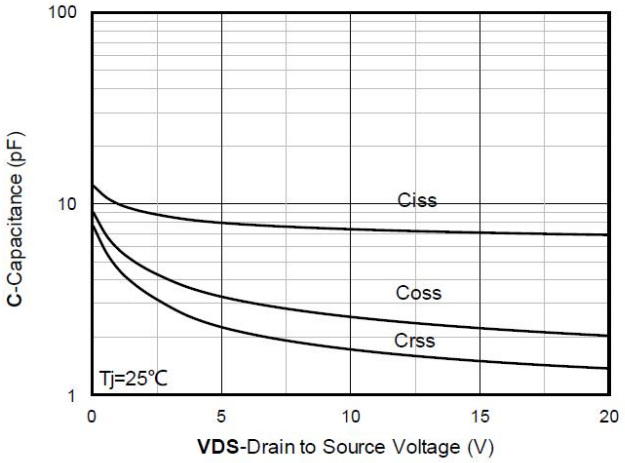
N-Channel Typical Characteristics



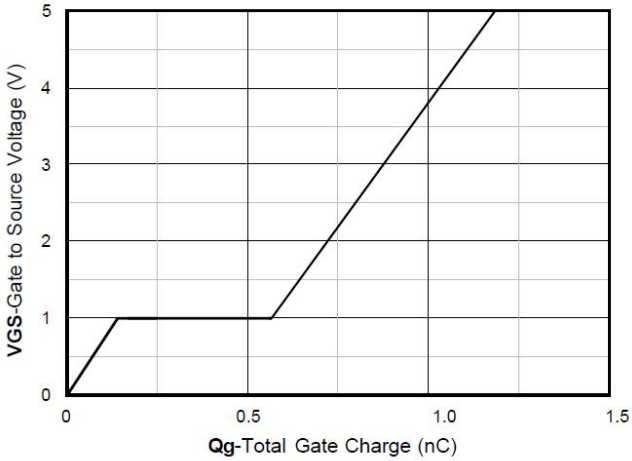
Output Characteristics



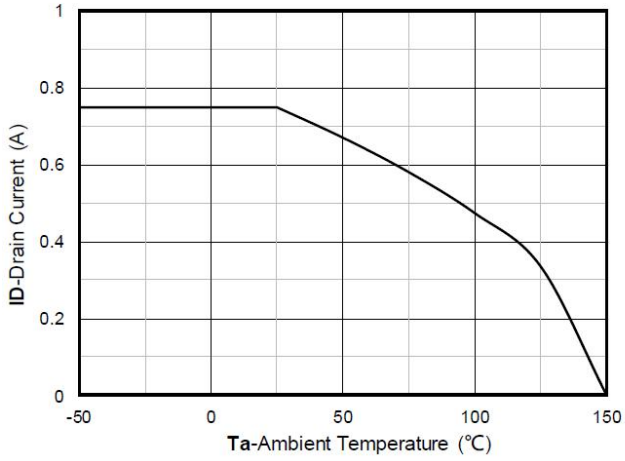
Transfer Characteristics

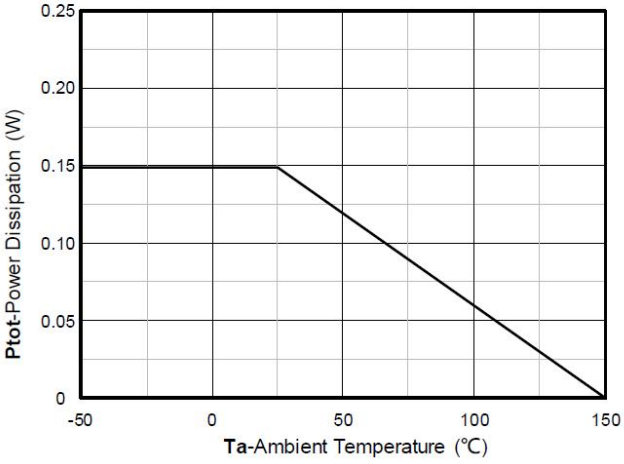


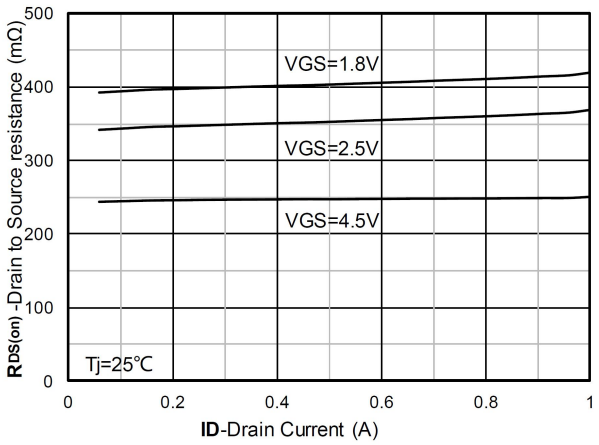
Capacitance Characteristics



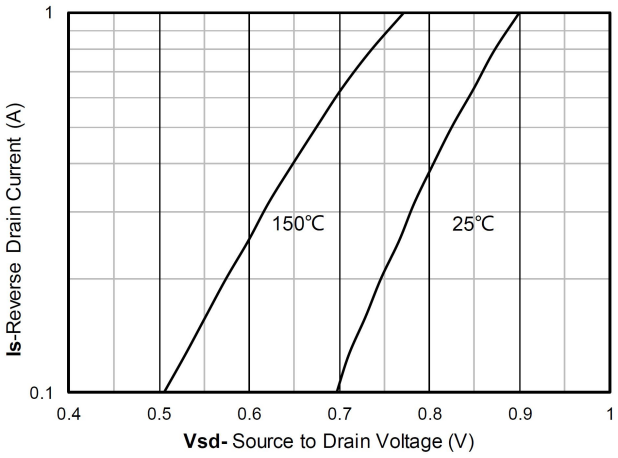
Gate Charge



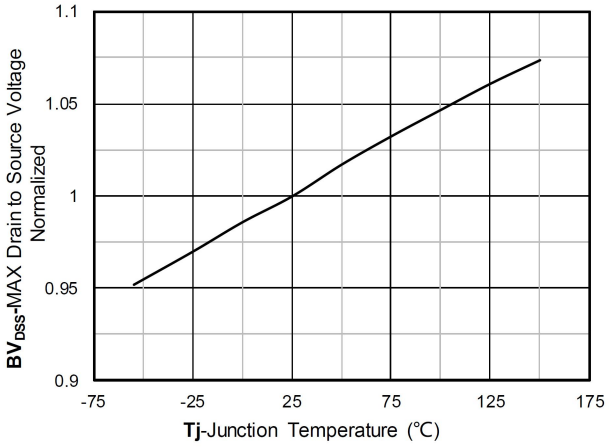




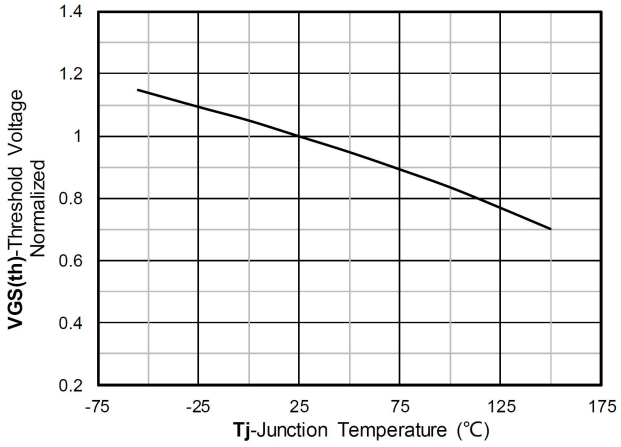
RDS(on) VS Drain Current



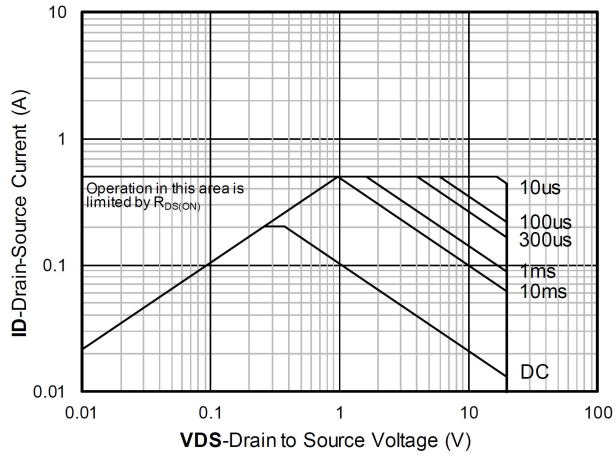
Forward characteristics of reverse diode



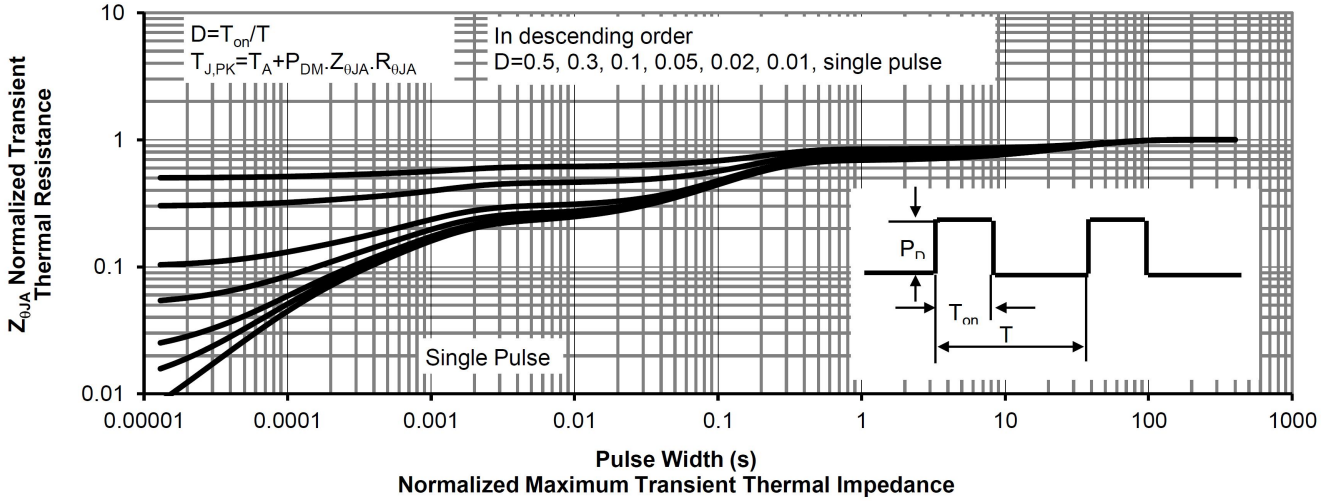
Normalized breakdown voltage



Normalized Threshold voltage

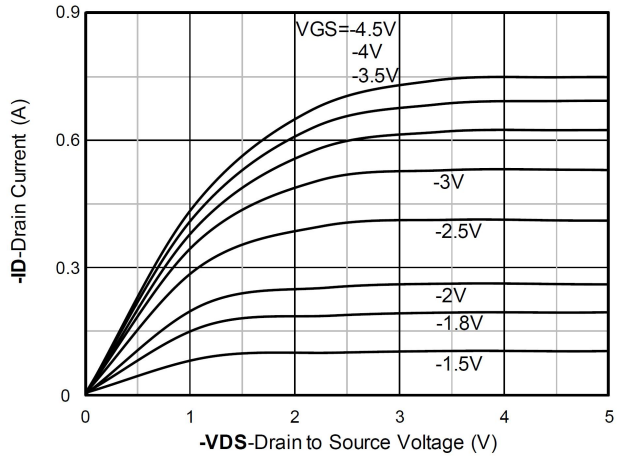


Safe Operation Area

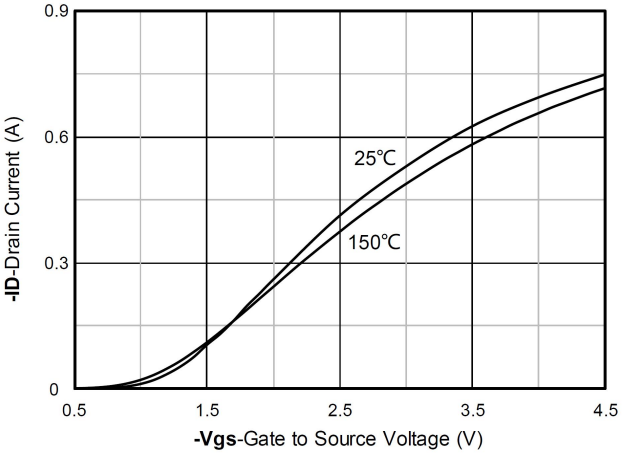


Normalized Maximum Transient Thermal Impedance

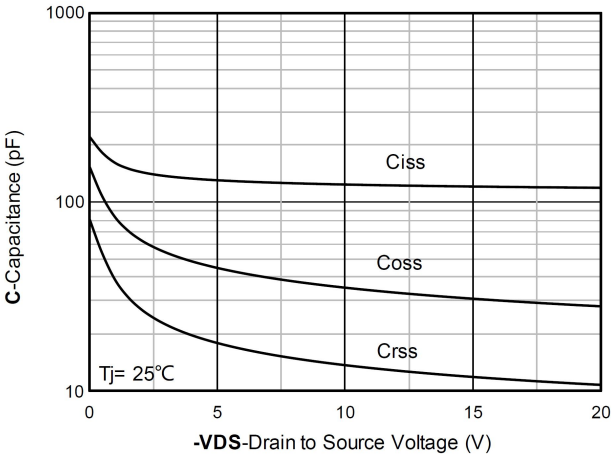
P-Channel Typical Characteristics



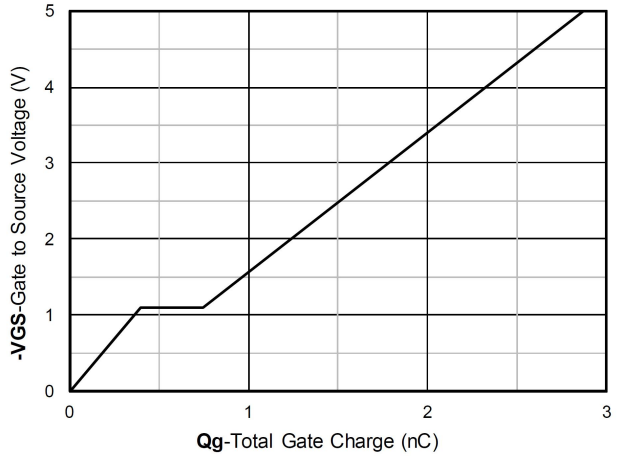
Output Characteristics



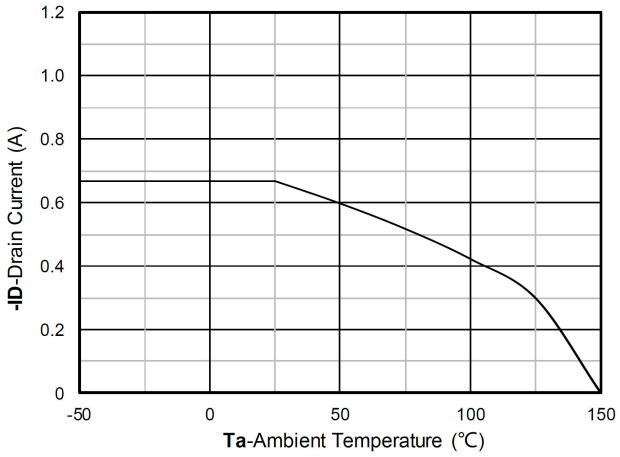
Transfer Characteristics



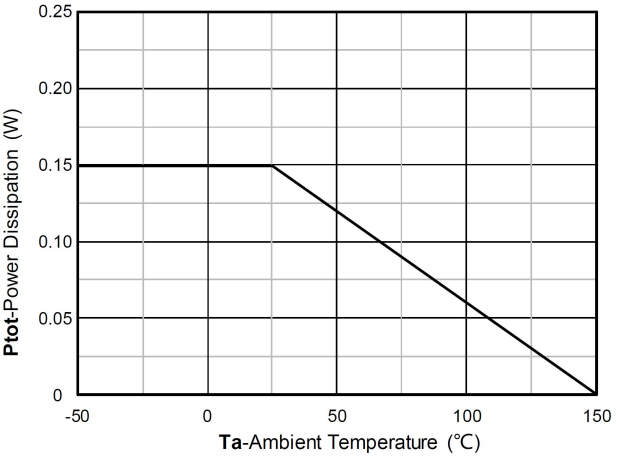
Capacitance Characteristics



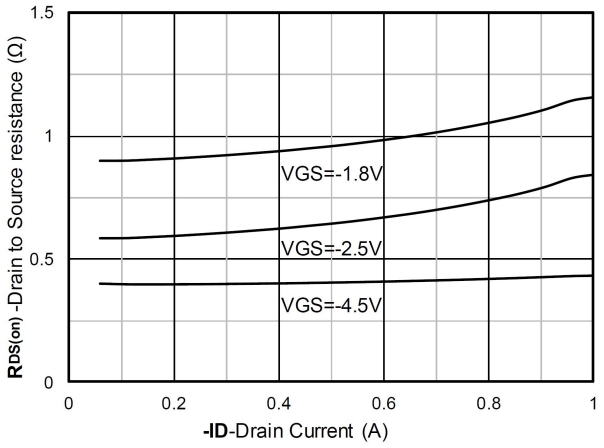
Gate Charge



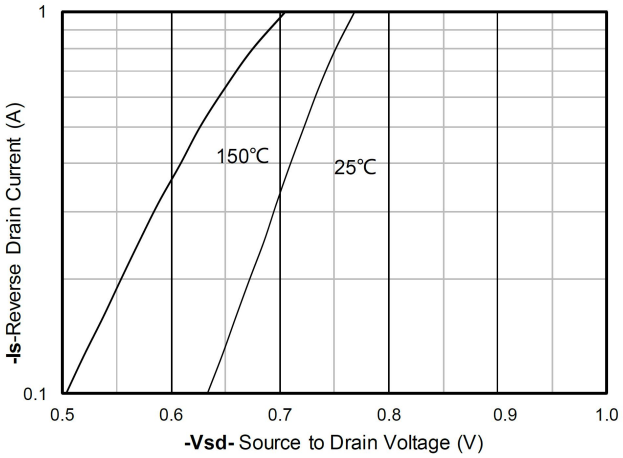
Current dissipation



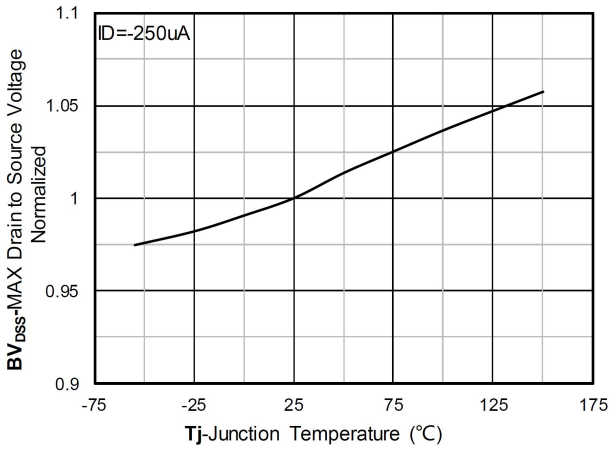
Power dissipation



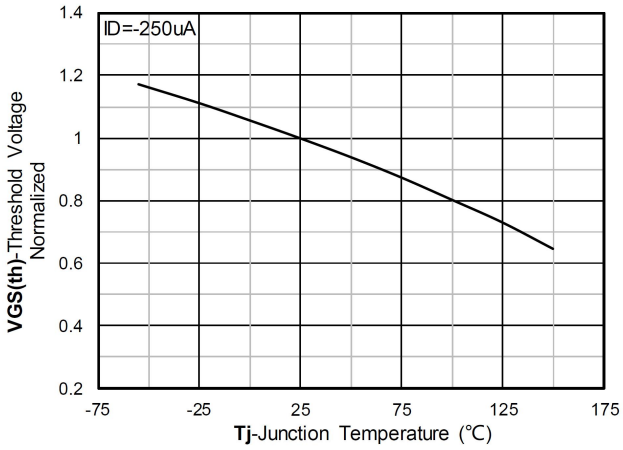
$R_{DS(on)}$ VS Drain Current



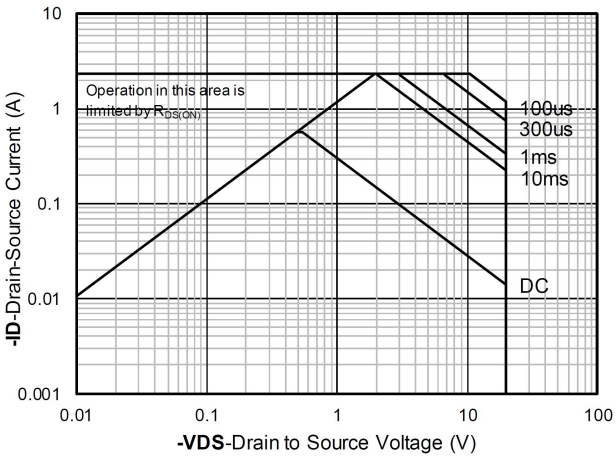
Forward characteristics of reverse diode



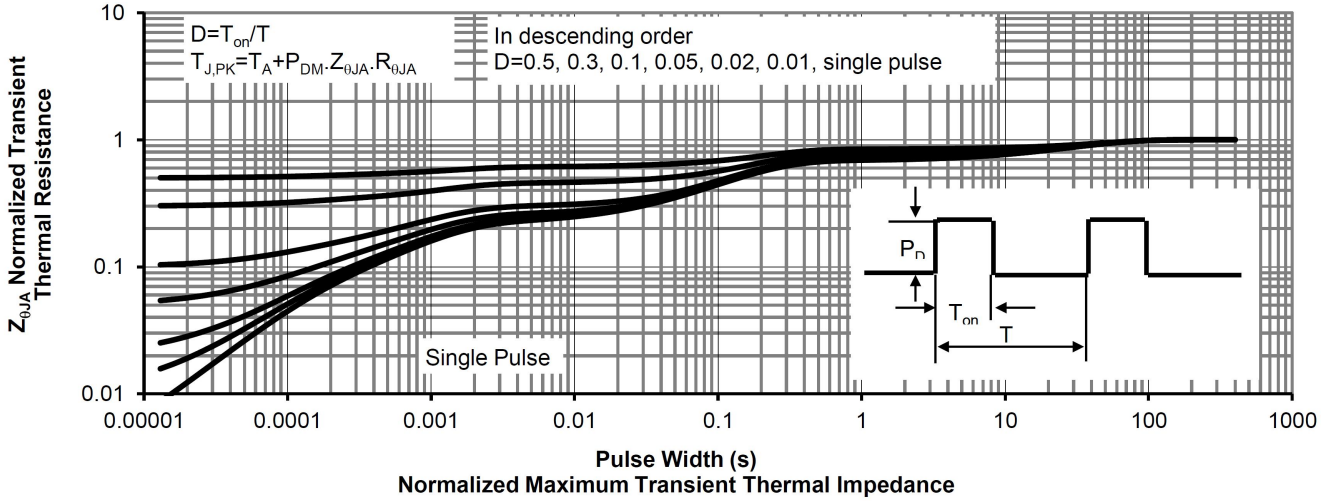
Normalized breakdown voltage



Normalized Threshold voltage



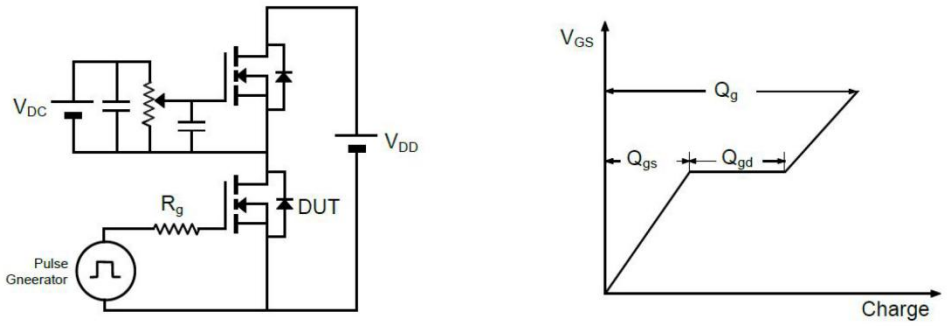
Safe Operation Area



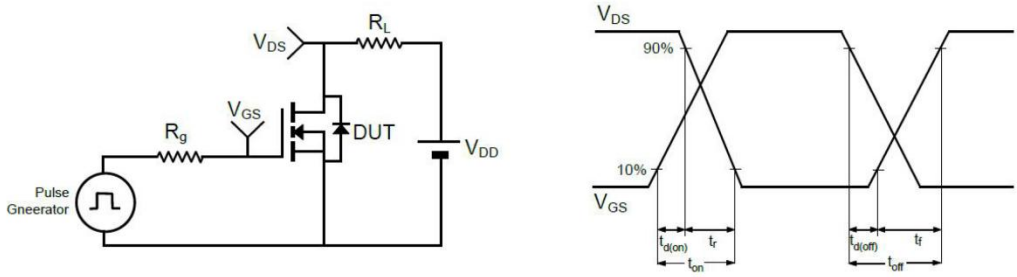
Normalized Maximum Transient Thermal Impedance

Test Circuit

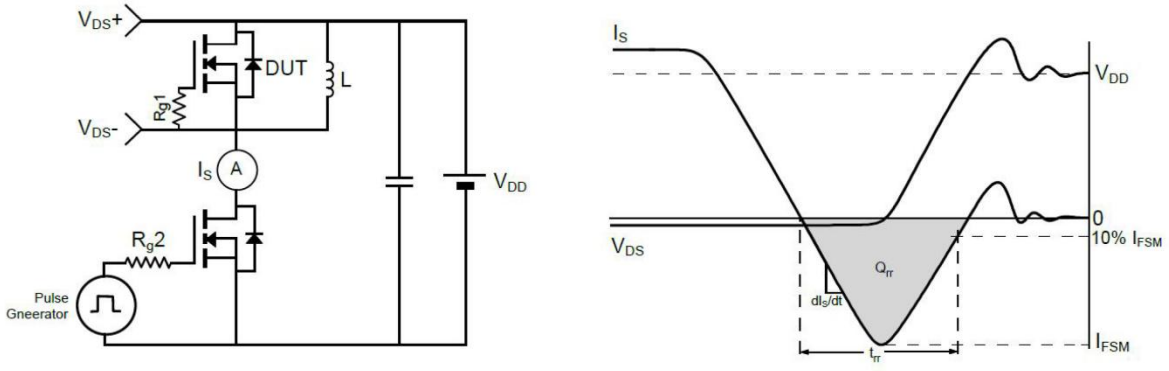
Gate Charge



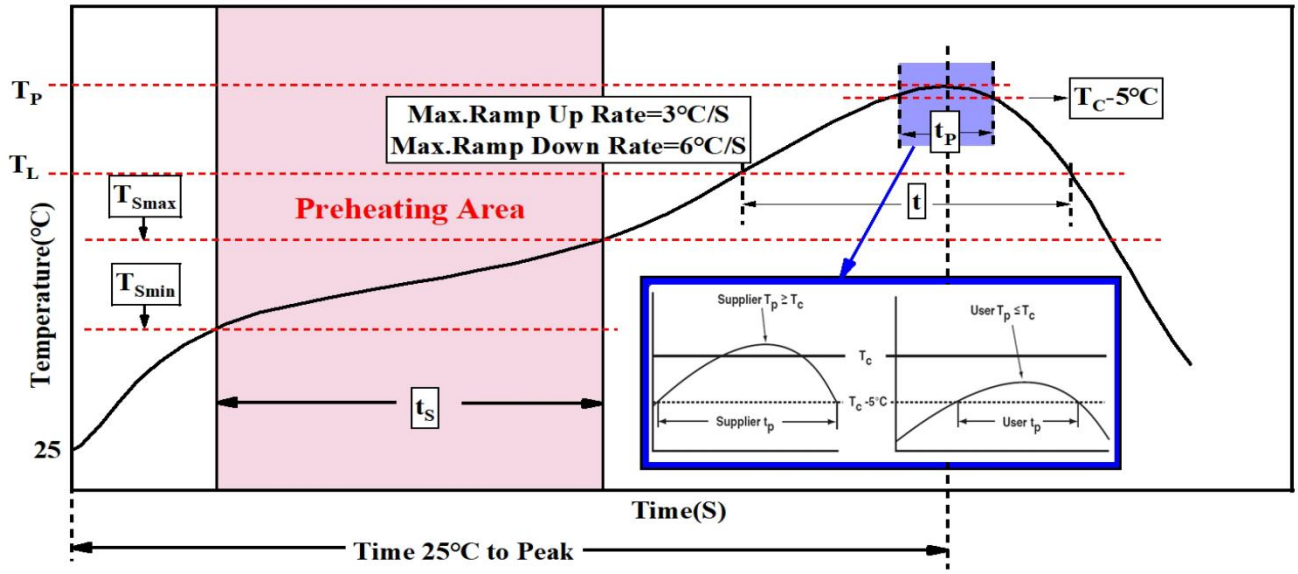
Resistive Load Switching Time



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (Tsmin) Temperature max (Tsmax) Time (Tsmin to Tsmax) (ts)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-120 seconds
Average ramp-up rate (Tsmax to Tp)	3 °C/second max.	3°C/second max.
Liquidous temperature (TL) Time at liquidous (tL)	183 °C 60-150 seconds	217°C 60-150 seconds
Peak package body Temperature e (Tp)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (tp)** within 5°C of the specified classification temperature (Tc)	20** seconds	30** seconds
Average ramp-down rate (Tp to Tsmax)	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (Tp) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum		

Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

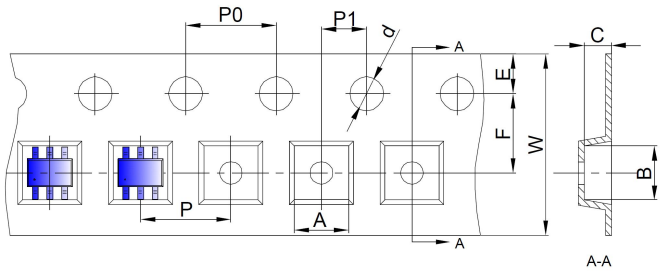
Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

SOT-363 Tape and Reel

SOT-363 Embossed Carrier Tape

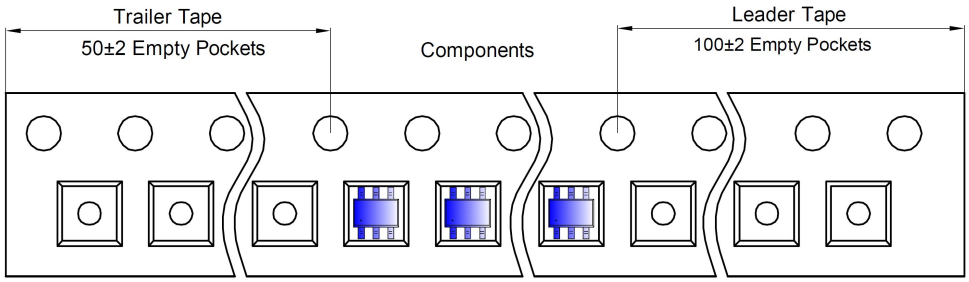


Packaging Description:

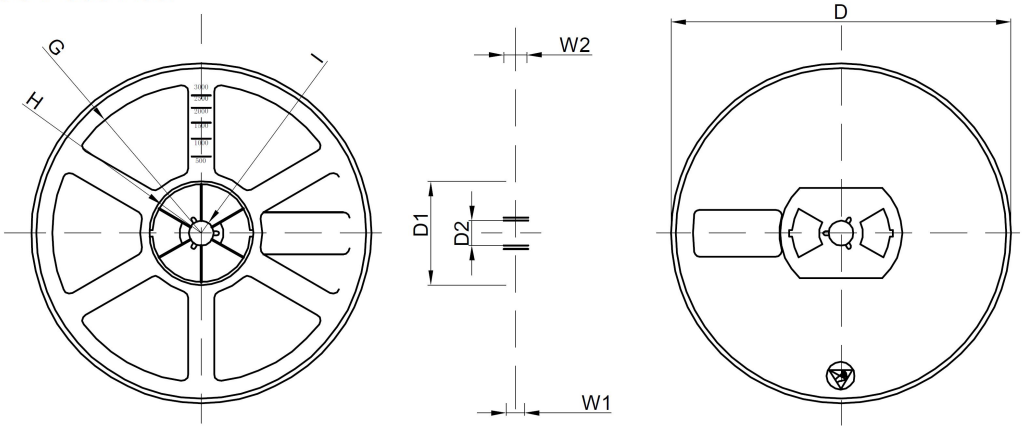
SOT-363 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-363	2.25	2.55	1.20	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-363 Tape Leader and Trailer



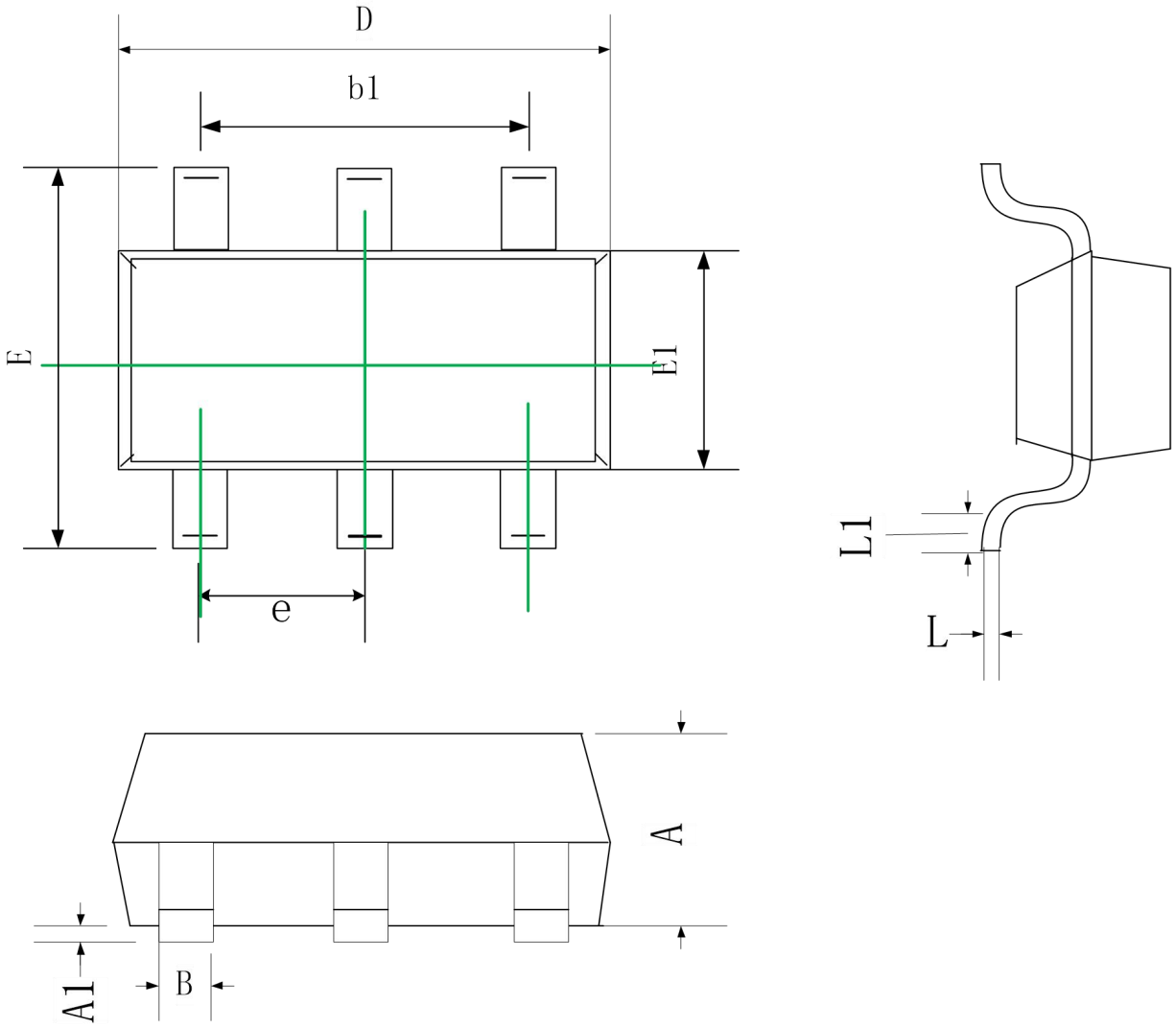
SOT-363 Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	45,000 pcs	203×203×195	180,000 pcs	438×438×220	

SOT-363 Package Information



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	0.90	1.00
A1	0.00	0.10
B	0.10	0.30
b1	1.30	
D	1.80	2.20
E	2.00	2.20
E1	1.15	1.35
e	0.65 TYP.	
L	0.10	0.25
L1	0.15	0.4