

V_{DSS}	-45V
$R_{DS(on)}$ (Max.)	155mΩ
I_D	-4.5A
P_D	15W

●Features

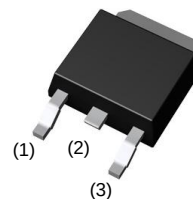
- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Drive circuits can be simple.
- 4) Parallel use is easy.
- 5) Pb-free lead plating ; RoHS compliant
- 6) 100% Avalanche tested

●Application

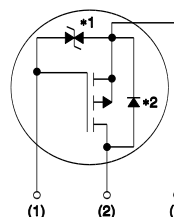
Switching Power Supply
Automotive Motor Drive
Automotive Solenoid Drive

●Outline

CPT3
(SC-63)
<SOT-428>



●Inner circuit



(1) Gate
(2) Drain
(3) Source

*1 ESD PROTECTION DIODE
*2 BODY DIODE

●Packaging specifications

Type	Packaging	Taping
	Reel size (mm)	330
	Tape width (mm)	16
	Basic ordering unit (pcs)	2,500
	Taping code	TL
	Marking	046P05

●Absolute maximum ratings($T_a = 25^\circ\text{C}$)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	-45	V
Continuous drain current	$T_c = 25^\circ\text{C}$	I_D^{*1}	±4.5	A
	$T_c = 100^\circ\text{C}$	I_D^{*1}	±2.4	A
Pulsed drain current		$I_{D,pulse}^{*2}$	±9.0	A
Gate - Source voltage		V_{GSS}	±20	V
Avalanche energy, single pulse		E_{AS}^{*3}	14.3	mJ
Avalanche current		I_{AR}^{*3}	-4.5	A
Power dissipation	$T_c = 25^\circ\text{C}$	P_D	15	W
	$T_a = 25^\circ\text{C}^{*4}$	P_D	0.85	W
Junction temperature		T_j	150	°C
Range of storage temperature		T_{stg}	-55 to +150	°C

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJC}	-	-	8.33	°C/W
Thermal resistance, junction - ambient ^{*4}	R_{thJA}	-	-	147	°C/W
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	°C

●Electrical characteristics($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -1mA$	-45	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -45V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	-	-	-1	μA
		$V_{DS} = -45V, V_{GS} = 0V$ $T_j = 125^\circ\text{C}$	-	-	-100	
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 10	μA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = -10V, I_D = -1mA$	-1	-	-3	V
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = -10V, I_D = -4.5A$	-	110	155	$\text{m}\Omega$
		$V_{GS} = -4.5V, I_D = -4.5A$	-	160	225	
		$V_{GS} = -4.0V, I_D = -4.5A$	-	185	260	
		$V_{GS} = -10V, I_D = -4.5A$ $T_j = 125^\circ\text{C}$	-	180	250	
Forward transfer admittance	g_{fs}	$V_{DS} = -10V, I_D = -4.5A$	3	6	-	S

●Electrical characteristics($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	$V_{GS} = 0V$	-	550	-	pF
Output capacitance	C_{oss}	$V_{DS} = -10V$	-	100	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	50	-	
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} \approx -25V, V_{GS} = -10V$	-	8	-	ns
Rise time	t_r^{*5}	$I_D = -2.0A$	-	8	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 12\Omega$	-	35	-	
Fall time	t_f^{*5}	$R_G = 10\Omega$	-	8	-	

●Gate Charge characteristics($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*5}	$V_{DD} \approx -25V$	-	12	-	nC
Gate - Source charge	Q_{gs}^{*5}	$I_D = -4.5A$	-	2.2	-	
Gate - Drain charge	Q_{gd}^{*5}	$V_{GS} = -5V$	-	2.2	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} \approx -30V, I_D = -4.5A$	-	-3.4	-	V

●Body diode electrical characteristics (Source-Drain)($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Continuous source current	I_S^{*1}	$T_c = 25^\circ\text{C}$	-	6	-4.5	A
Pulsed source current	I_{SM}^{*2}		-	-	-9	A
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0V, I_S = -4.5A$	-	-	-1.2	V
Reverse recovery time	t_{rr}^{*5}	$I_S = -4.5A$	-	40	-	ns
Reverse recovery charge	Q_{rr}^{*5}	$di/dt = -100A/\mu s$	-	60	-	μC

*1 Limited only by maximum temperature allowed.

*2 $P_w \leq 10\mu s$, Duty cycle $\leq 1\%$

*3 $L \approx 1mH$, $V_{DD} = -25V$, $R_g = 10\Omega$, starting $T_j = 25^\circ\text{C}$

*4 Mounted on a epoxy PCB FR4 (20mm $\times$ 30mm $\times$ 0.8mm)

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

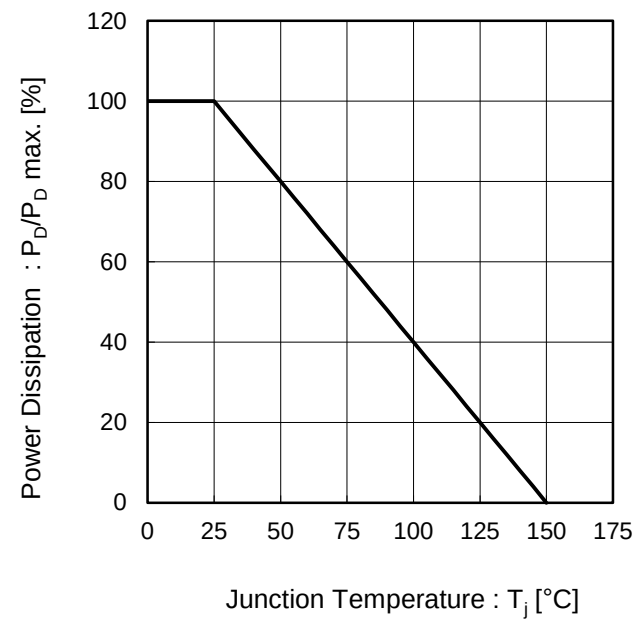


Fig.2 Maximum Safe Operating Area

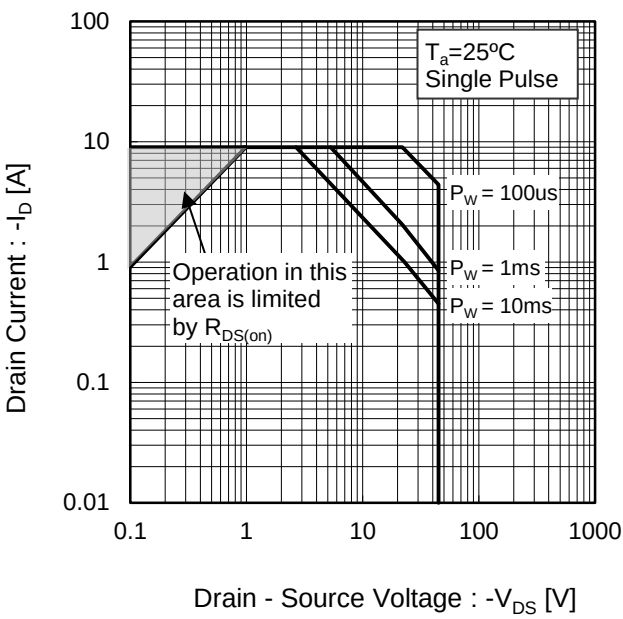
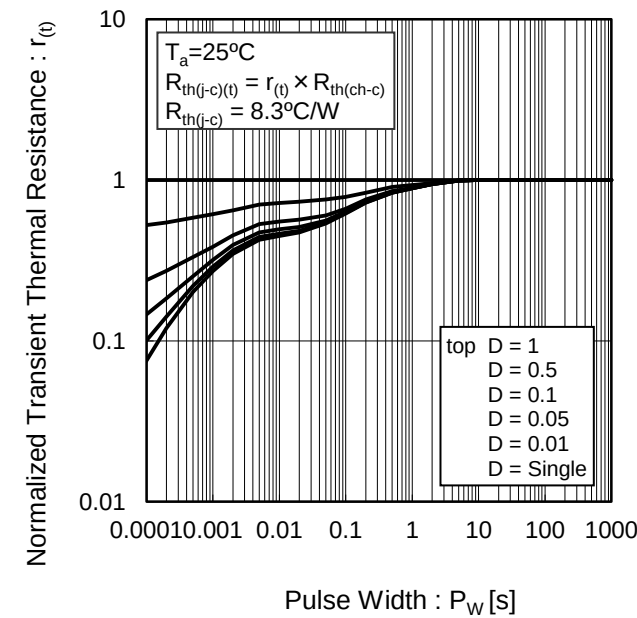


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

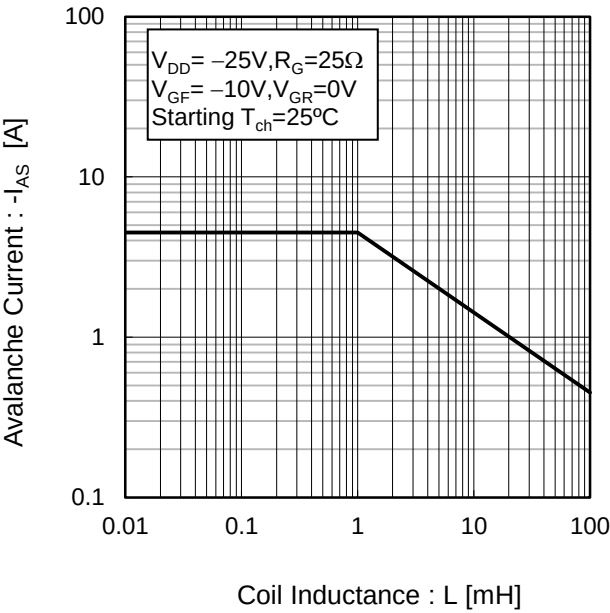


Fig.5 Avalanche Energy Derating Curve vs Junction Temperature

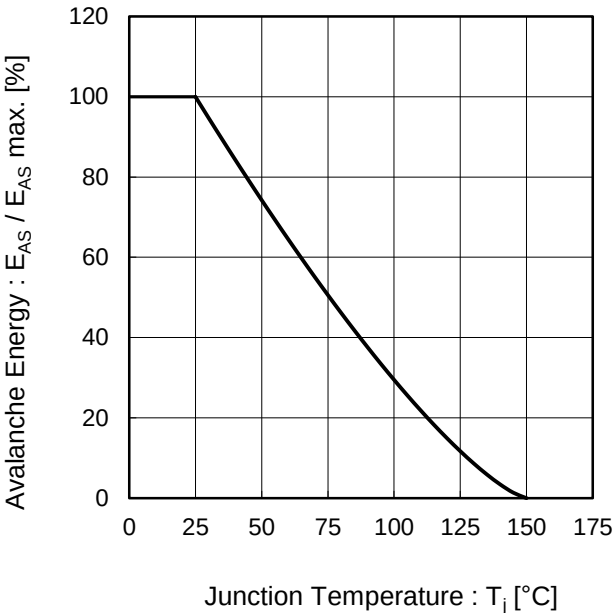


Fig.6 Typical Output Characteristics(I)

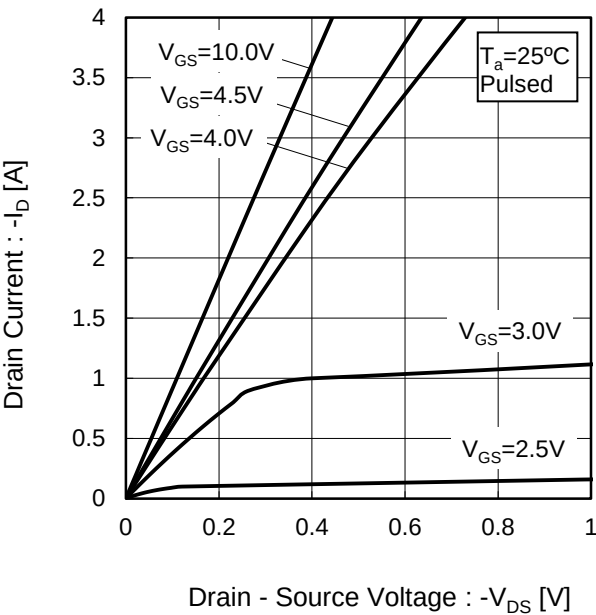
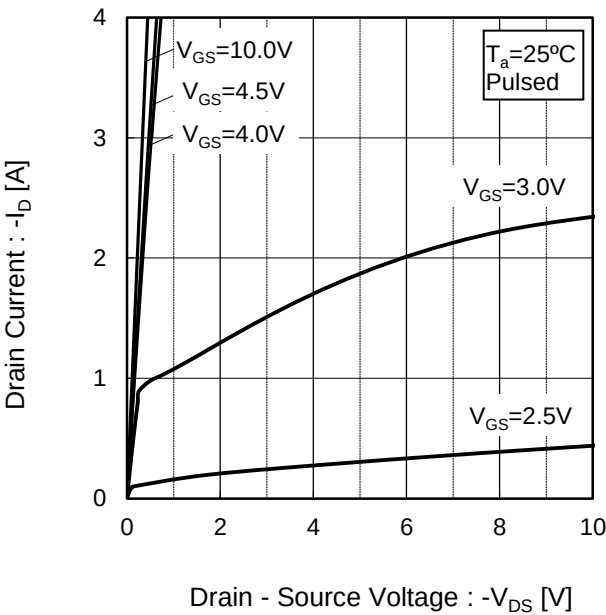


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Breakdown Voltage
vs. Junction Temperature

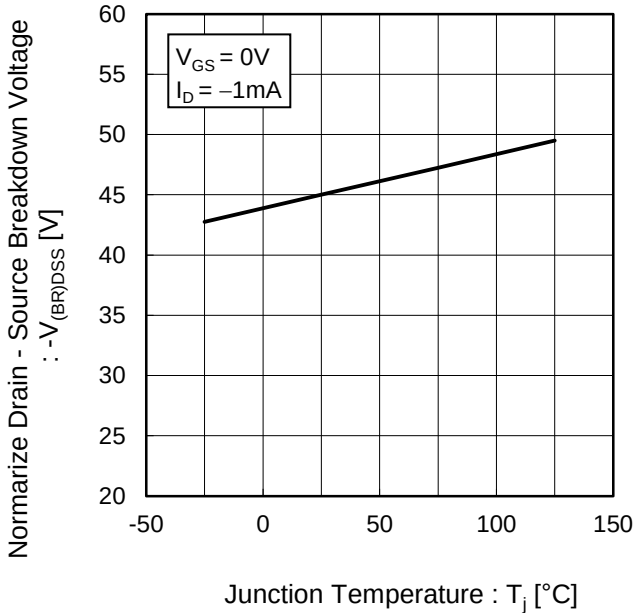


Fig.9 Typical Transfer Characteristics

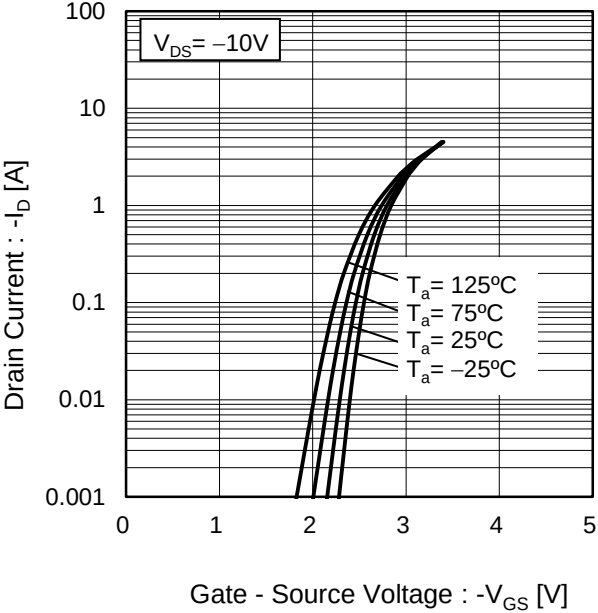


Fig.10 Gate Threshold Voltage
vs. Junction Temperature

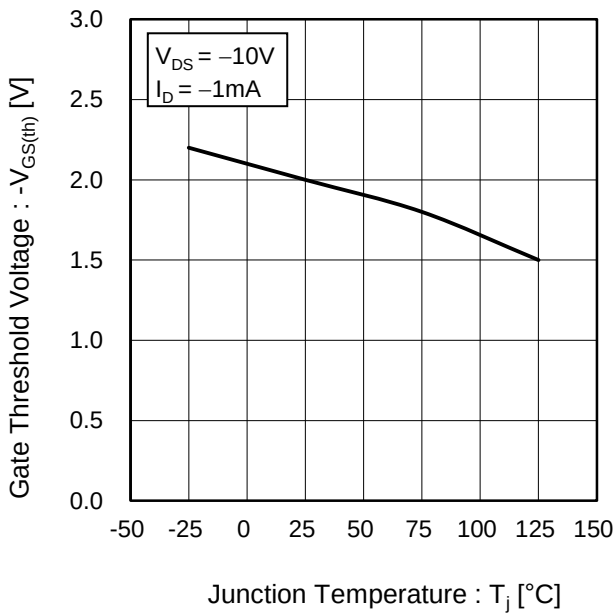
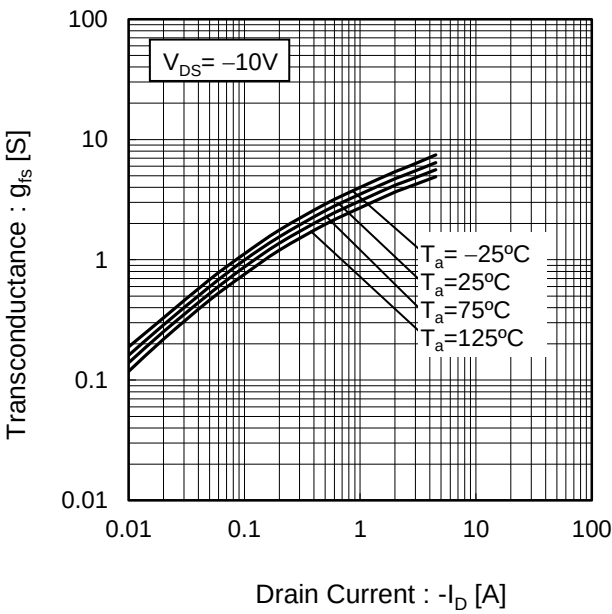


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

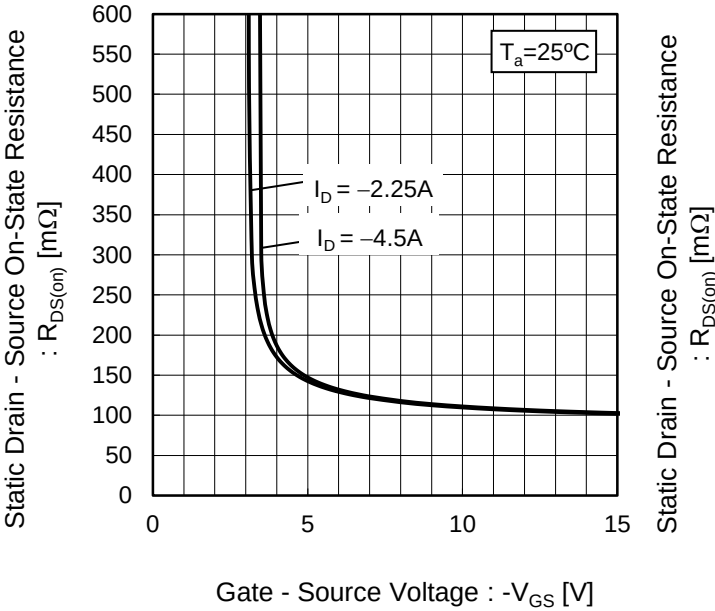


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

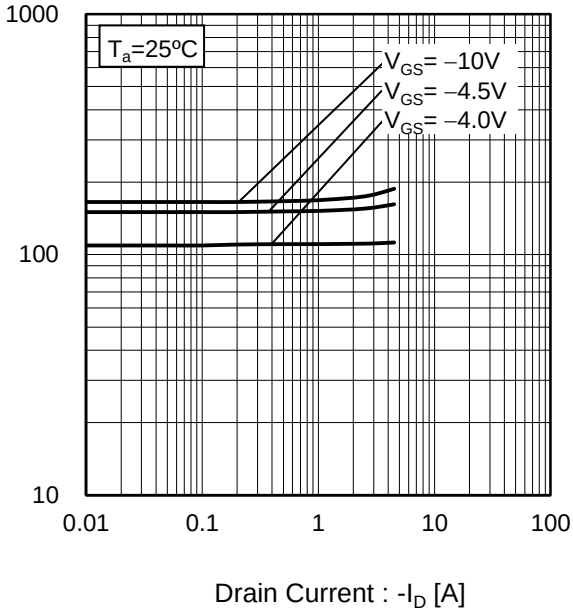
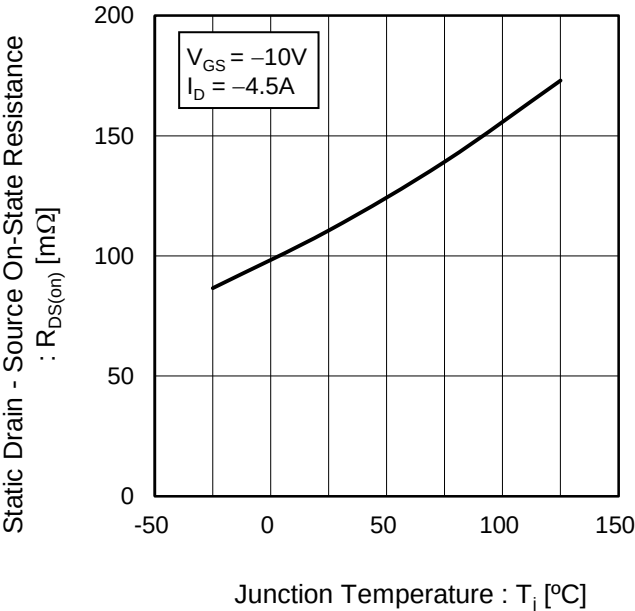


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

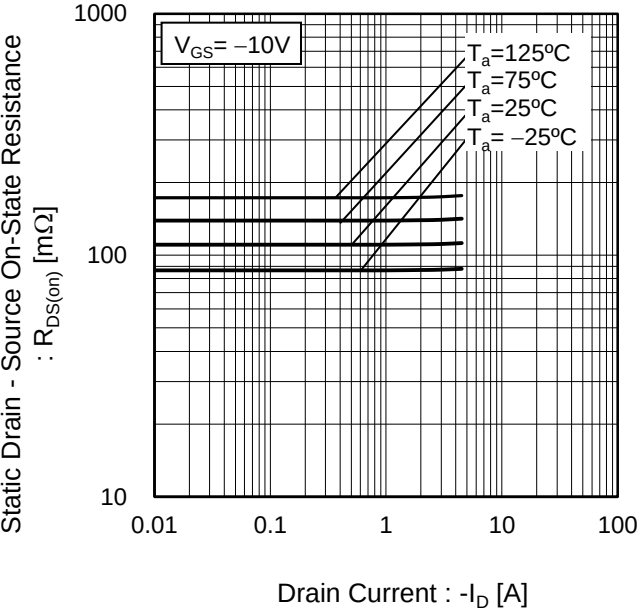


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)

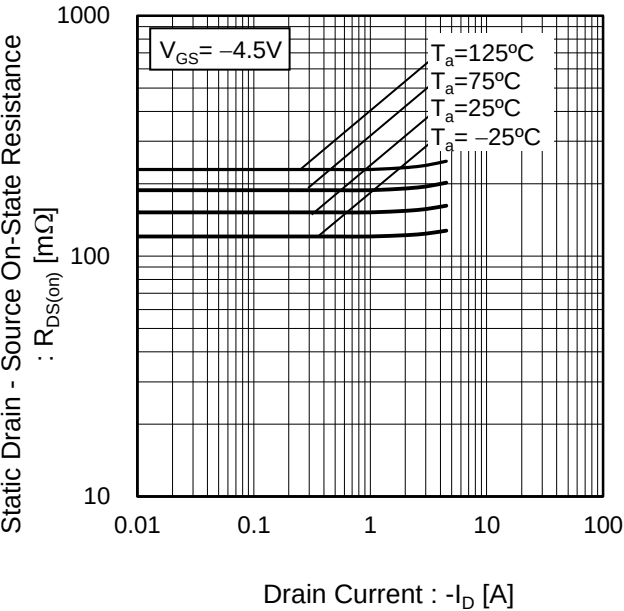


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)

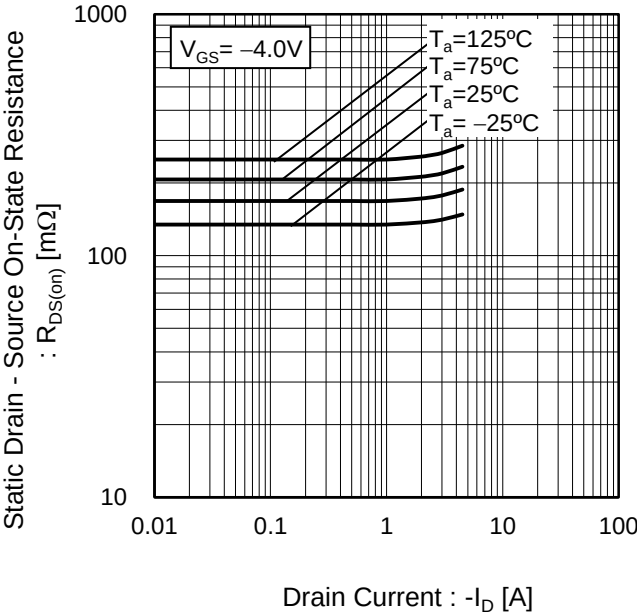
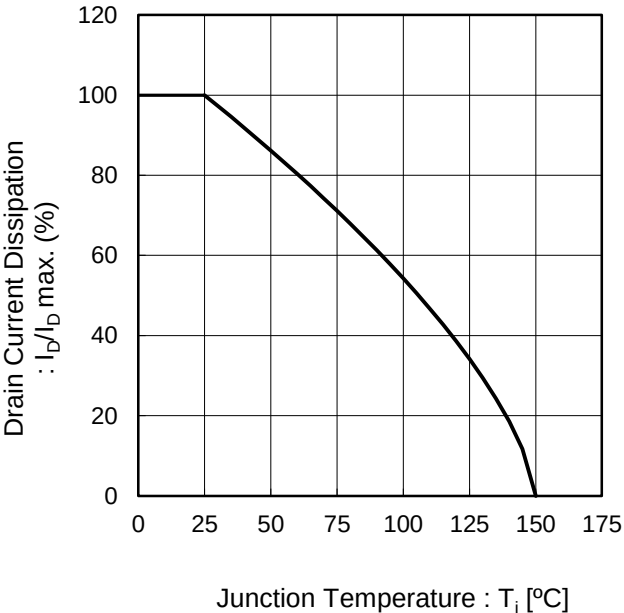


Fig.18 Drain Current Derating Curve



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

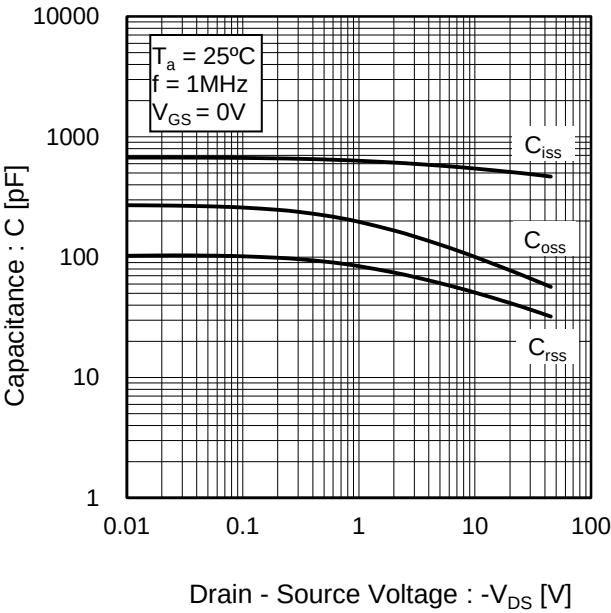


Fig.20 Switching Characteristics

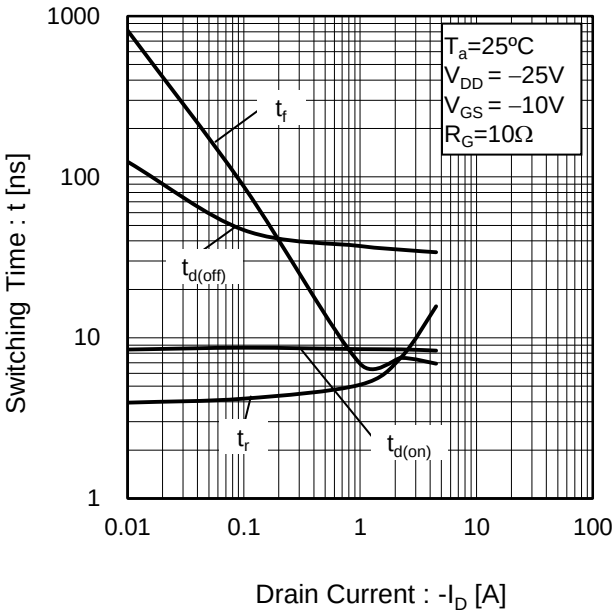


Fig.21 Dynamic Input Characteristics

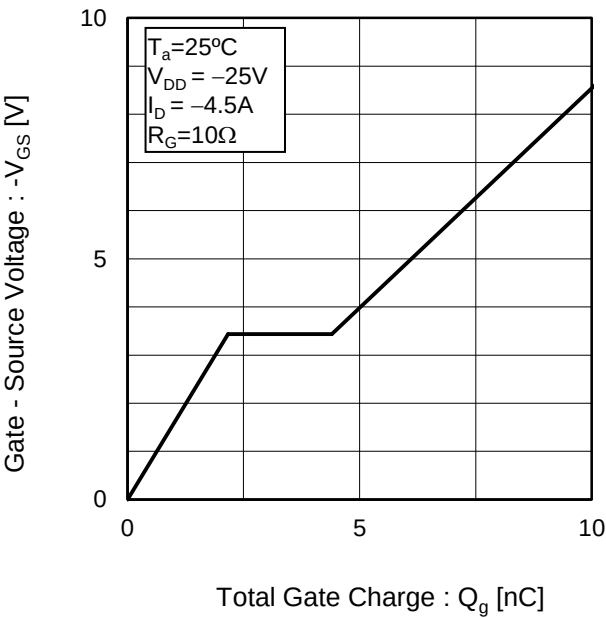
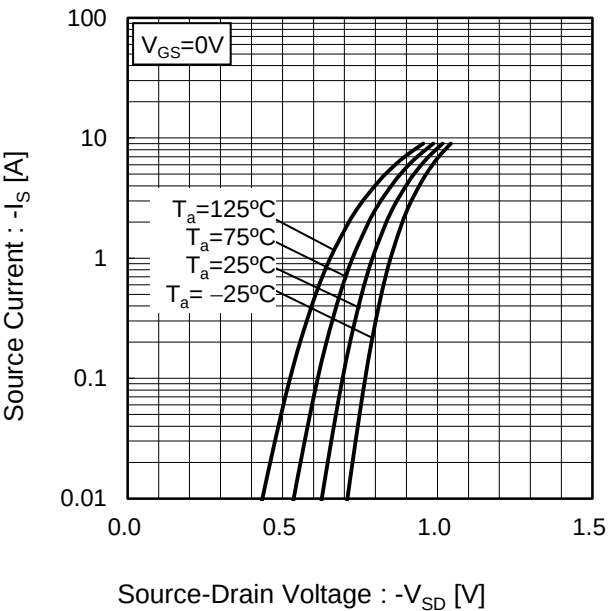
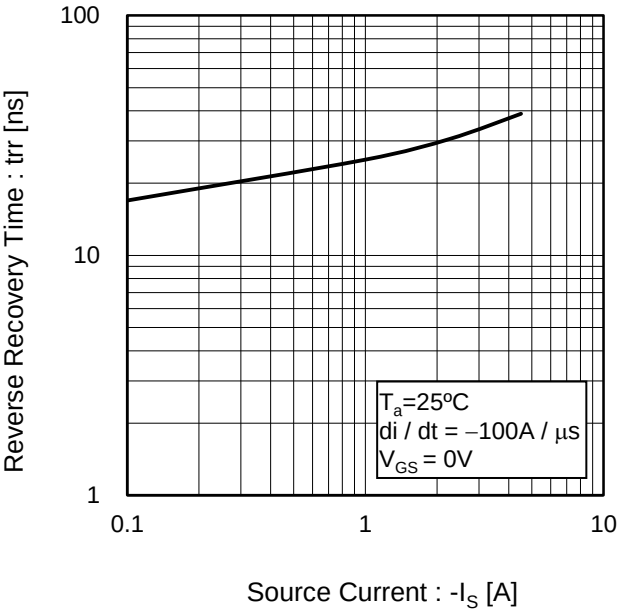


Fig.22 Source Current vs. Source - Drain Voltage



●Electrical characteristic curves

Fig23 Reverse Recovery Time
vs.Source Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

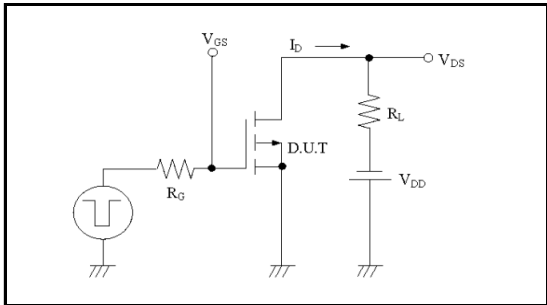


Fig.1-2 Switching Waveforms

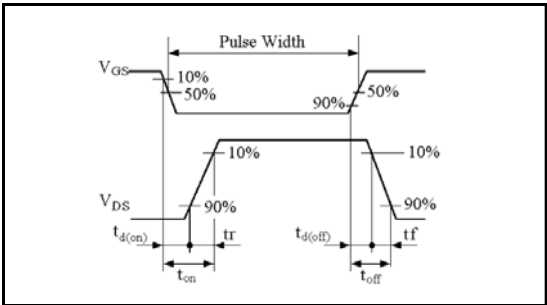


Fig.2-1 Gate Charge Measurement Circuit

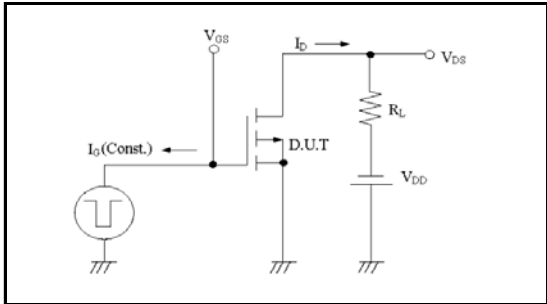


Fig.2-2 Gate Charge Waveform

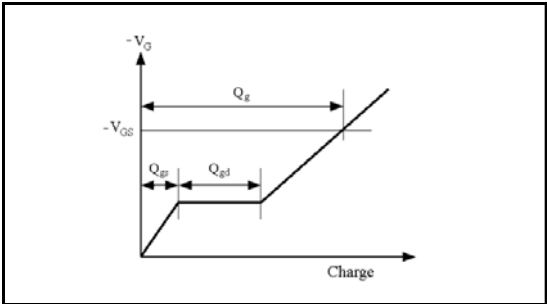


Fig.3-1 Avalanche Measurement Circuit

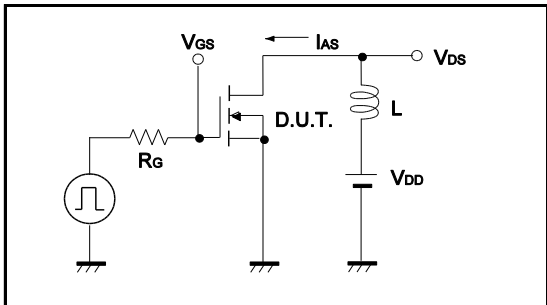
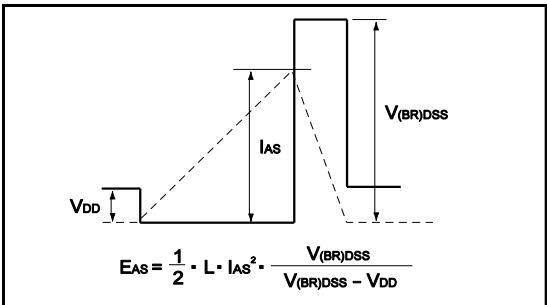
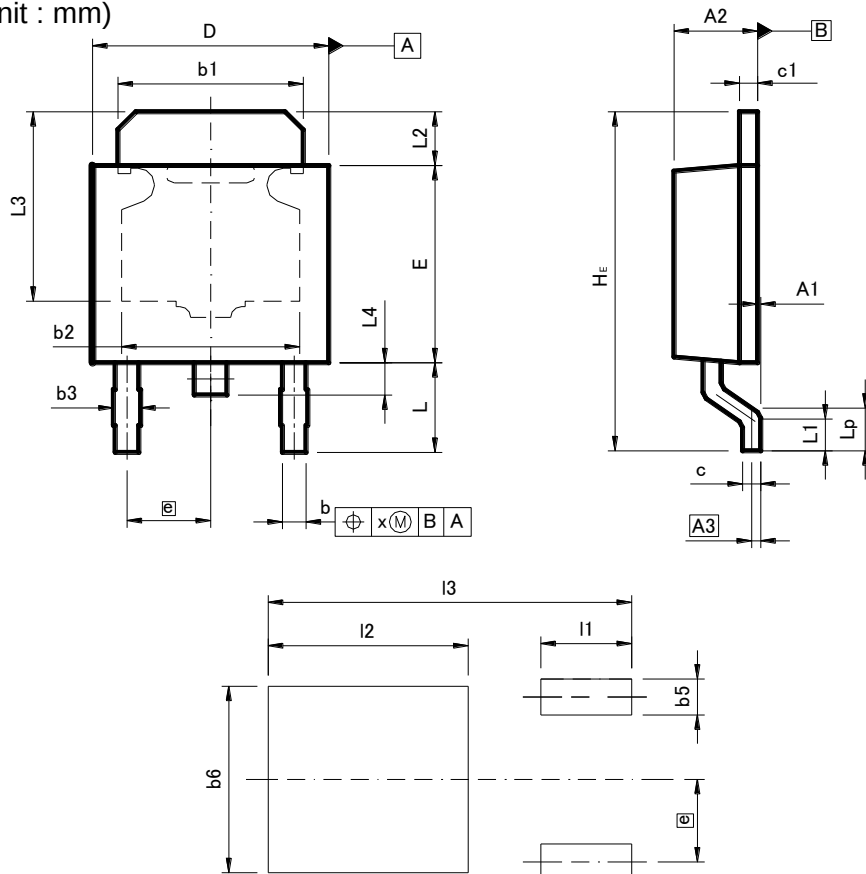


Fig.3-2 Avalanche Waveform



●Dimensions (Unit : mm)

CPT3



Pattern of terminal position areas
[Not a recommended pattern of soldering pads]

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A1	0.00	0.15	0.000	0.006
A2	2.20	2.50	0.087	0.098
A3	0.25		0.010	
b	0.55	0.75	0.022	0.030
b1	5.00	5.30	0.197	0.209
b2	5.00		0.197	
b3	0.75		0.030	
c	0.40	0.60	0.016	0.024
c1	0.40	0.60	0.016	0.024
D	6.30	6.70	0.248	0.264
E	5.40	5.80	0.213	0.228
e	2.30		0.091	
HE	9.00	10.00	0.354	0.394
L	2.20	2.80	0.087	0.110
L1	0.80	1.40	0.031	0.055
L2	1.20	1.80	0.047	0.071
L3	5.30		0.209	
L4	0.90		0.035	
Lp	1.00	1.60	0.039	0.063
x	—	0.25	—	0.010

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b5	—	1.00	—	0.04
b6	—	5.20	—	0.205
l1	—	2.50	—	0.098
l2	—	5.50	—	0.217
l3	—	10.00	—	0.394

Dimension in mm / inches

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