

## General Description

The WSF6032 is the highest performance trench N-Ch and P-Channel MOSFET with extreme high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The WSF6032 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

## Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

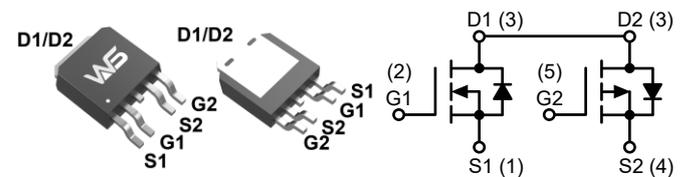
## Product Summary

$BV_{DSS}$	$R_{DSON}$	$I_D$
60V	13.5mΩ	40A
-60V	31mΩ	-35A

## Applications

- High Frequency Point-of-Load Synchronous Buck Converter.
- Networking DC-DC Power System
- Load Switch

## TO-252-4L Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
$V_{DS}$	Drain-Source Voltage	60	-60	V
$V_{GS}$	Gate-Source Voltage	±20	±20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	40	-35	A
$I_D@T_C=70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	16	-14	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	120	-105	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	16	56	mJ
$I_{AS}$	Avalanche Current	8	-15	A
$P_D@T_C=25^\circ C$	Total Power Dissipation <sup>4</sup>	20.8	20.8	W
$T_{STG}$	Storage Temperature Range	-55 to 150	-55 to 150	°C
$T_J$	Operating Junction Temperature Range	-55 to 150	-55 to 150	°C

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	---	75	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	6	°C/W

**N-Channel Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	60	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.063	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	---	13.5	15.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A	---	18.5	22	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA	1.3	1.6	2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-5.24	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	μA
		V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =8A	---	21	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	2.8	---	Ω
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =7A	---	10	14	nC
Q <sub>gs</sub>	Gate-Source Charge		---	1.7	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	2.0	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, R <sub>G</sub> =6, I <sub>D</sub> =1A	---	6	11	ns
T <sub>r</sub>	Rise Time		---	10	18	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	5.3	10	
T <sub>f</sub>	Fall Time		---	21	38	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz	---	1650	1815	pF
C <sub>oss</sub>	Output Capacitance		---	110	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	96	---	

**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,6</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	20	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,6</sup>		---	---	60	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =1.7A, T <sub>J</sub> =25°C	---	---	1.4	V

Note :

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, t<10sec.
2. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
3. The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=30V, V<sub>GS</sub>=10V, L=0.5mH, I<sub>AS</sub>=8A
4. The power dissipation is limited by 150°C junction temperature
5. The Min. value is 100% EAS tested guarantee.
6. The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

**P-Channel Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-60	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	---	-0.03	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-20A	---	31	35	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A	---	40	45	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1.3	-1.8	-2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	4.56	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-4.5A	---	15	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	3	---	Ω
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-30V, V <sub>GS</sub> =-10, I <sub>D</sub> =-7A	---	23.7	33.2	nC
Q <sub>gs</sub>	Gate-Source Charge		---	3.6	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	4.9	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =-30V, V <sub>GS</sub> =-10V, R <sub>G</sub> =6Ω, I <sub>D</sub> =-1A,	---	8	14	ns
T <sub>r</sub>	Rise Time		---	12	22	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	12	22	
T <sub>f</sub>	Fall Time		---	40	72	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, f=1MHz	---	2270	2520	pF
C <sub>oss</sub>	Output Capacitance		---	119	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	96	---	

**Diode Characteristics**

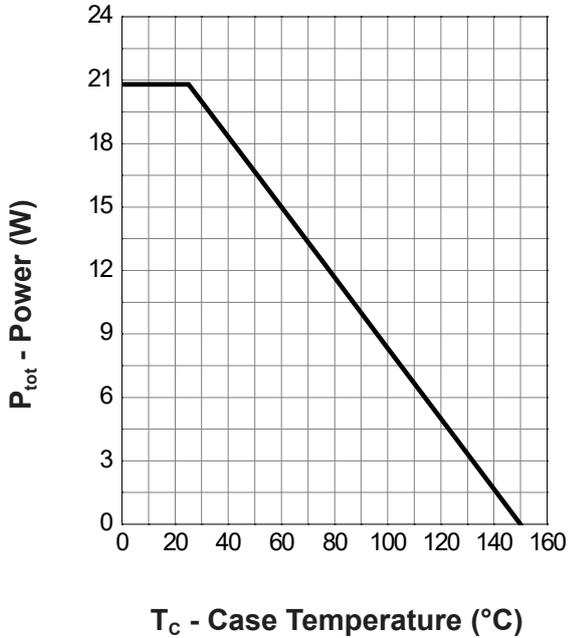
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,6</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-15	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,6</sup>		---	---	-50	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C	---	---	-1.2	V

Note :

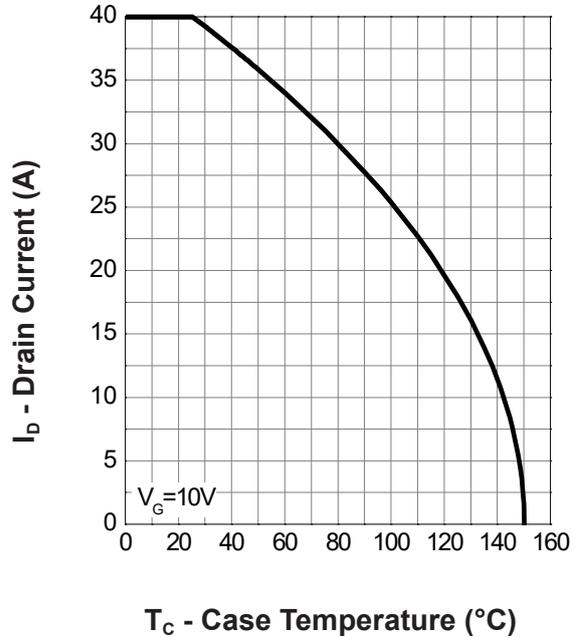
1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, t<10sec.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
3. The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=-30V, V<sub>GS</sub>=-10V, L=0.5mH, I<sub>AS</sub>=-15A
4. The power dissipation is limited by 150°C junction temperature
5. The Min. value is 100% EAS tested guarantee.
6. The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

**N-Channel Typical Characteristics**

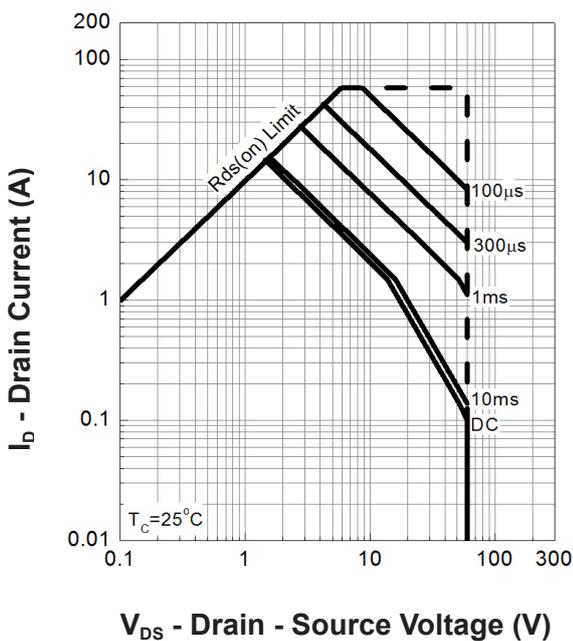
**Power Dissipation**



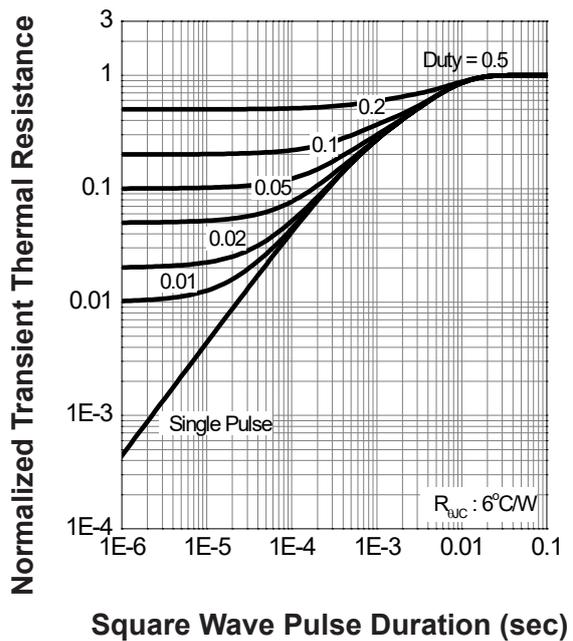
**Drain Current**



**Safe Operation Area**

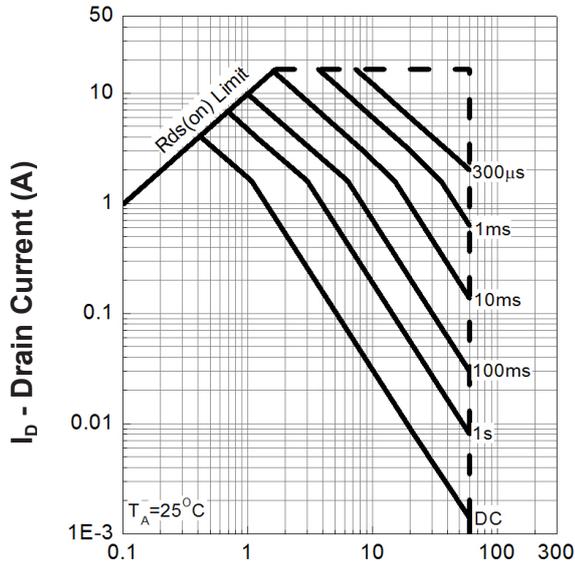


**Thermal Transient Impedance**



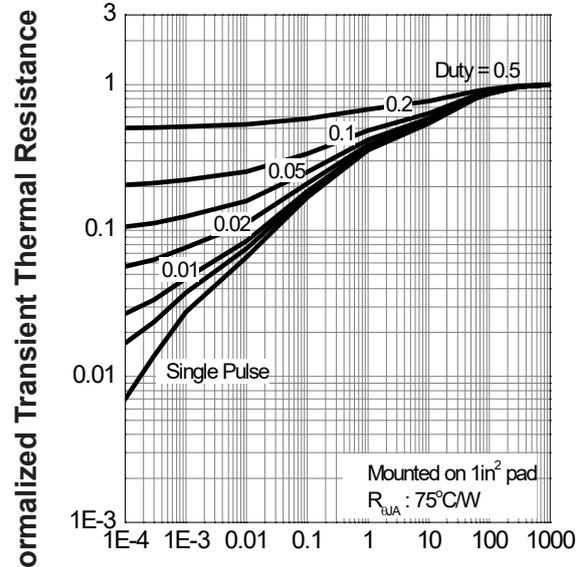
**N-Channel Typical Characteristics (Cont.)**

**Safe Operation Area**



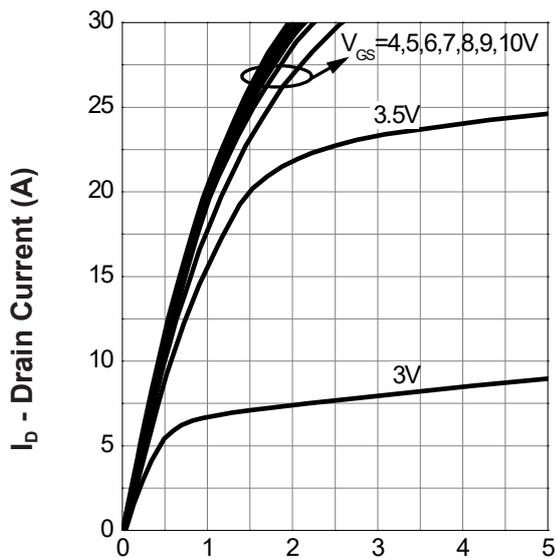
$V_{DS}$  - Drain - Source Voltage (V)

**Thermal Transient Impedance**



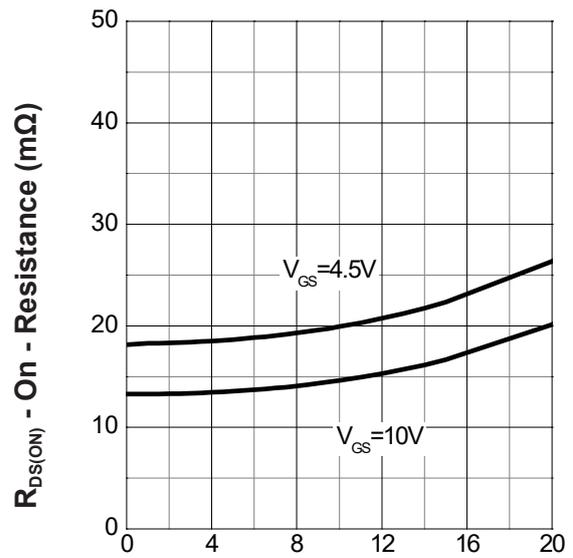
Square Wave Pulse Duration (sec)

**Output Characteristics**



$V_{DS}$  - Drain - Source Voltage (V)

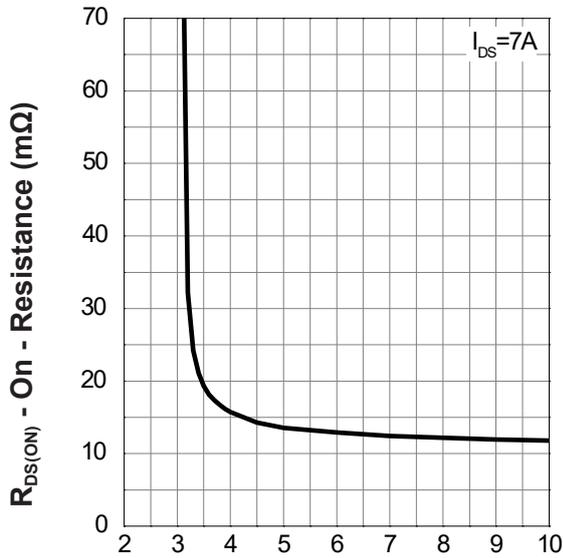
**Drain-Source On Resistance**



$I_D$  - Drain Current (A)

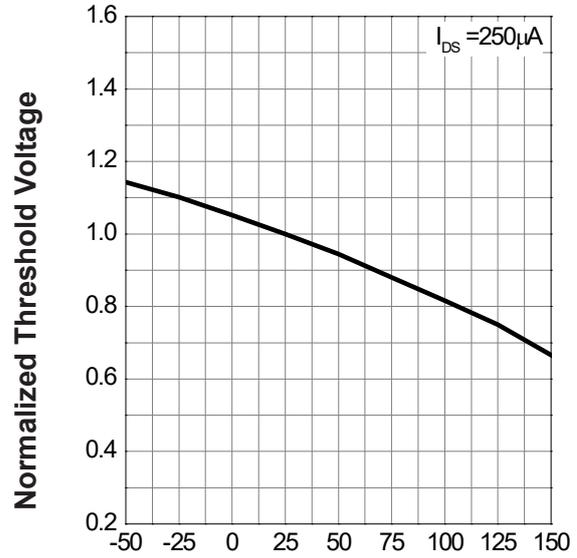
**N-Channel Typical Characteristics (Cont.)**

**Gate-Source On Resistance**



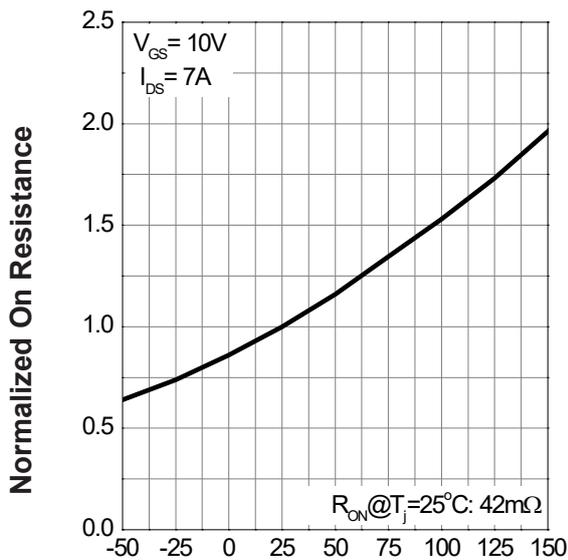
**V<sub>GS</sub> - Gate - Source Voltage (V)**

**Gate Threshold Voltage**



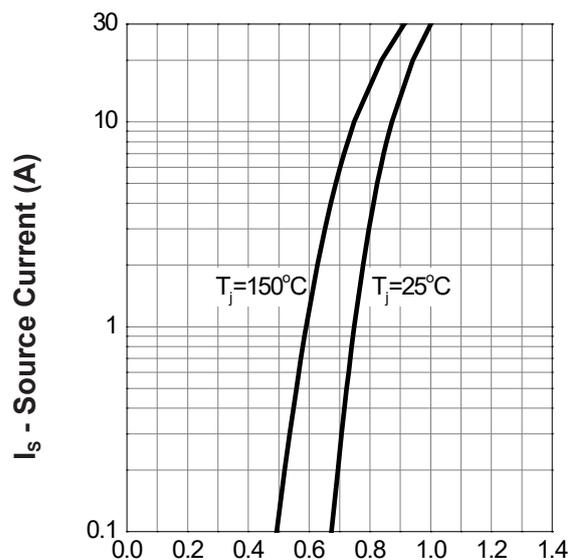
**T<sub>j</sub> - Junction Temperature (°C)**

**Drain-Source On Resistance**



**T<sub>j</sub> - Junction Temperature (°C)**

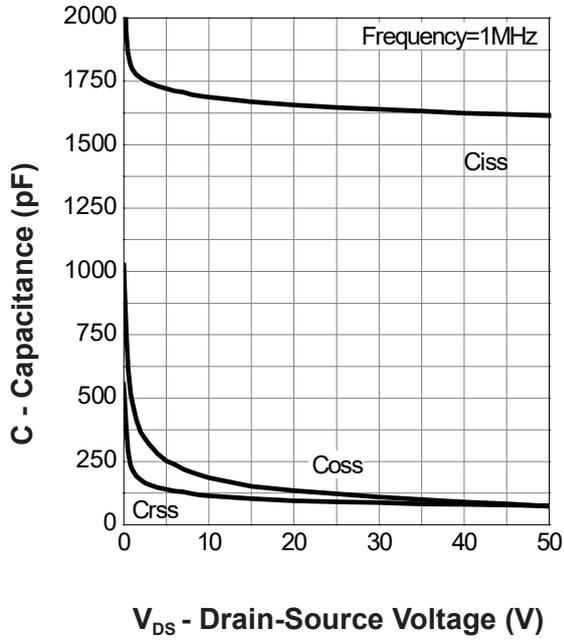
**Source-Drain Diode Forward**



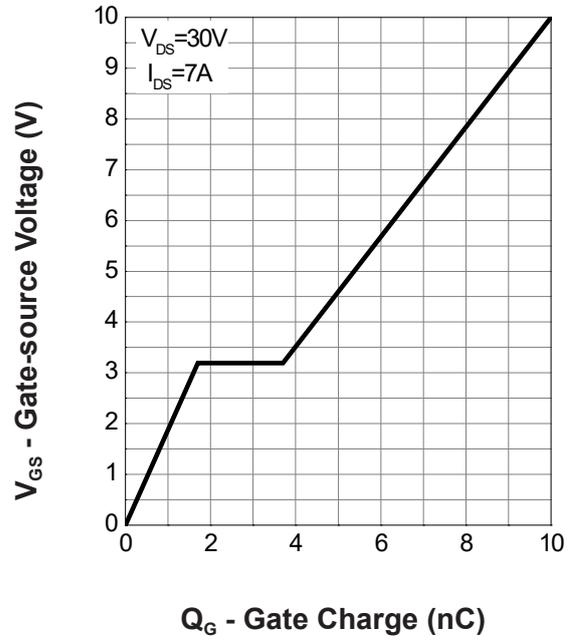
**V<sub>SD</sub> - Source - Drain Voltage (V)**

**N-Channel Typical Characteristics (Cont.)**

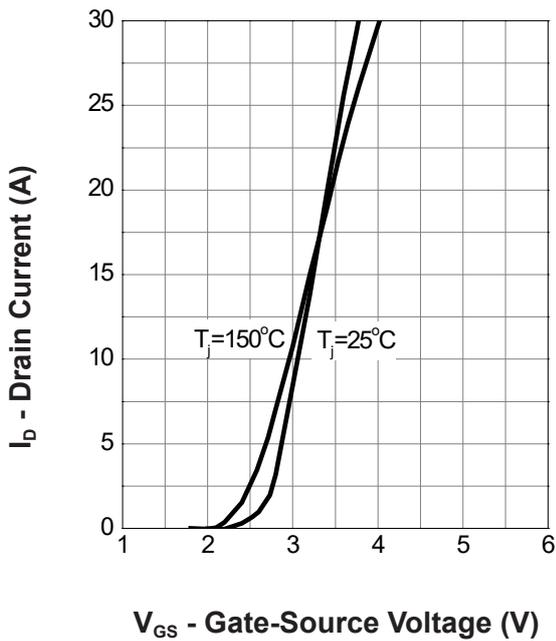
**Capacitance**



**Gate Charge**

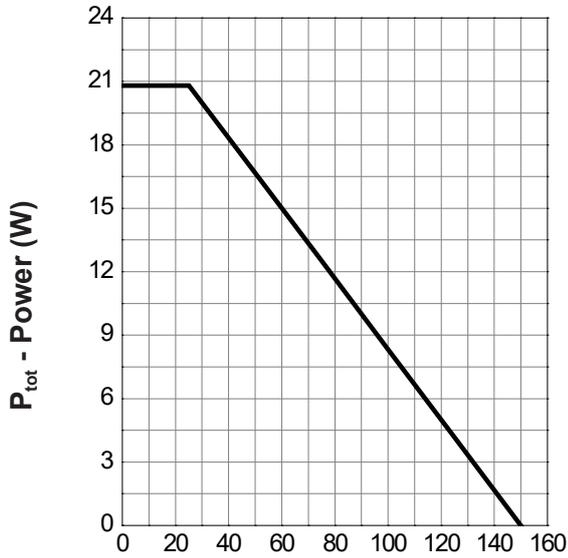


**Transfer Characteristics**



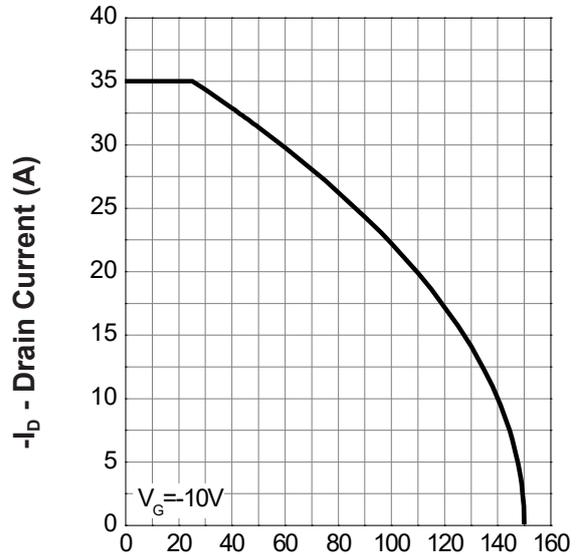
**P-Channel Typical Characteristics**

**Power Dissipation**



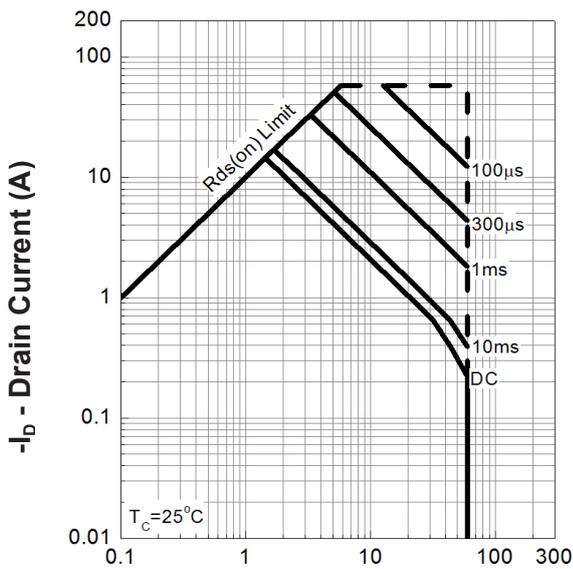
T<sub>c</sub> - Case Temperature (°C)

**Drain Current**



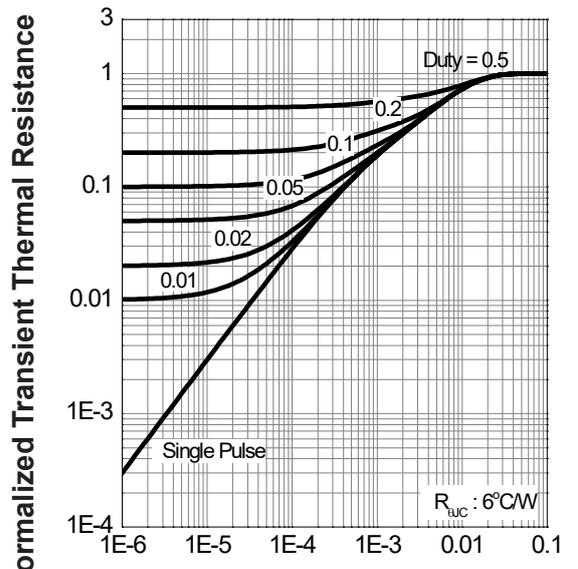
T<sub>c</sub> - Case Temperature (°C)

**Safe Operation Area**



-V<sub>DS</sub> - Drain - Source Voltage (V)

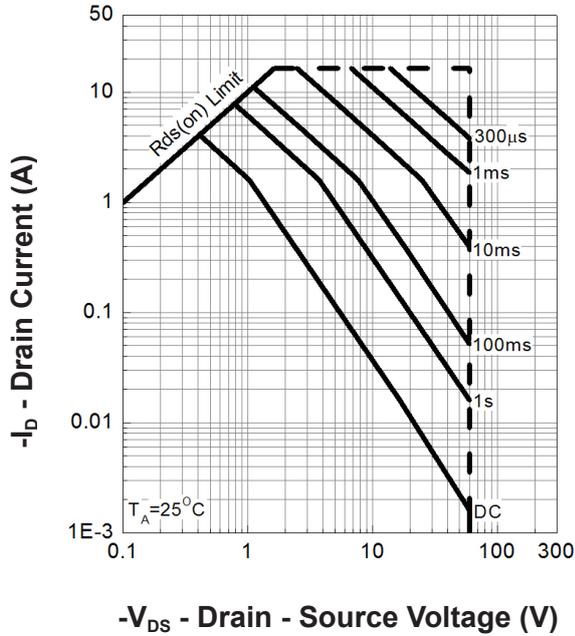
**Thermal Transient Impedance**



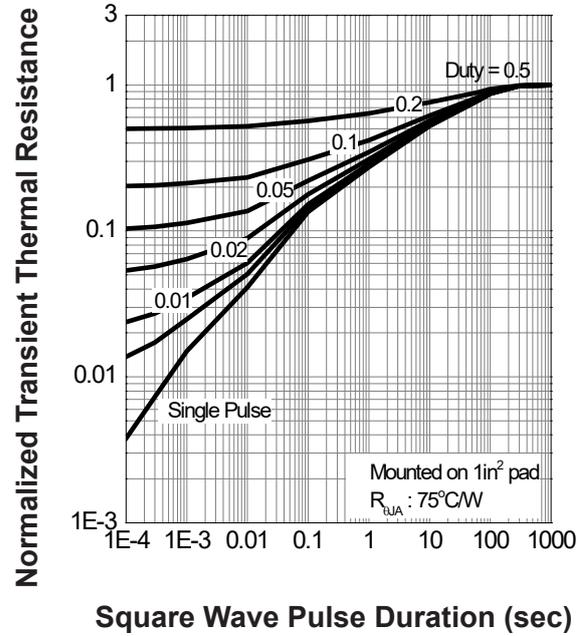
Square Wave Pulse Duration (sec)

**P-Channel Typical Characteristics (Cont.)**

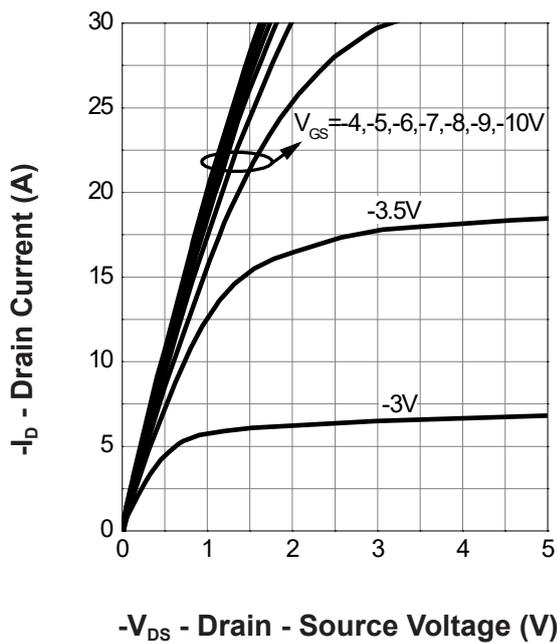
**Safe Operation Area**



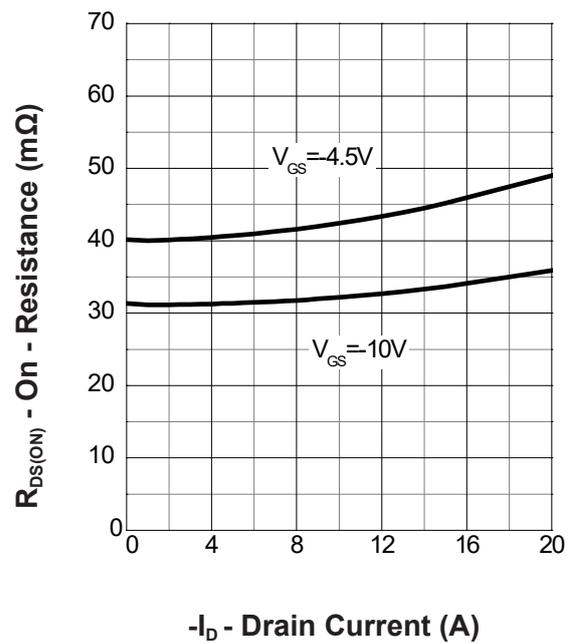
**Thermal Transient Impedance**



**Output Characteristics**

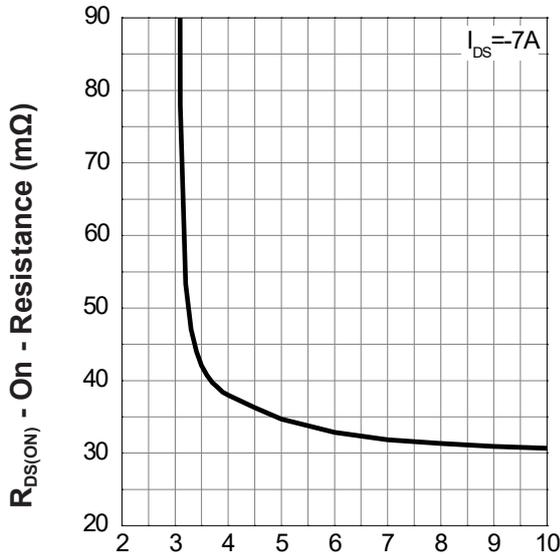


**Drain-Source On Resistance**



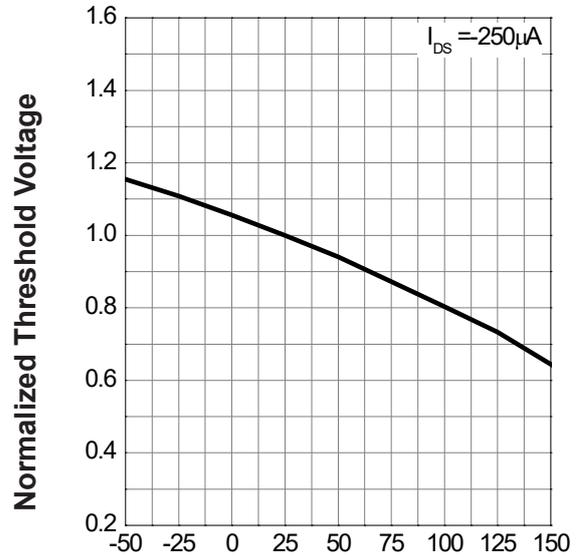
**P-Channel Typical Characteristics (Cont.)**

**Gate-Source On Resistance**



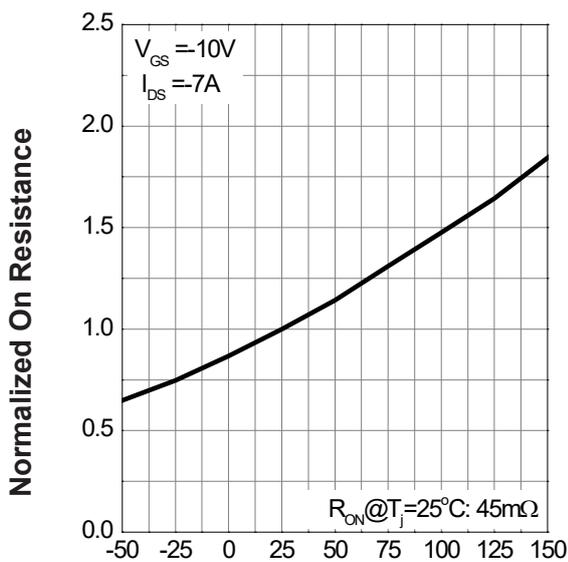
-V<sub>GS</sub> - Gate - Source Voltage (V)

**Gate Threshold Voltage**



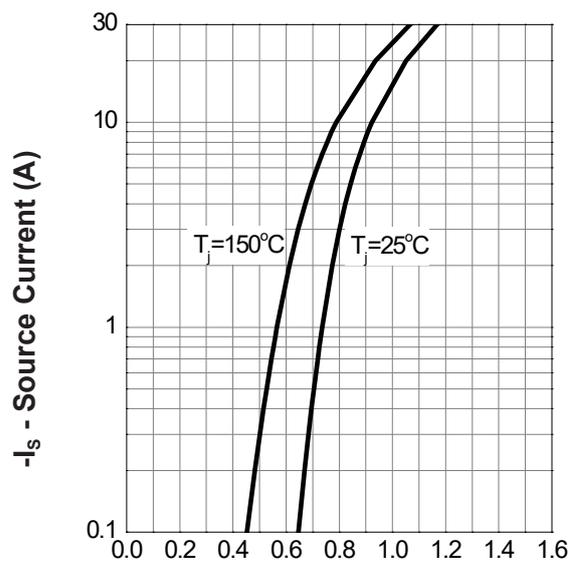
T<sub>J</sub> - Junction Temperature (°C)

**Drain-Source On Resistance**



T<sub>J</sub> - Junction Temperature (°C)

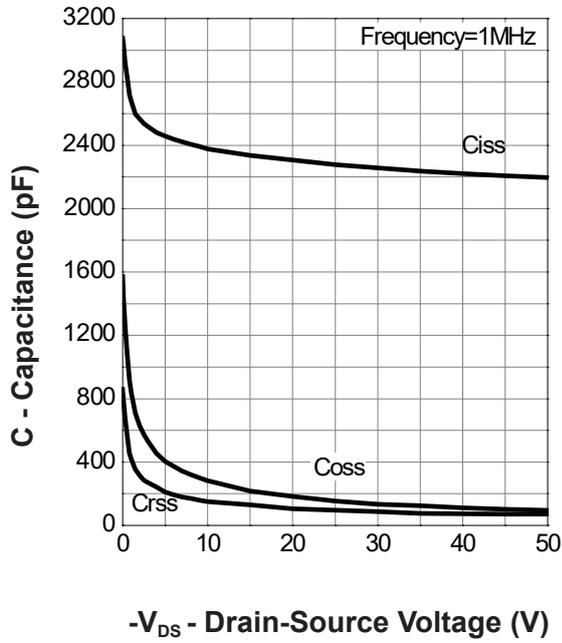
**Source-Drain Diode Forward**



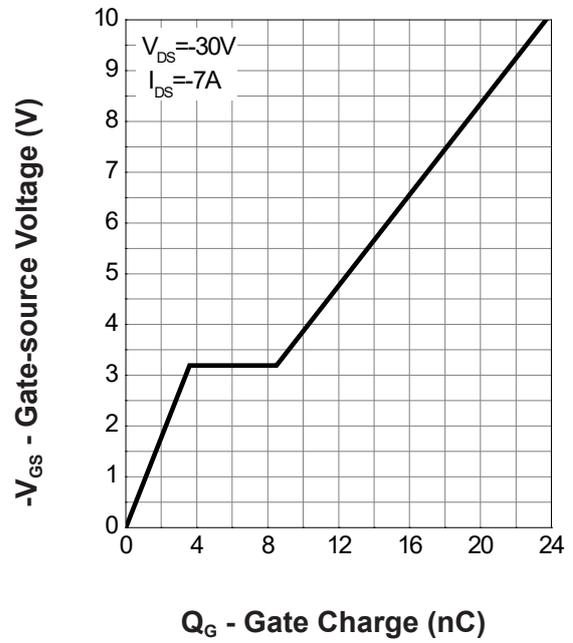
-V<sub>SD</sub> - Source - Drain Voltage (V)

**P-Channel Typical Characteristics (Cont.)**

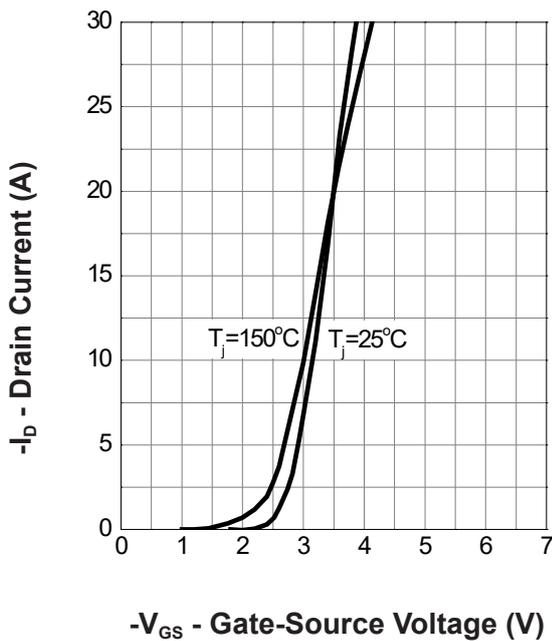
**Capacitance**

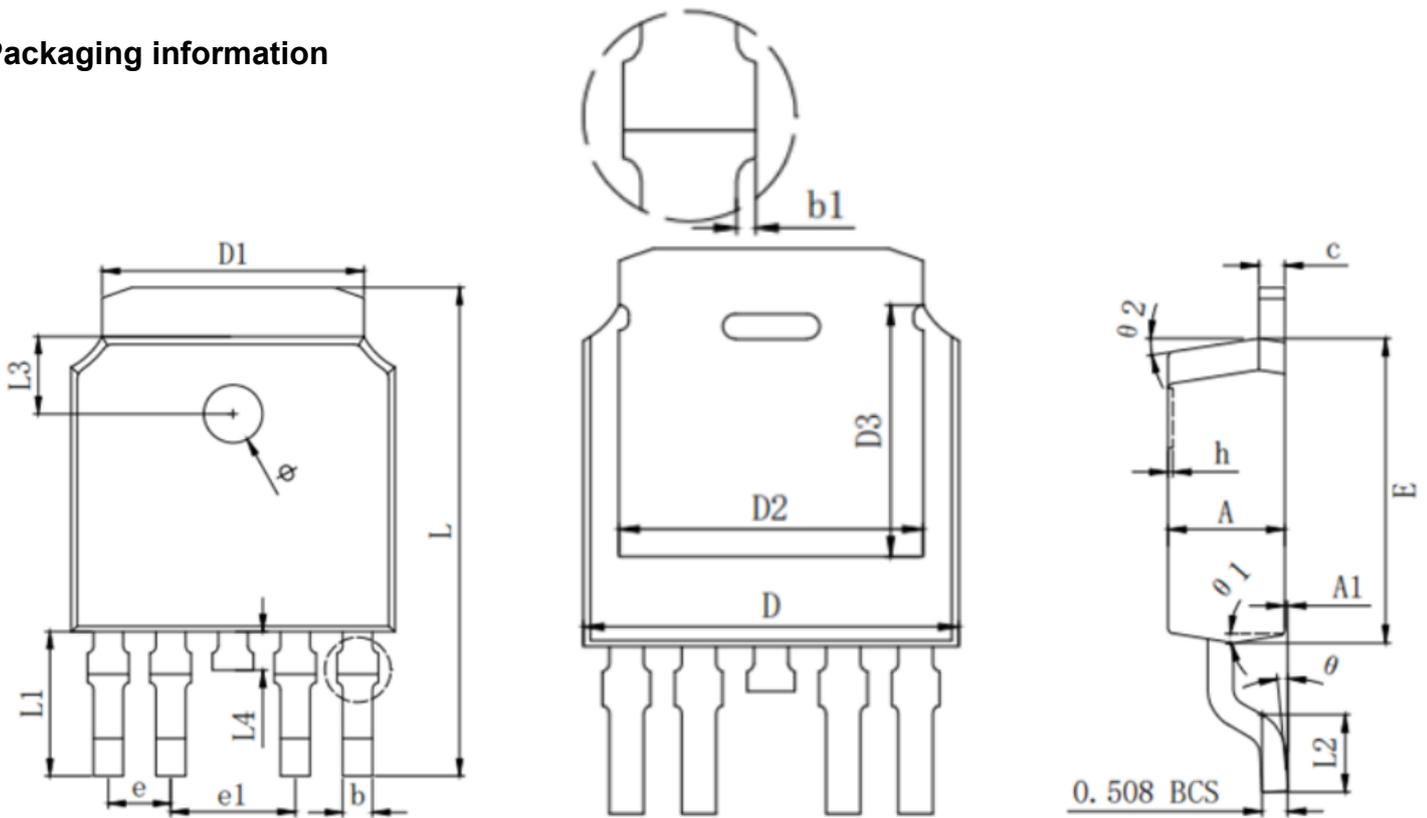


**Gate Charge**



**Transfer Characteristics**



**Packaging information**


SYMBOLS	MILLIMETERS		
	MIN.	Typ.	MAX.
A	2.200	2.300	2.400
A1	0.000	-	0.127
b	0.550	0.600	0.650
b1	0.000	-	0.120
c(电镀后)	0.460	0.520	0.580
D	6.500	6.600	6.700
D1	5.334 REF		
D2	5.346 REF		
D3	4.490 REF		
E	6.000	6.100	6.200
e	1.270 TYP		
e1	2.540 TYP		
h	0.000	0.100	0.200
L	9.900	10.100	10.300
L1	2.988 REF		
L2	1.400	1.550	1.700
L3	1.600 REF		
L4	0.700	0.800	0.900
φ	1.100	1.200	1.300
θ	0°	-	8°
θ 1	9° TYP		
θ 2	9° TYP		



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