650V N-Channel Power MOSFET

DESCRIPTION：
- Excellent $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested, 100% △Vds Tested
- RoHS compliant
- Pb-Free Lead Plating

V_{DS}	650V
I_D @V_{GS}= 10V	53A
$R_{DS(ON)\_Typ.}$@V_{GS}=10V	34mΩ

TYPICAL APPLICATIONS：
- SMPS with PFC
- Flyback and LLC topologies
- Silver ATX, adapter, TV, lighting, Telecom

TO-247-3L

MAXIMUM RATINGS (at T_A = 25 °C, unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current	Tc=25℃ Tc=100℃	I_D	53 33	A
Pulsed Drain Current (1)		I_{DM}	Refer to Fig.4	A
Avalanche Energy (2)		E_{AS}	794	mJ
Power dissipation	Tc=25℃ Tc=100℃	P_D	248 111	W
Junction & Storage temperature Range		T_J, T_{STG}	-55~+150	℃

Notes： 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. E_{AS} condition: Starting T_J=25℃, V_{DD}=50V, V_{GS}=10V, R_G=25ohm, L=10mH, I_{AS}=12.6A, V_{DD}=0V during time in avalanche.

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Value	Unit
Thermal resistance,	Junction to Ambient Junction to Case	$R_{\theta JA}$ $R_{\theta JC}$	40 0.45	℃/W

ELECTRICAL CHARATERISTICS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage VGS = 0V, ID = 250uA	$V_{(BR)DSS}$	650			V
Zero Gate Voltage Drain Current VDS = 650 V, VGS = 0 V	I_{DSS}			10	uA
Gate-Source Leakage Current VGS = ±30V, VDS = 0V	I_{GSS}			±100	nA
Gate-Source threshold voltage VDS = VGS, ID = 250uA	$V_{GS(th)}$	2.7	3.9	5.1	V
Drain-Source On-State Resistance VGS = 10V, ID = 30A	$R_{DS(on)}$		34	40	mΩ
Input capacitance f=1MHz, VDS=325 V, VGS=0 V	C_{iss}		6248	8435	pF
Output capacitance f=1MHz, VDS=325 V, VGS=0 V	C_{oss}		131	177	pF
Reverse transfer capacitance f=1MHz, VDS=325 V, VGS=0 V	C_{rss}		8.4		pF
Gate Resistance VDS=0 V, VGS= 0V, f=1MHz	R_g		1.0		Ω
Total Gate Charge VDS= 325V, ID= 36A,VGS=0 to 10V	Q_G		124	168	nC
Gate to Source Charge VDS= 325V, ID= 36A,VGS=0 to 10V	Q_{GS}		43	58	nC
Gate to Drain Charge VDS= 325V, ID= 36A,VGS=0 to 10V	Q_{GD}		45	61	nC
Turn-on delay time VDD=325 V, VGS= 10V, ID= 36A, R_{GEN}=6Ω	td (ON)		129		ns
Rise time VDD=325 V, VGS= 10V, ID= 36A, R_{GEN}=6Ω	tr		124		ns
Turn-off delay time VDD=325 V, VGS= 10V, ID= 36A, R_{GEN}=6Ω	td (OFF)		311		ns
Fall time VDD=325 V, VGS= 10V, ID= 36A, R_{GEN}=6Ω	tf		96		ns

Body Diode

ELECTRICAL CHARATERISTICS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Diode Forward Voltage VGS = 0V, I_S = 1A	V_{SD}			1.2	V
Maximum Continuous Body Diode Forward Current	I_S			53	A
Maximum Pulsed Body Diode Forward Current	I_{SM}			211	A
Revers Recovery Time IF= 40A, di/dt = 100A/us	Trr		196	265	ns
Revers Recovery Charge IF= 40A, di/dt = 100A/us	Qrr		1700		nC

Typical Performance Characteristics

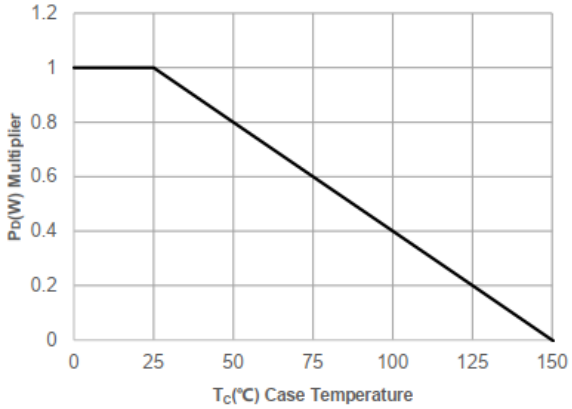


Figure 1. Power De-rating

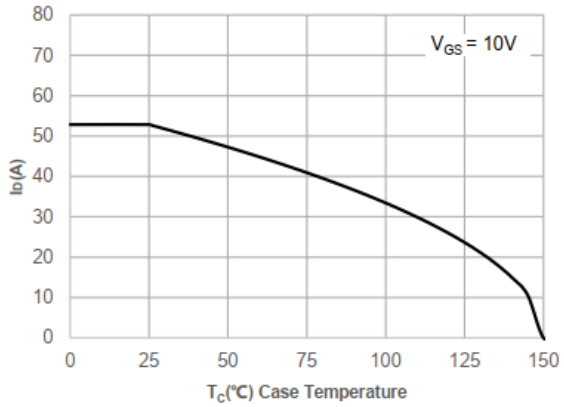


Figure 2. Current De-rating

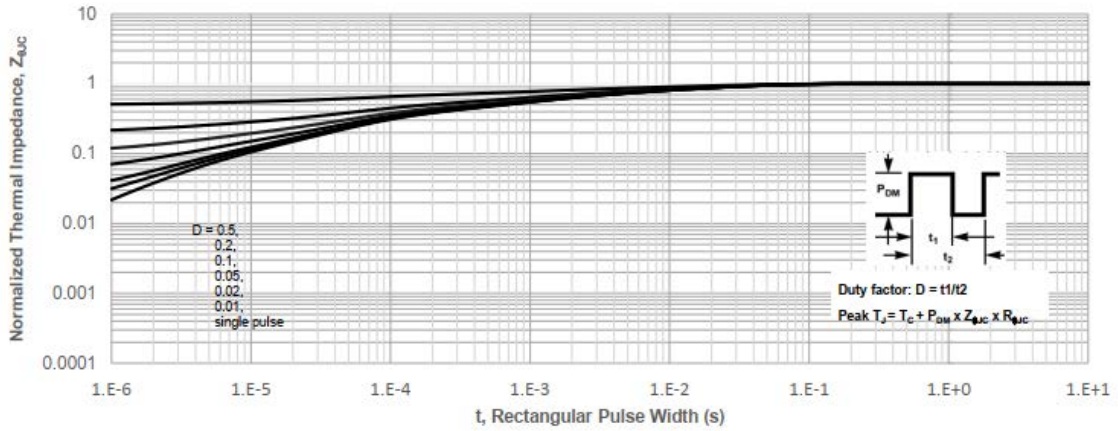


Figure 3. Normalized Maximum Transient Thermal Impedance

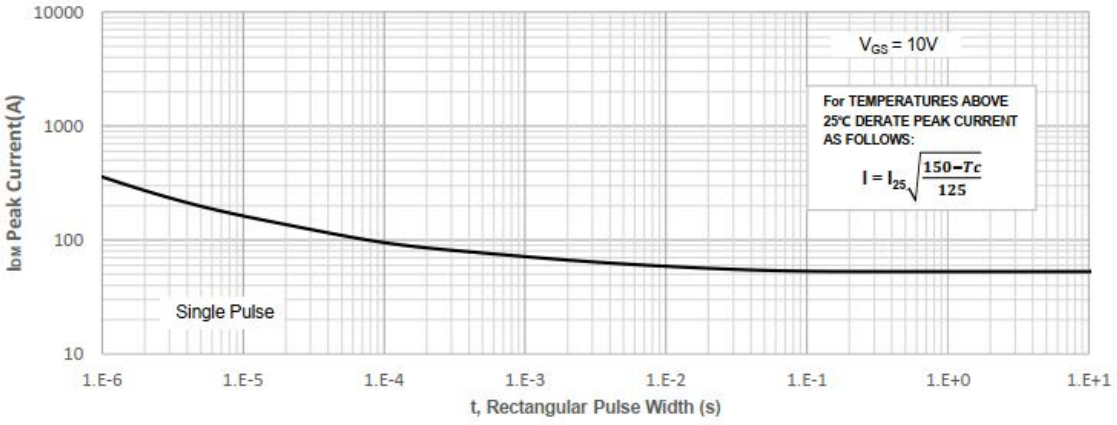


Figure 4. Peak Current Capacity

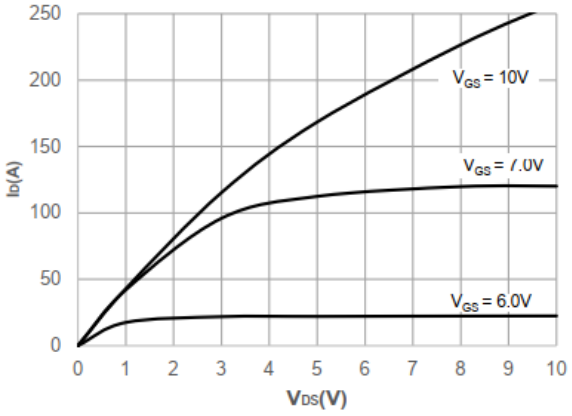


Figure 5. Output Characteristics

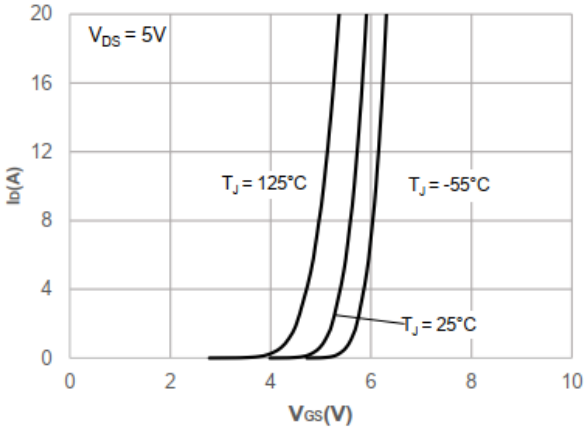


Figure 6. Typical Transfer Characteristics

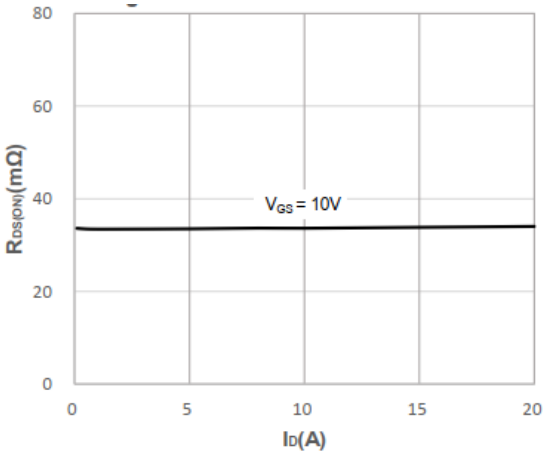


Figure 7. On-resistance vs. Drain Current

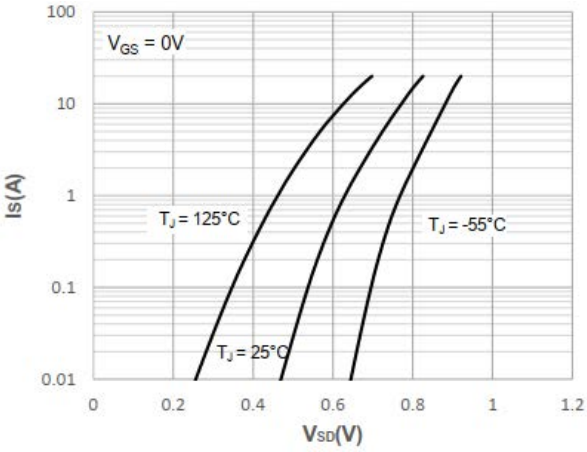


Figure 8. Body Diode Characteristics

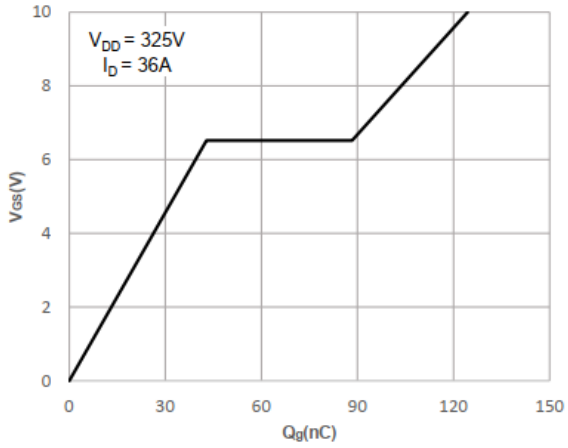


Figure 9. Gate Charge Characteristics

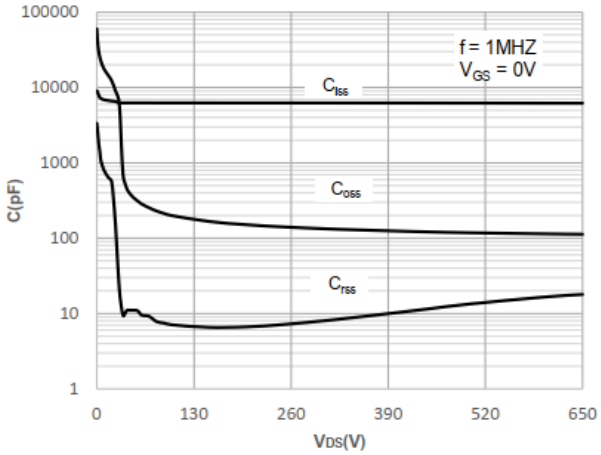


Figure 10. Capacitance Characteristics

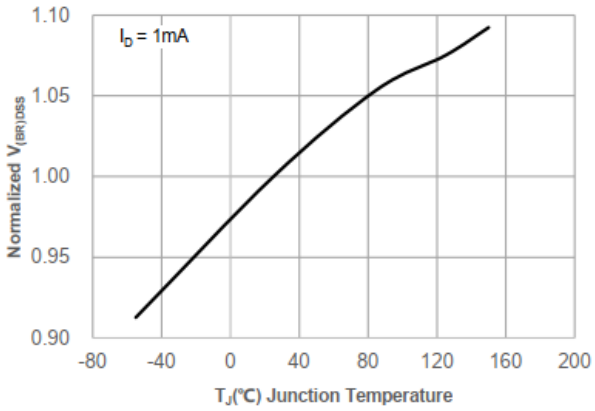


Figure 11. Normalized Breakdown voltage vs. Junction Temperature

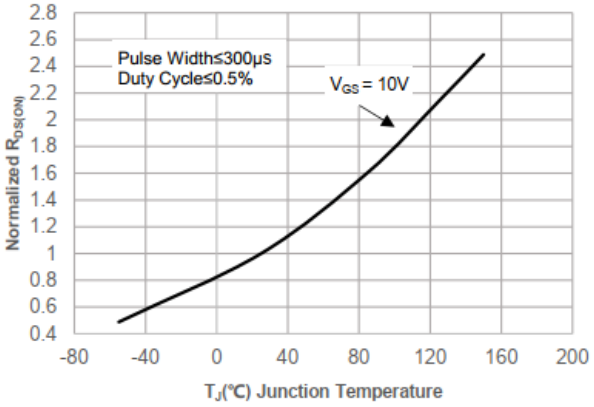


Figure 12. Normalized on Resistance vs. Junction Temperature

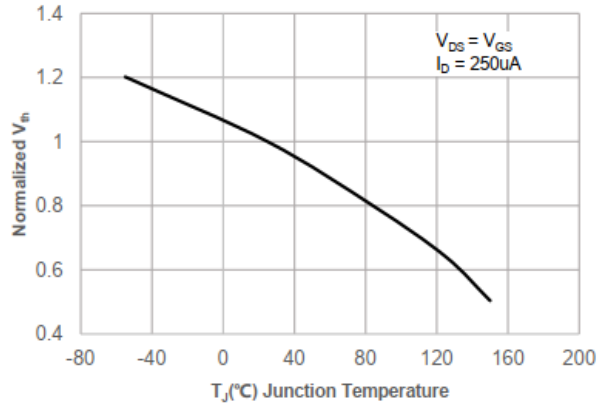


Figure 13. Normalized Threshold Voltage vs. Junction Temperature

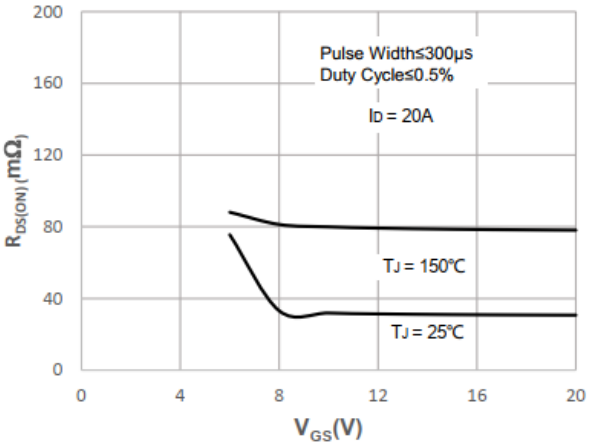


Figure 14. RDS(ON) vs. VGS

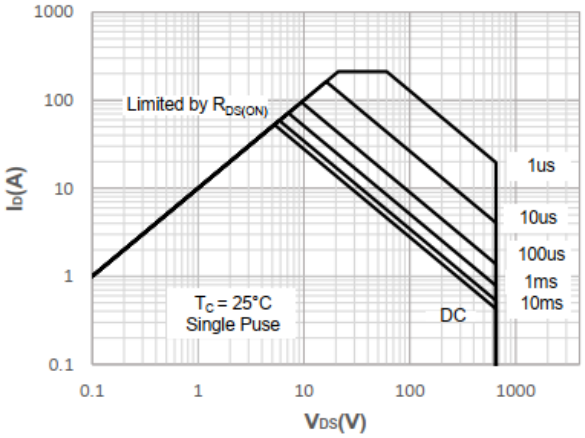
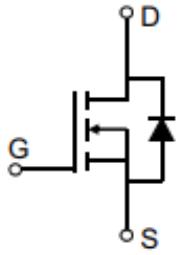
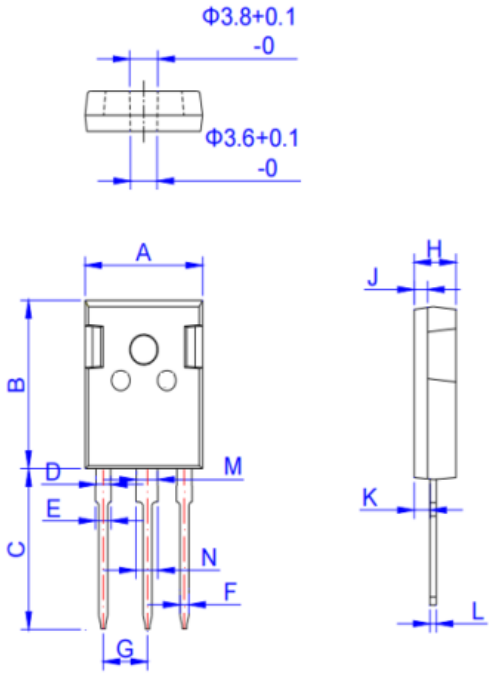


Figure 15. Maximum Safe Operating Area

- Circuit diagram



- Package outlines :



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.50	15.80	16.10	0.610	0.622	0.634
B	20.80	21.00	21.20	0.819	0.827	0.835
C	19.70	20.00	20.30	0.776	0.787	0.799
D	1.80	2.00	2.20	0.071	0.079	0.087
E	1.90	2.10	2.30	0.075	0.083	0.091
F	1.00	1.20	1.40	0.039	0.047	0.055
G	5.25		5.65	0.207		0.222
H	4.80	5.00	5.20	0.189	0.197	0.205
J	1.90	2.00	2.10	0.075	0.079	0.083
K	2.20	2.35	2.50	0.087	0.093	0.098
L	0.41	0.60	0.79	0.016	0.024	0.031
M	2.80	3.00	3.20	0.110	0.118	0.126
N	2.90	3.10	3.30	0.114	0.122	0.130

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