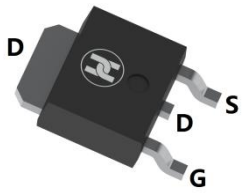
N-CHANNEL HIGH VOLTAGE MOSFET

FEATURES

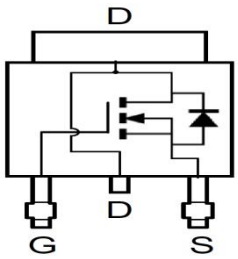
- $R_{DS(ON)}$ = 2.5Ω @V_{GS} = 10 V
- Ultra Low Gate Charge (typical 15 nC)
- Low Reverse Transfer Capacitance (C_{RSS} = typical 8.0 pF)
- Fast Switching Capability
- Avalanche Energy Specified
- Improved dv/dt Capability, high Ruggedness



TO-252

MECHANICAL DATA

- Case: TO-252
- Case Material: Molded Plastic. UL flammability
- Classification Rating: 94V-0
- Weight: 0.33 grams (approximate)



MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage		4N60	V_{DSS}	600	V
		4N65		650	V
Gate-Source Voltage			V_{GSS}	±30	V
Avalanche Current (Note 2)			I_{AR}	4.4	A
Drain Current	Continuous		I_D	4.0	A
	Pulsed (Note 2)		I_{DM}	16	A
Avalanche Energy	Single Pulsed (Note 3)		E_{AS}	260	mJ
	Repetitive (Note 2)		E_{AR}	10.6	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	4.5	V/ns
Power Dissipation (T_C = 25°C)			P_D	50	W
Junction Temperature			T_J	+150	°C
Ambient Operating Temperature			T_{OPR}	-55 ~ +150	°C
Storage Temperature			T_{STG}	-55 ~ +150	°C
Junction-to-Ambient			θ_{JA}	83	℃/W
Junction-to-Case			θ_{Jc}	2.50	℃/W

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating : Pulse width limited by T_J
3. L=64mH, I_{AS}=4.0A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C
4. I_{SD}≤4.0A, di/dt≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

N-CHANNEL HIGH VOLTAGE MOSFET

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	2N60-A	BV_{DSS}	V_{GS} = 0V, I_D = 250μA	600			V
	2N60-B			650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 600V, V_{GS} = 0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30V, V_{DS} = 0V			100	nA
	Reverse		V_{GS} = -30V, V_{DS} = 0V			-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D = 250 μA, Referenced to 25°C		0.6		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10V, I_D =2A			2.5	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS} =25V, V_{GS} =0V,f =1MHz		520	670	pF
Output Capacitance		C_{OSS}			70	90	pF
Reverse Transfer Capacitance		C_{RSS}			8	11	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D\ (ON)}$	V_{DD} =300V, I_D =4.0A, R_G=25Ω (Note 1, 2)		13	35	ns
Turn-On Rise Time		t_R			45	100	ns
Turn-Off Delay Time		$t_{D(OFF)}$			25	60	ns
Turn-Off Fall Time		t_F			35	80	ns
Total Gate Charge		Q_G	V_{DS}=480V, V_{GS}=10V, I_D=4.0A (Note 1, 2)		15	20	nC
Gate-Source Charge		Q_{GS}			3.4		nC
Gate-Drain Charge		Q_{GD}			7.1		nC
DRAIN-SOURCE DIODE CHARACTERISTICS							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS} = 0 V, I_{SD} = 4.0 A			1.4	V
Continuous Drain-Source Current		I_{SD}				4.4	A
Pulsed Drain-Source Current		I_{SM}				17.6	A
Reverse Recovery Time		t_{RR}	V_{GS} = 0 V, I_{SD} = 4.0A, di/dt = 100 A/μs (Note1)		250		ns
Reverse Recovery Charge		Q_{RR}			1.50		μC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle≤2%
2. Essentially independent of operating temperature

N-CHANNEL HIGH VOLTAGE MOSFET

Test Circuits And Waveforms

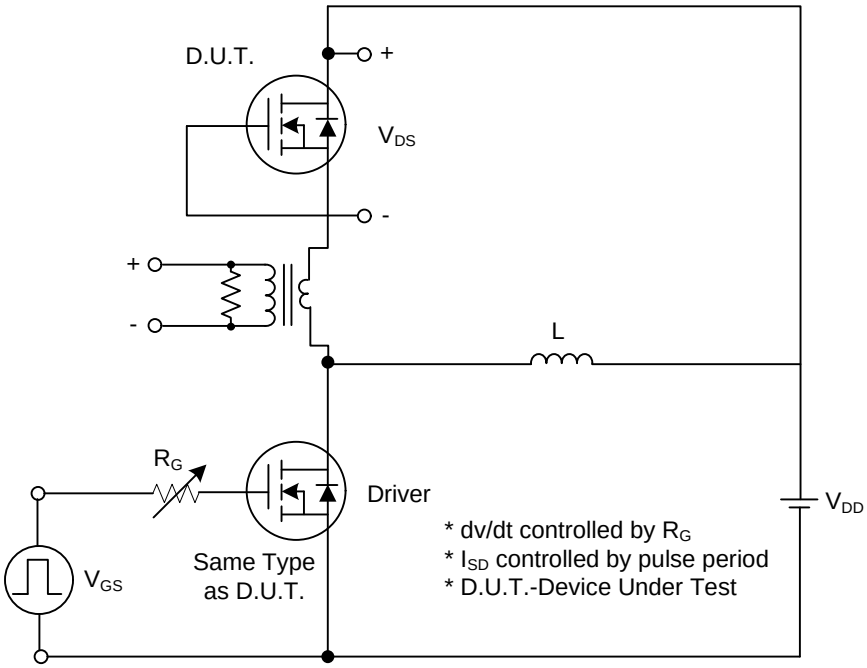


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

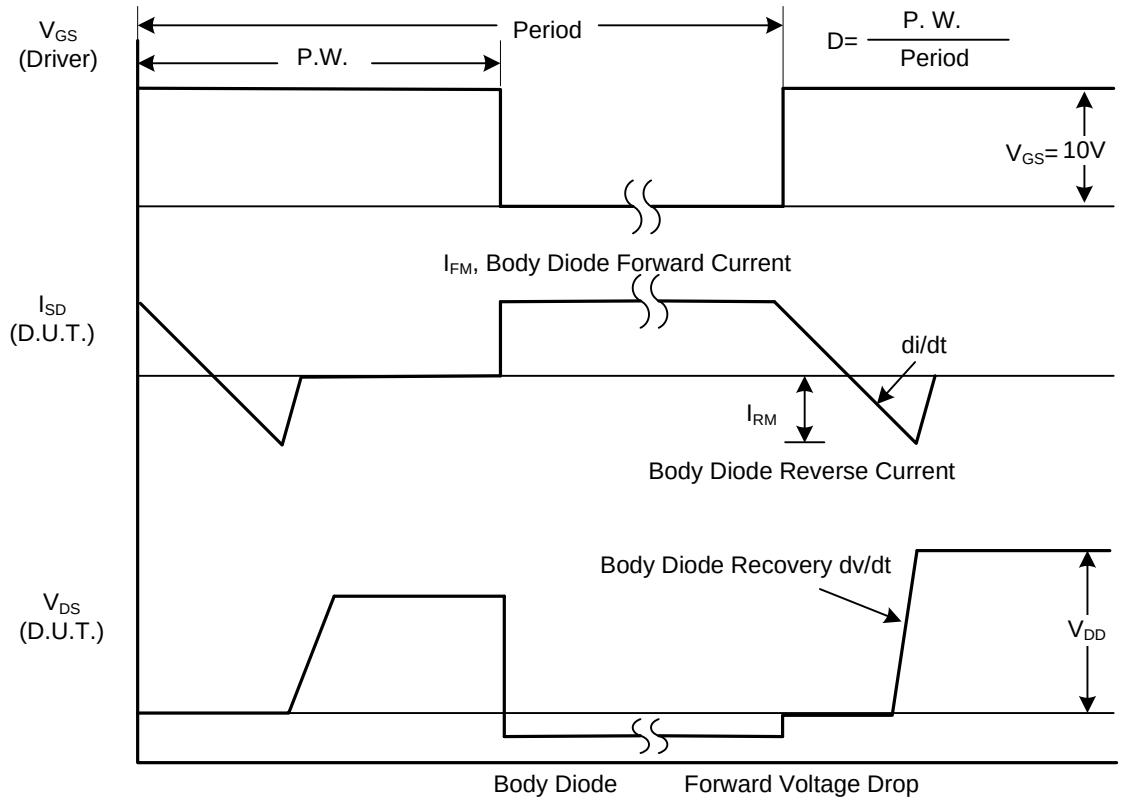


Fig. 1B Peak Diode Recovery dv/dt Waveforms

N-CHANNEL HIGH VOLTAGE MOSFET

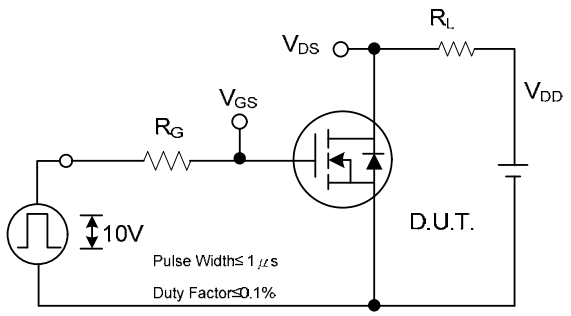


Fig. 2A Switching Test Circuit

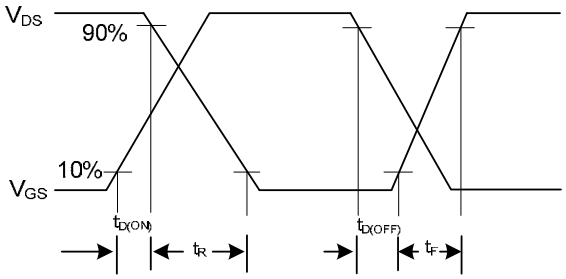


Fig. 2B Switching Waveforms

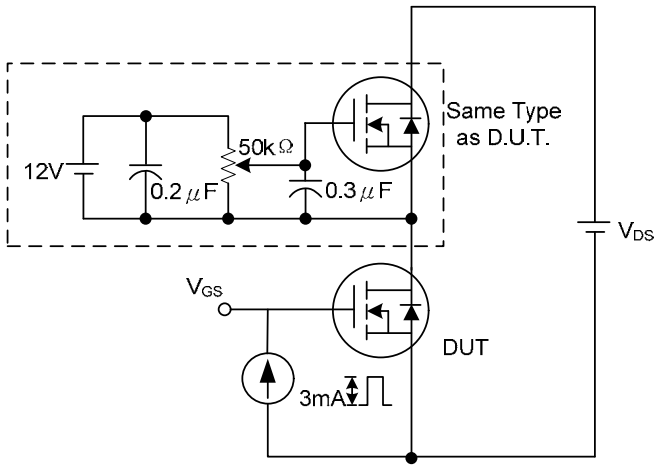


Fig. 3A Gate Charge Test Circuit

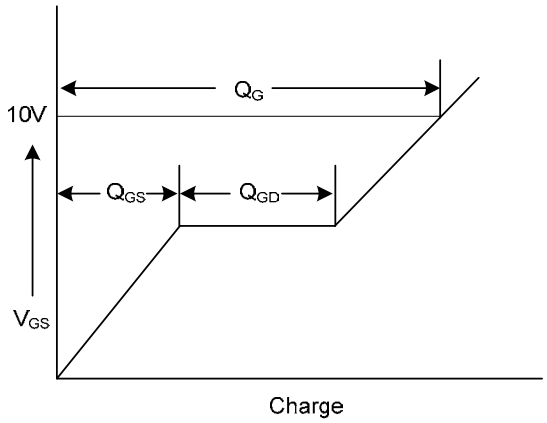


Fig. 3B Gate Charge Waveform

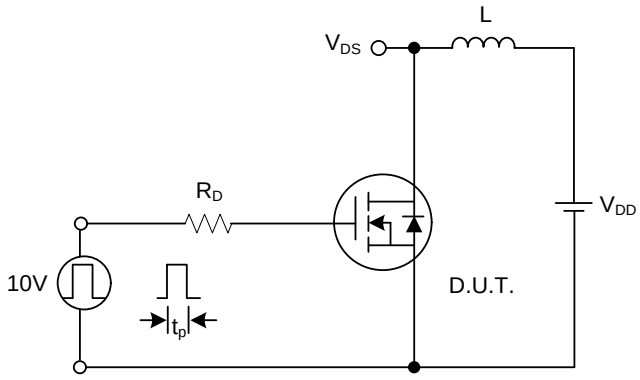


Fig. 4A Unclamped Inductive Switching Test Circuit

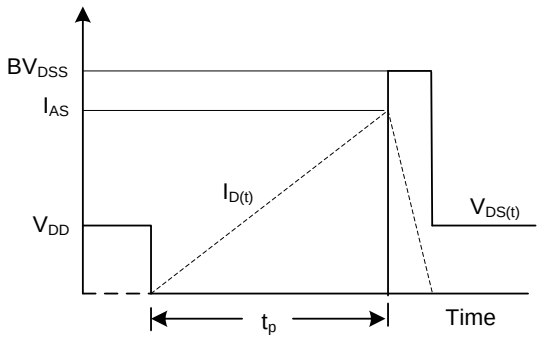
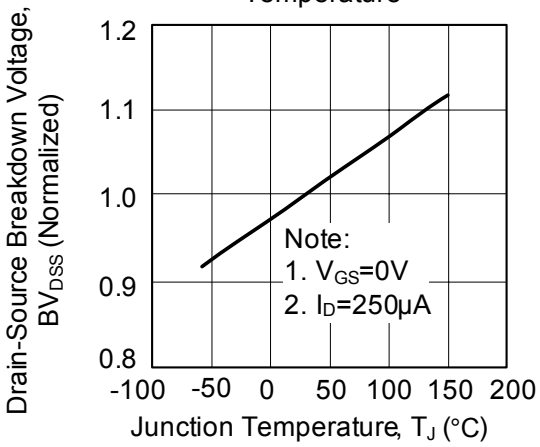


Fig. 4B Unclamped Inductive Switching Waveforms

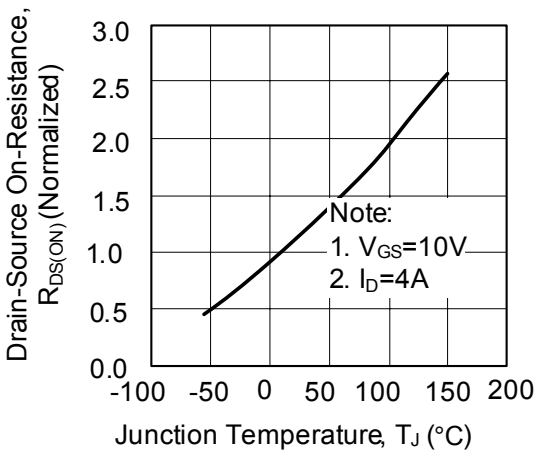
N-CHANNEL HIGH VOLTAGE MOSFET

Typical Characteristics

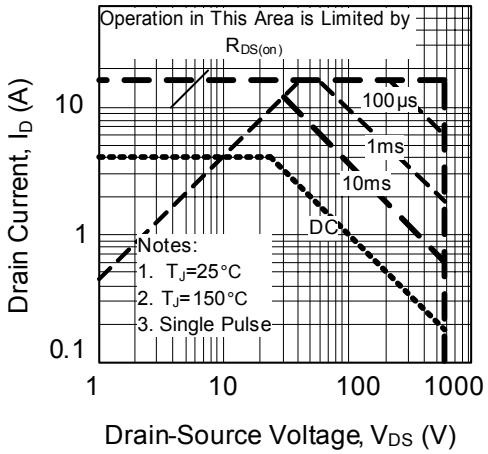
Breakdown Voltage Variation vs Temperature



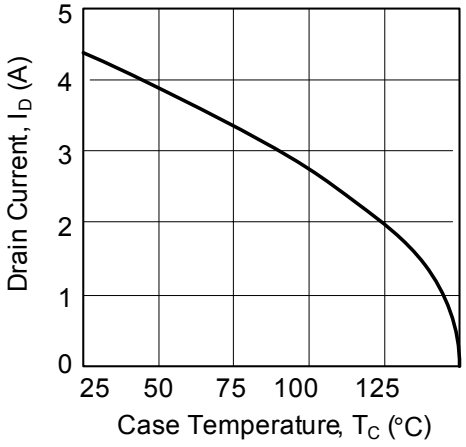
On-Resistance Junction Temperature



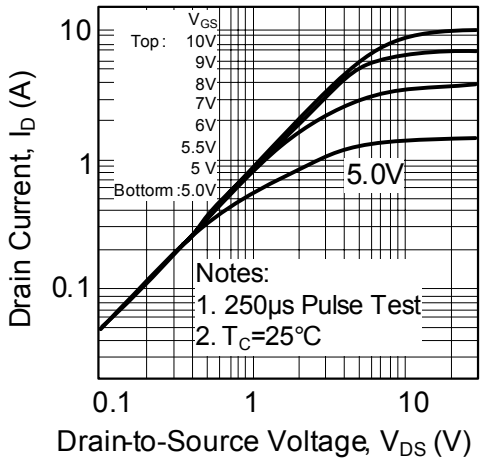
Maximum Safe Operating Area



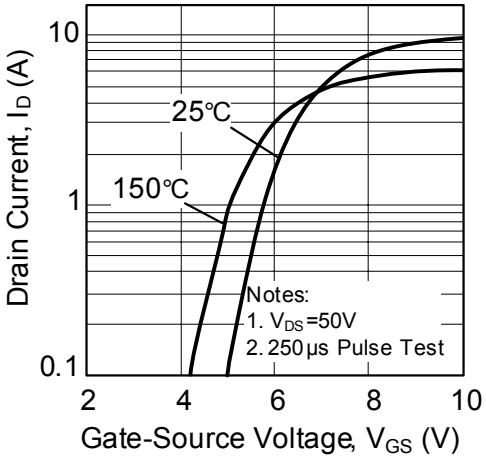
Maximum Drain Current vs. Case Temperature



On-State Characteristics

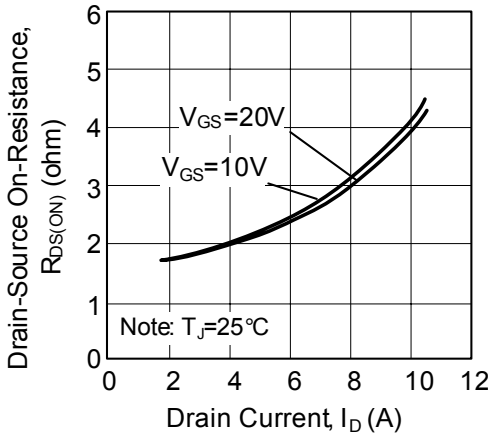


Transfer Characteristics

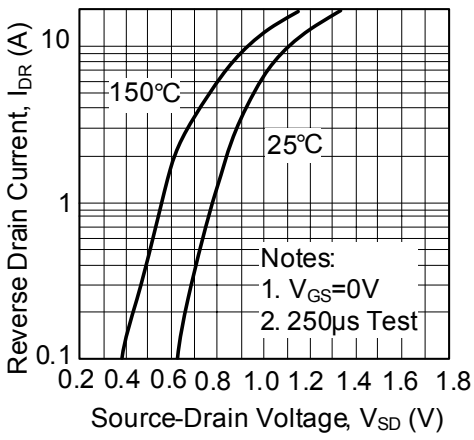


N-CHANNEL HIGH VOLTAGE MOSFET

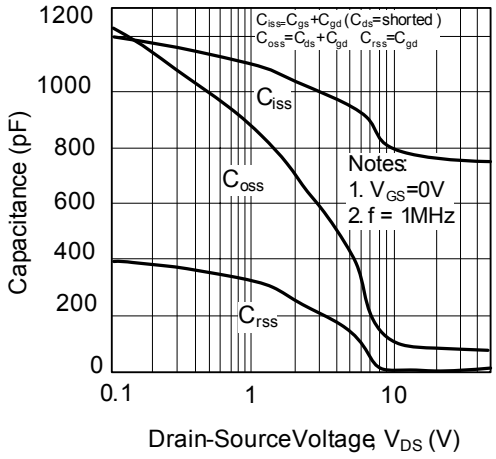
On-Resistance Variation vs Drain Current and Gate Voltage



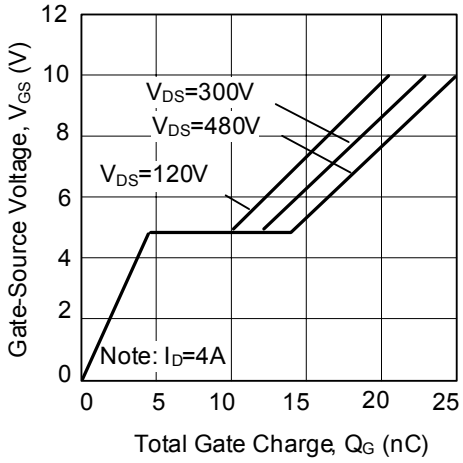
On State Current vs. Allowable Case Temperature



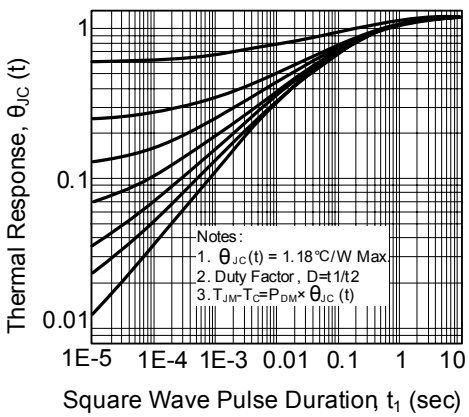
Capacitance Characteristics (Non-Repetitive)



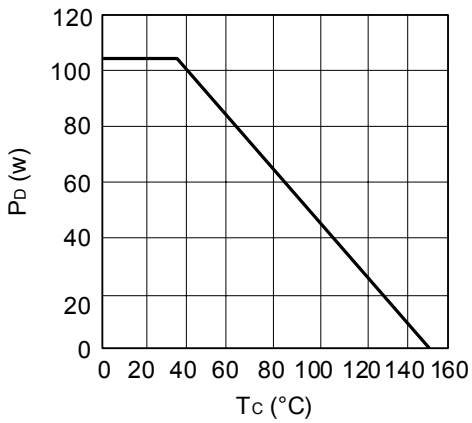
Gate Charge Characteristics



Transient Thermal Response Curve

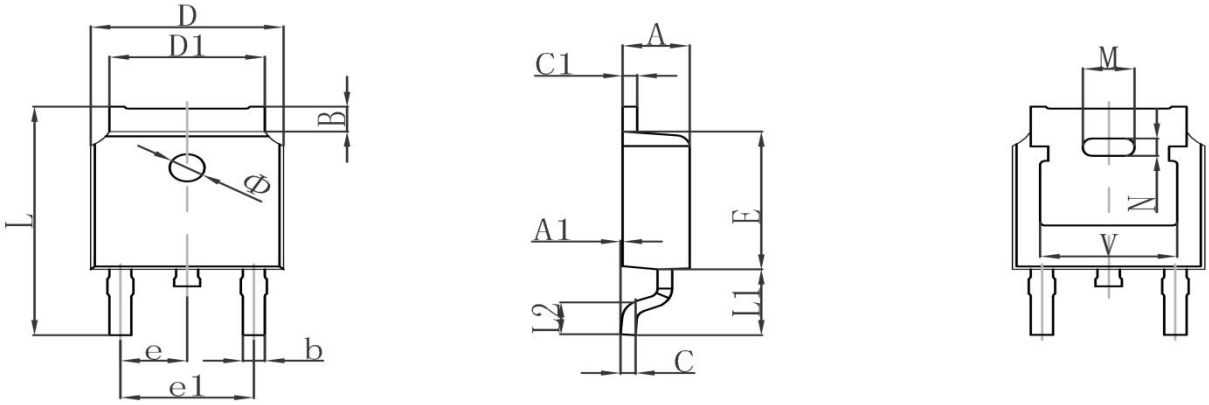


Power Dissipation



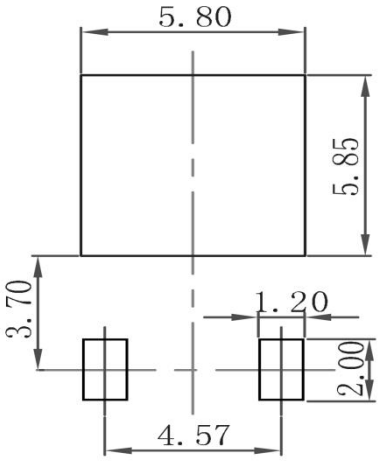
N-CHANNEL HIGH VOLTAGE MOSFET

TO-252 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.380	0.087	0.094
A1	0.000	0.100	0.000	0.004
B	0.800	1.400	0.031	0.055
b	0.710	0.810	0.028	0.032
c	0.460	0.560	0.018	0.022
c1	0.460	0.560	0.018	0.022
D	6.500	6.700	0.256	0.264
D1	5.130	5.460	0.202	0.215
E	6.000	6.200	0.236	0.244
e	2.286TYP		0.090TYP	
e1	4.327	4.727	0.170	0.186
M	1.778REF		0.070REF	
N	0.762REF		0.018REF	
L	9.800	10.400	0.386	0.409
L1	2.9REF		0.114REF	
L2	1.400	1.700	0.055	0.067
V	4.830REF		0.190REF	
Φ	1.100	1.300	0.043	0.051

TO-252 Suggested Pad Layout



Note:

1.Controlling dimension: in millimeters

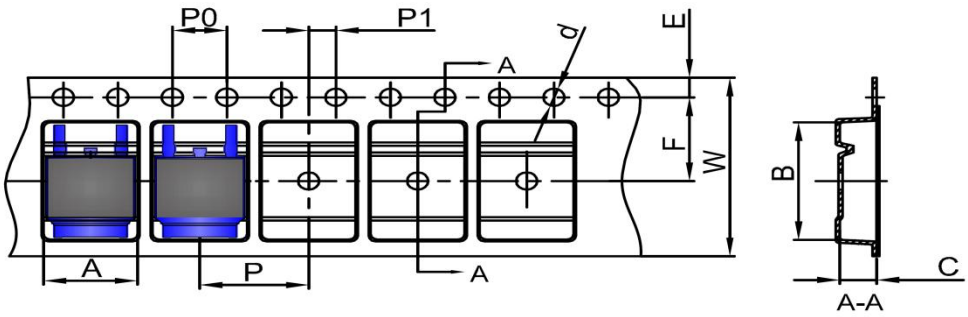
2.General tolerance: ±0.05mm

3.The pad layout is for reference purposes only

N-CHANNEL HIGH VOLTAGE MOSFET

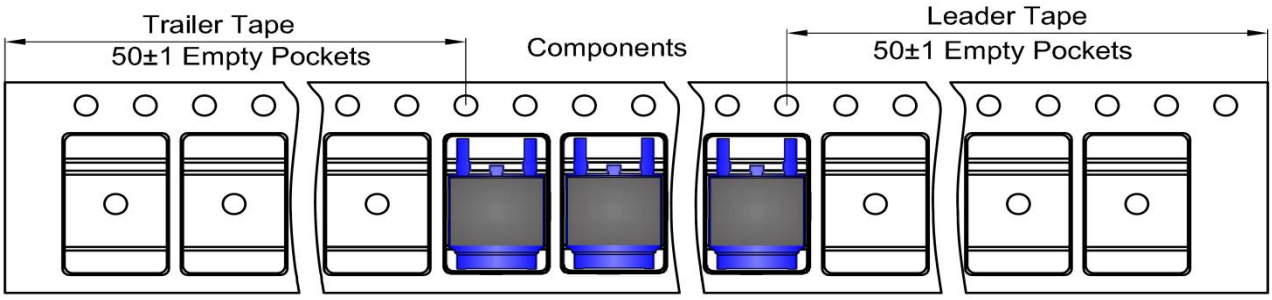
TO-252 Tape and Reel

TO-252 Embossed Carrier Tape

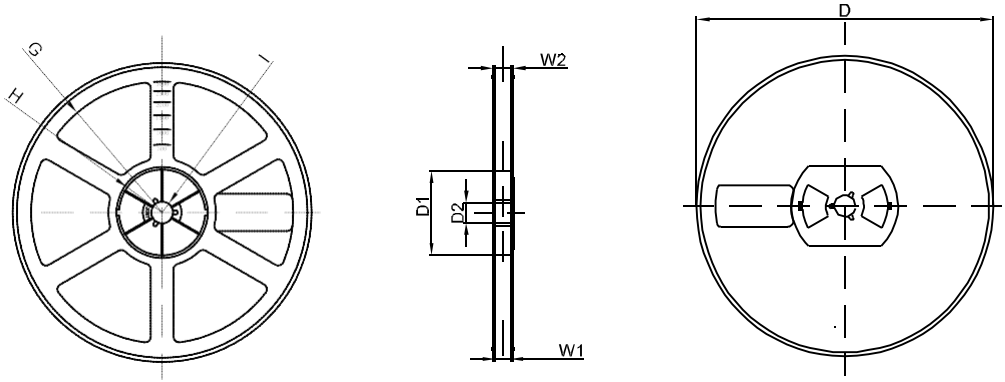


	DIMENSIONS ARE IN MILLIMETER									
TYPE	A	B	C	d	E	F	P0	P	P1	W
TO-252	6.90	10.50	2.70	Ø1.55	1.75	7.50	4.00	8.00	2.00	16.00
TOLERANCE	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1

TO-252 Tape Leader and Trailer



TO-252 Reel



	DIMENSIONS ARE IN MILLIMETER							
REEL OPTION	D	D1	D2	G	H	I	W1	W2
13” DIA	Ø330.00	100.00	Φ21.00	R151.00	R56.00	R6.50	16.40	21.00
TOLERANCE	±2	±1	±1	±1	±1	±1	±1	±1