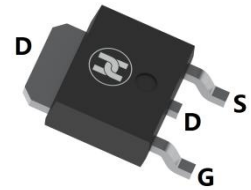
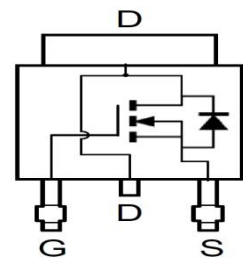


N-CHANNEL HIGH VOLTAGE MOSFET
FEATURES

- $R_{DS(ON)} = 2.5\Omega @V_{GS} = 10V$
- 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 ($T_A = 25^\circ\text{C}$ 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 ($T_C = 25^\circ\text{C}$)		P_D	50	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Ambient Operating Temperature		T_{OPR}	-55 ~ +150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^\circ\text{C}$
Junction-to-Ambient		θ_{JA}	83	$^\circ\text{C}/\text{W}$
Junction-to-Case		θ_{Jc}	2.50	$^\circ\text{C}/\text{W}$

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. $L=64\text{mH}$, $I_{AS}=4.0\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 4.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

N-CHANNEL HIGH VOLTAGE MOSFET

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	2N60-A	$V_{GS} = 0V, I_D = 250\mu A$	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	$V_{GS} = 30V, V_{DS} = 0V$ $V_{GS} = -30V, V_{DS} = 0V$			100	nA
	Reverse				-100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250 \mu A$, Referenced to 25°C		0.6		V/°C
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	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	$t_{D(ON)}$	$V_{DD} = 300V, I_D = 4.0A,$ $R_G = 25\Omega$ (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}	$V_{GS} = 0V, I_{SD} = 4.0A$			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}	$V_{GS} = 0V, I_{SD} = 4.0A,$ $di/dt = 100 A/\mu s$ (Note 1)		250		ns
Reverse Recovery Charge	Q_{RR}			1.50		μC

Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
2. Essentially independent of operating temperature

N-CHANNEL HIGH VOLTAGE MOSFET

Test Circuits And Waveforms

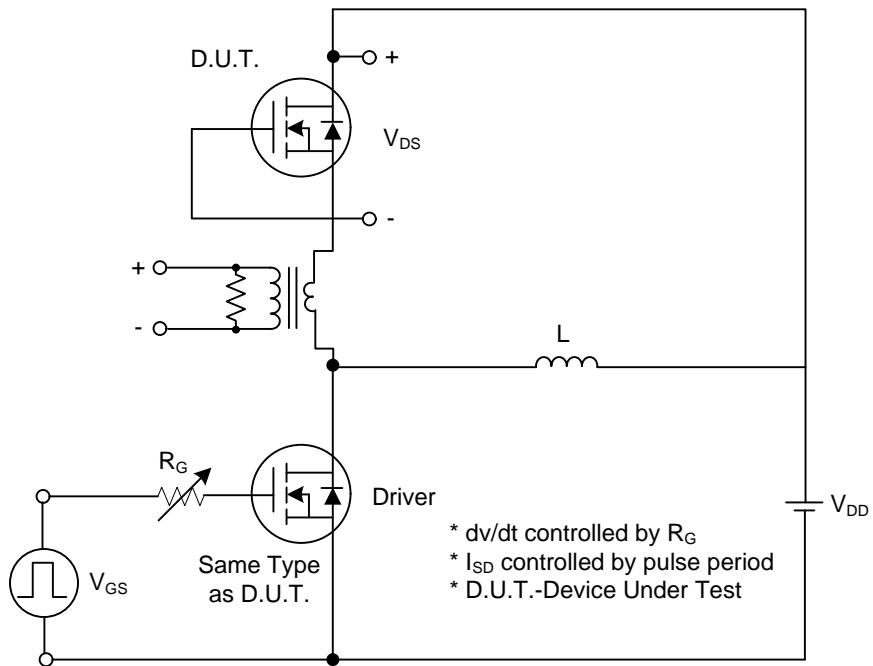


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

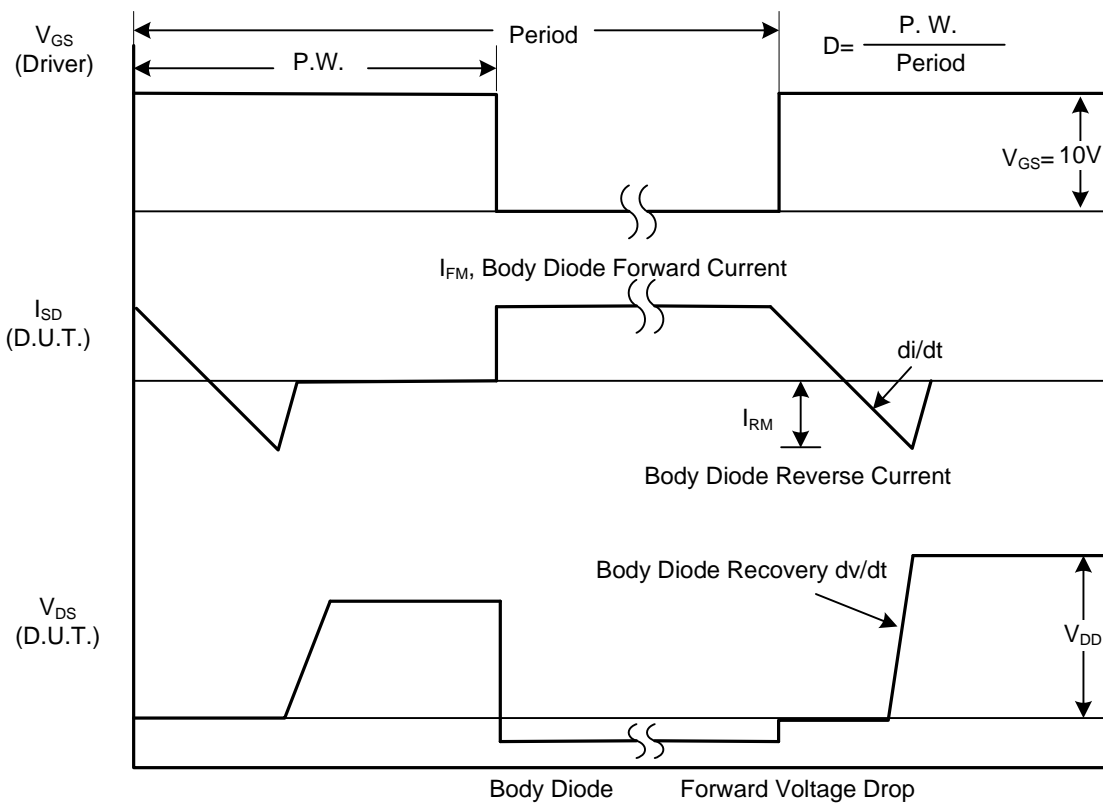


Fig. 1B Peak Diode Recovery dv/dt Waveforms

N-CHANNEL HIGH VOLTAGE MOSFET

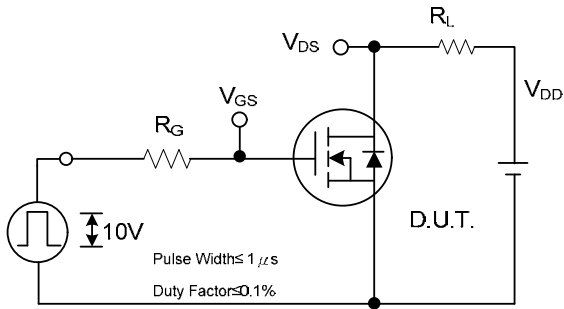


Fig. 2A Switching Test Circuit

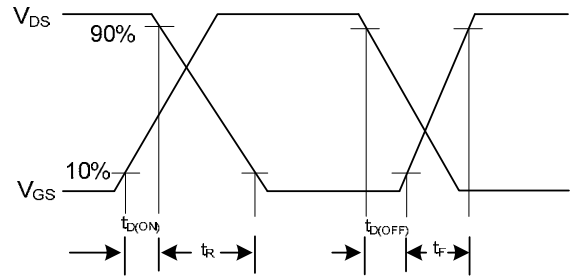


Fig. 2B Switching Waveforms

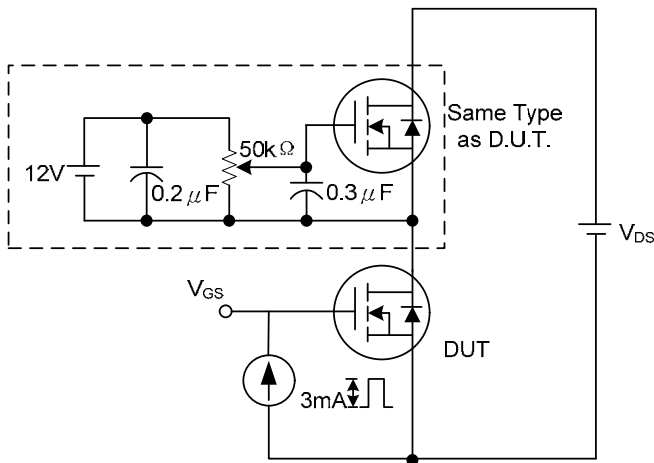


Fig. 3A Gate Charge Test Circuit

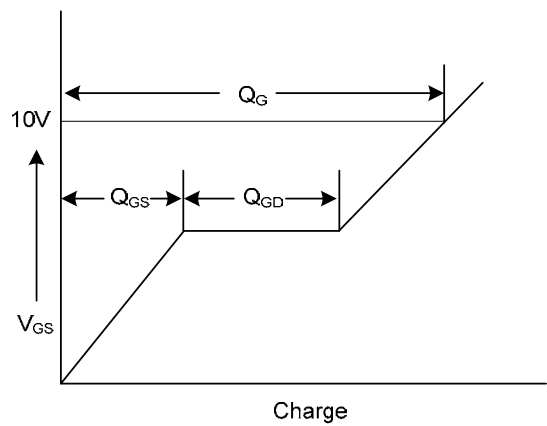


Fig. 3B Gate Charge Waveform

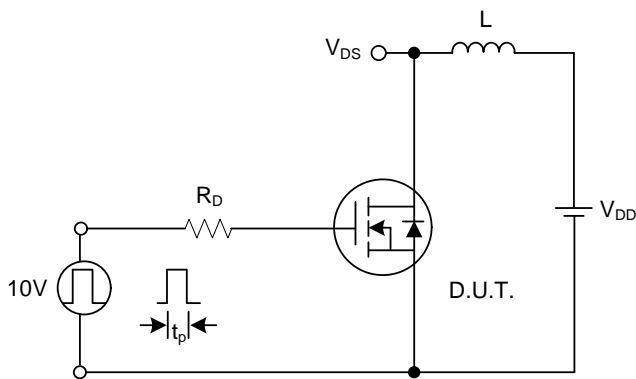


Fig. 4A Unclamped Inductive Switching Test Circuit

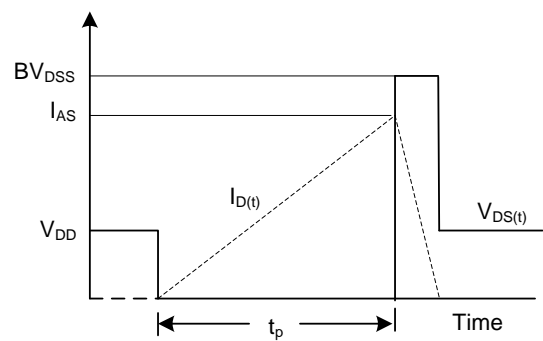
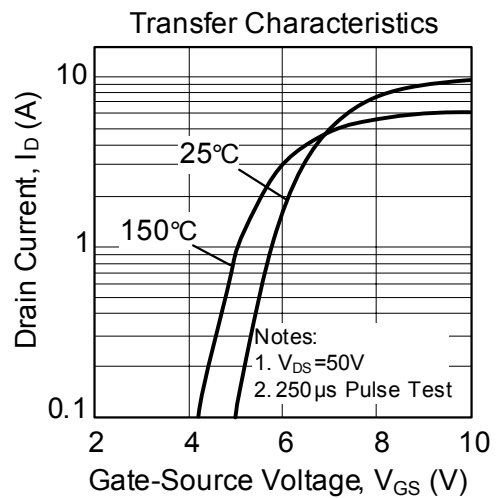
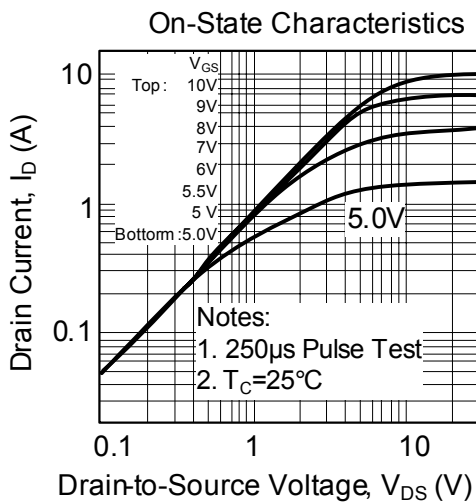
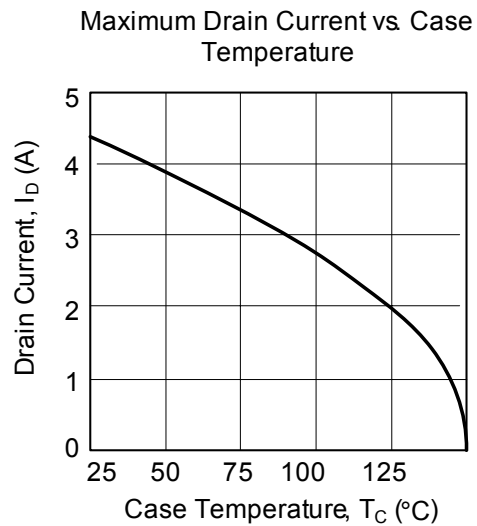
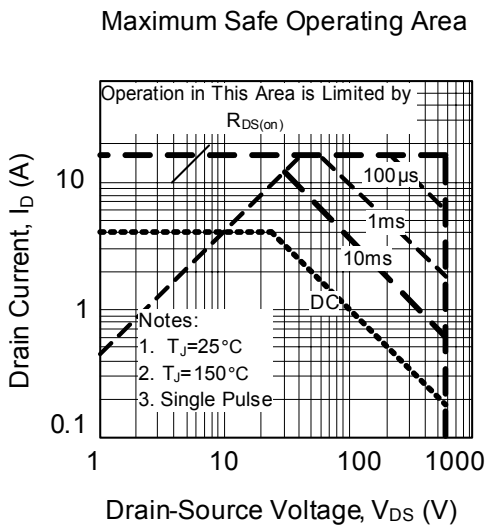
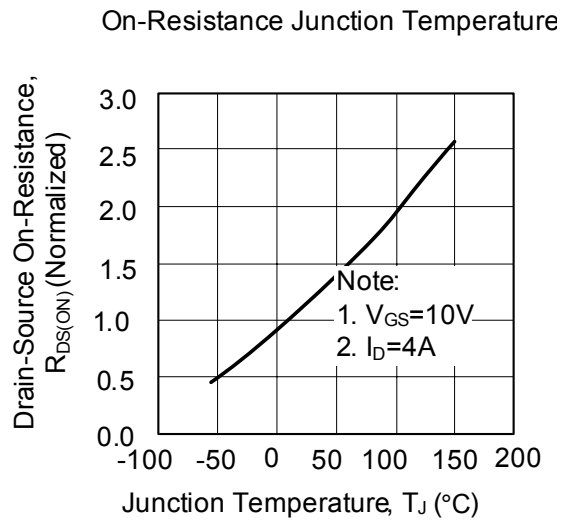
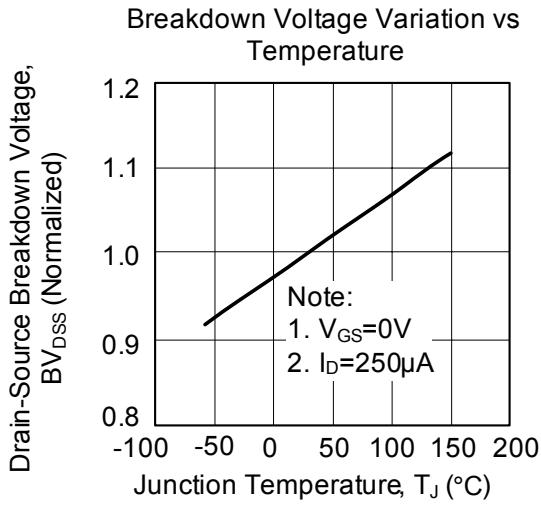


Fig. 4B Unclamped Inductive Switching Waveforms

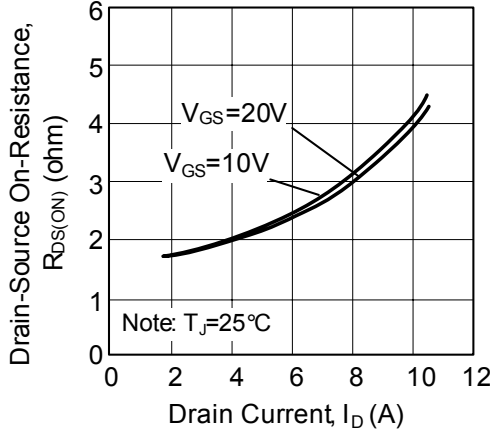
N-CHANNEL HIGH VOLTAGE MOSFET

Typical Characteristics

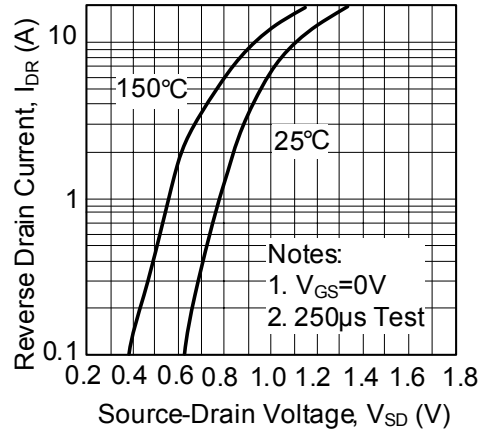


N-CHANNEL HIGH VOLTAGE MOSFET

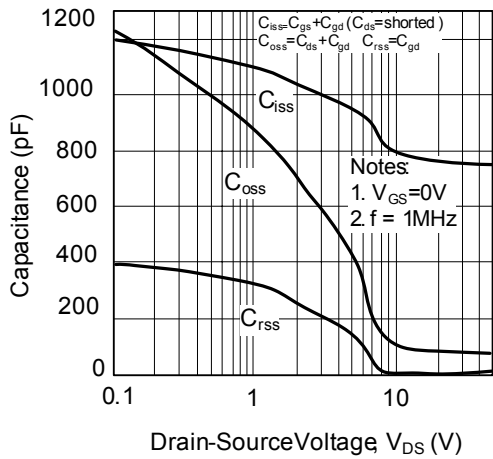
On-Resistance Variation vs Drain Current and Gate Voltage



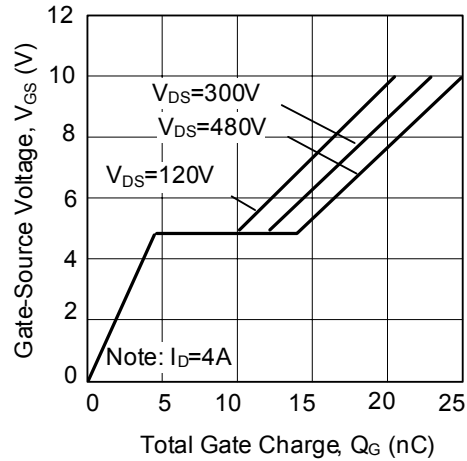
On State Current vs. Allowable Case Temperature



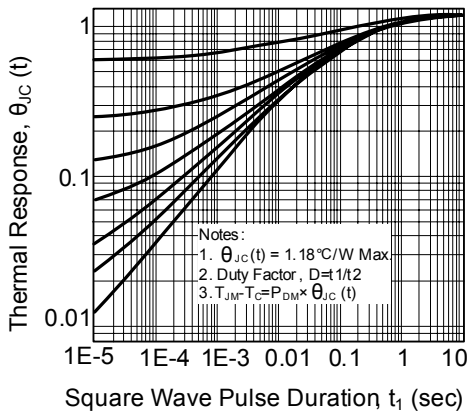
Capacitance Characteristics (Non-Repetitive)



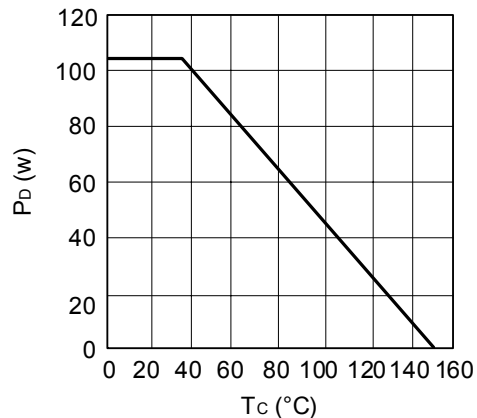
Gate Charge Characteristics

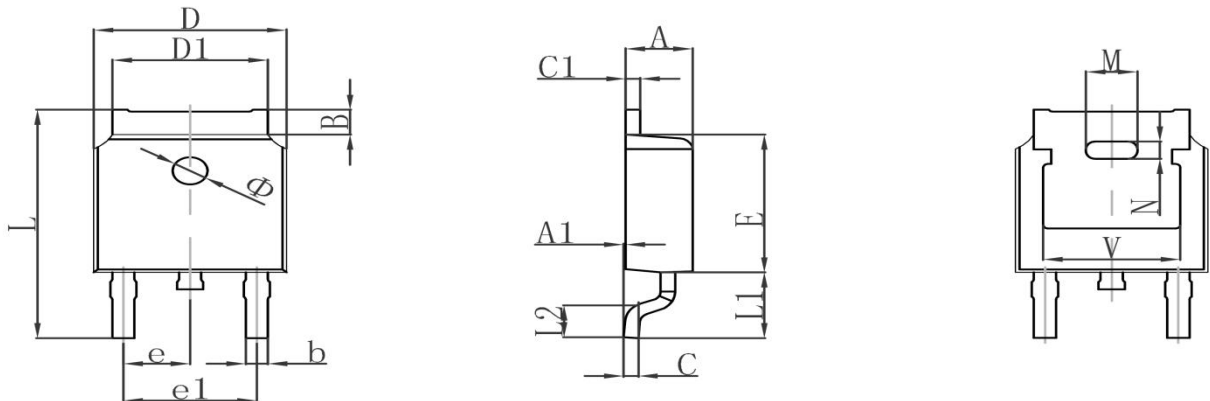


Transient Thermal Response Curve

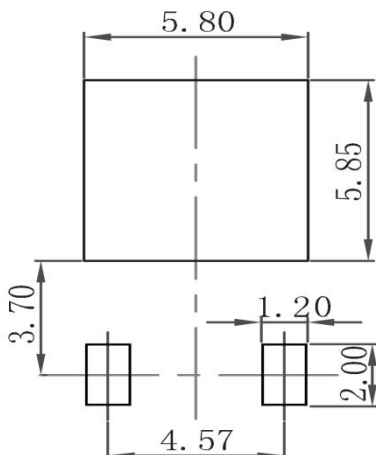


Power Dissipation

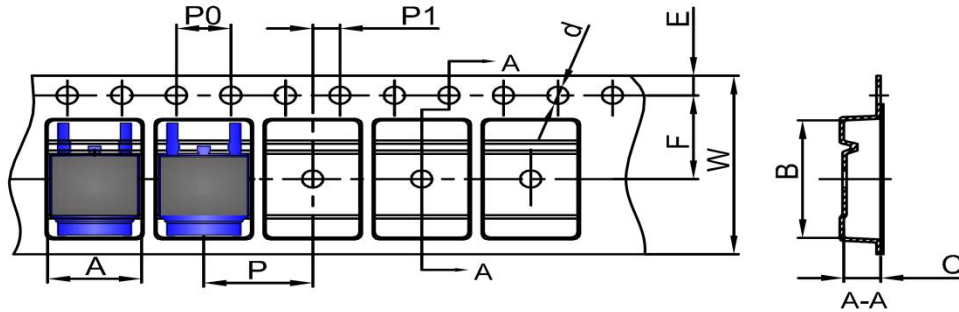


N-CHANNEL HIGH VOLTAGE MOSFET
TO-252 Package Outline Dimensions


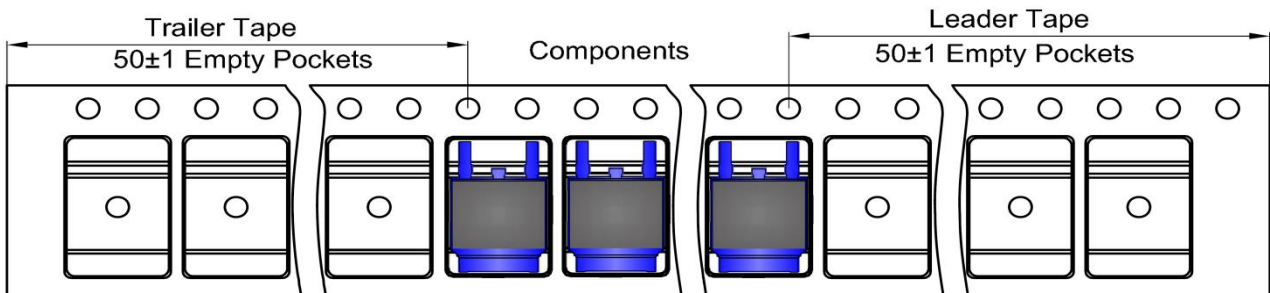
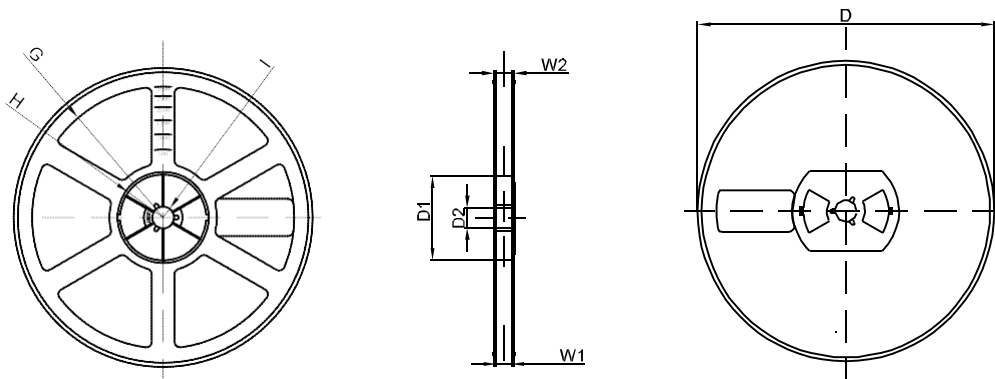
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.380	0.087	0.094
A1	0.000	0.100	0.000	0.004
B	0.800	1.400	0.031	0.055
b	0.710	0.810	0.028	0.032
c	0.460	0.560	0.018	0.022
c1	0.460	0.560	0.018	0.022
D	6.500	6.700	0.256	0.264
D1	5.130	5.460	0.202	0.215
E	6.000	6.200	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: $\pm 0.05\text{mm}$
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