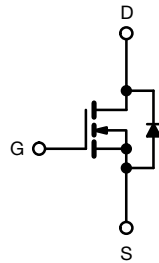
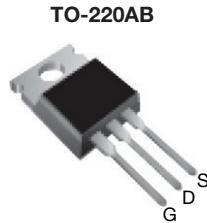


E Series Power MOSFET With Fast Body Diode and Low Gate Charge



N-Channel MOSFET

FEATURES

- Reduced figure-of-merit (FOM): $R_{on} \times Q_g$
- Fast body diode MOSFET using E series technology
- Reduced t_{rr} , Q_{rr} , and I_{RRM}
- Increased robustness due to low Q_{rr}
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
Available

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ typ. (Ω) at 25 °C	$V_{GS} = 10$ V	0.127
Q_g (Max.) (nC)	75	
Q_{gs} (nC)	17	
Q_{gd} (nC)	19	
Configuration	Single	

APPLICATIONS

- Telecommunications
 - Server and telecom power supplies
- Computing
 - ATX power supplies
- Industrial
 - Welding
 - Induction heating
 - Battery chargers
 - Uninterruptible power supplies (UPS)
- Renewable energy
 - String PV inverters

ORDERING INFORMATION	
Package	TO-220AB
Lead (Pb)-free and halogen-free	SiHP25N60EFL-BE3 ^a
	SiHP25N60EFL-GE3

Note

- a. "-BE3" denotes alternate manufacturing location

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)				
PARAMETER	SYMBOL		LIMIT	UNIT
Drain-source voltage	V_{DS}		600	V
Gate-source voltage	V_{GS}		± 30	
Continuous drain current ($T_J = 150$ °C)	V_{GS} at 10 V	$T_C = 25$ °C	25	A
		$T_C = 100$ °C	16	
Pulsed drain current ^a	I_{DM}		61	
Linear derating factor			2	W/°C
Single pulse avalanche energy ^b	E_{AS}		353	mJ
Maximum power dissipation	P_D		250	W
Operating junction and storage temperature range	T_J, T_{stg}		-55 to +150	°C
Drain-source voltage slope	$T_J = 125$ °C		70	V/ns
Reverse diode dV/dt ^d			15	
Soldering recommendations (peak temperature) ^c	For 10 s		300	°C


Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature
 b. $V_{DD} = 140$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω , $I_{AS} = 5$ A
 c. 1.6 mm from case



d. $I_{SD} \leq I_D$, $di/dt = 100 \text{ A}/\mu\text{s}$, starting $T_J = 25 \text{ }^\circ\text{C}$

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	62	$^\circ\text{C}/\text{W}$
Maximum junction-to-case (drain)	R_{thJC}	-	0.5	

SPECIFICATIONS ($T_J = 25 \text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$		600	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25 \text{ }^\circ\text{C}$, $I_D = 10 \text{ mA}$		-	0.69	-	$\text{V}/^\circ\text{C}$
Gate-source threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$		3.0	-	5.0	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20 \text{ V}$		-	-	± 100	nA
		$V_{GS} = \pm 30 \text{ V}$		-	-	± 1	μA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 480 \text{ V}$, $V_{GS} = 0 \text{ V}$		-	-	1	μA
		$V_{DS} = 480 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 125 \text{ }^\circ\text{C}$		-	-	500	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 12.5 \text{ A}$	-	0.127	0.146	Ω
Forward transconductance	g_{fs}	$V_{DS} = 30 \text{ V}$, $I_D = 12.5 \text{ A}$		-	11.3	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 100 \text{ V}$, $f = 1 \text{ MHz}$		-	2274	-	pF
Output capacitance	C_{oss}			-	137	-	
Reverse transfer capacitance	C_{rss}			-	4	-	
Effective output capacitance, energy related ^a	$C_{o(er)}$			-	79	-	
Effective output capacitance, time related ^b	$C_{o(tr)}$	$V_{DS} = 0 \text{ V to } 480 \text{ V}$, $V_{GS} = 0 \text{ V}$		-	330	-	
Total gate charge	Q_g	$V_{GS} = 10 \text{ V}$	$I_D = 12.5 \text{ A}$, $V_{DS} = 480 \text{ V}$	-	50	75	nC
Gate-source charge	Q_{gs}			-	17	-	
Gate-drain charge	Q_{gd}			-	19	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 480 \text{ V}$, $I_D = 12.5 \text{ A}$, $R_g = 9.1 \Omega$, $V_{GS} = 10 \text{ V}$		-	25	50	ns
Rise time	t_r			-	39	68	
Turn-off delay time	$t_{d(off)}$			-	47	94	
Fall time	t_f			-	21	42	
Gate input resistance	R_g	$f = 1 \text{ MHz}$, open drain		0.4	0.7	1.4	Ω
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	25	A	
Pulsed diode forward current	I_{SM}		-	-	61		
Diode forward voltage	V_{SD}	$T_J = 25 \text{ }^\circ\text{C}$, $I_S = 12.5 \text{ A}$, $V_{GS} = 0 \text{ V}$		-	0.9	1.2	V
Reverse recovery time	t_{rr}	$T_J = 25 \text{ }^\circ\text{C}$, $I_F = I_S = 12.5 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_R = 25 \text{ V}$		-	138	276	ns
Reverse recovery charge	Q_{rr}			-	0.8	1.6	μC
Reverse recovery current	I_{RRM}			-	11	-	A

Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}
- b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

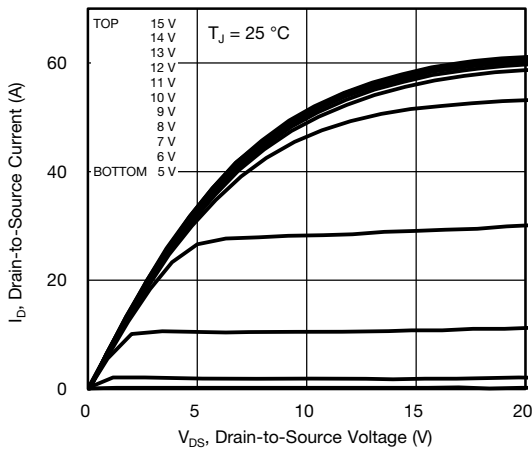


Fig. 1 - Typical Output Characteristics

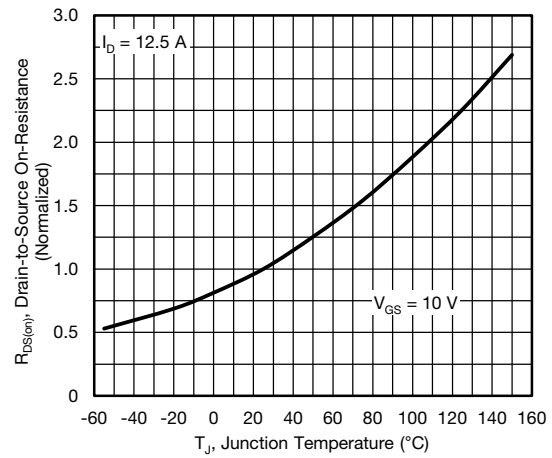


Fig. 4 - Normalized On-Resistance vs. Temperature

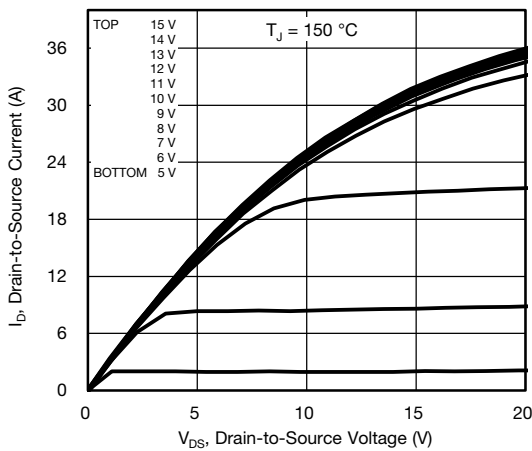


Fig. 2 - Typical Output Characteristics

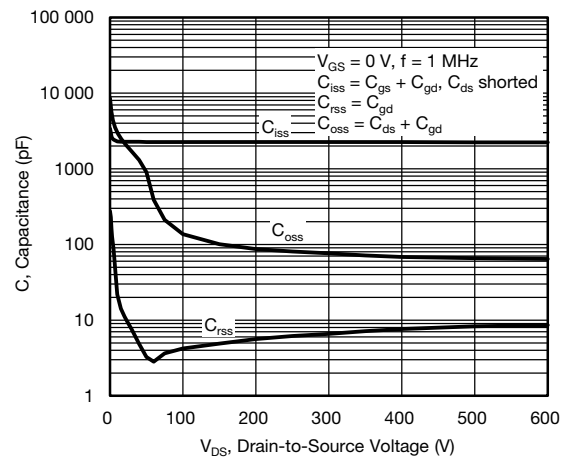


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

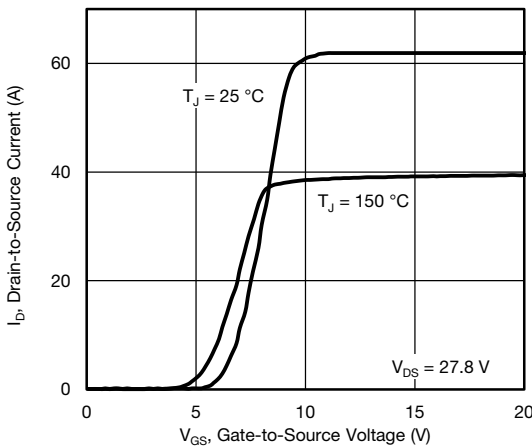


Fig. 3 - Typical Transfer Characteristics

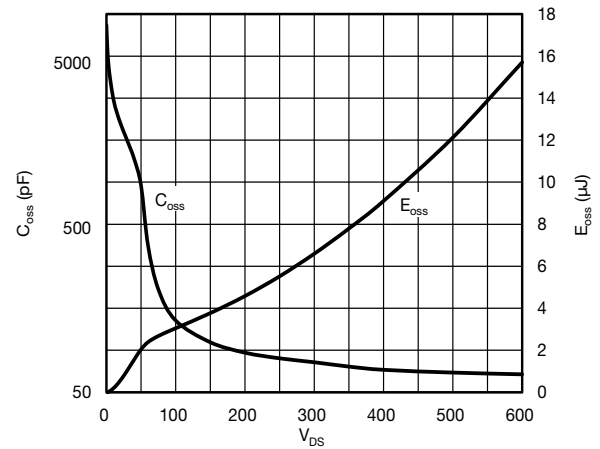


Fig. 6 - Coss and Eoss vs. Vds

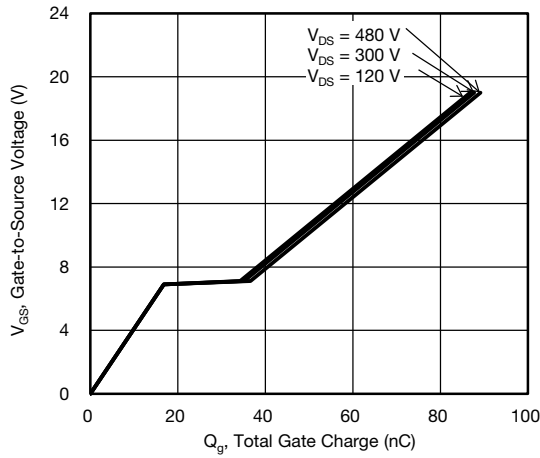


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

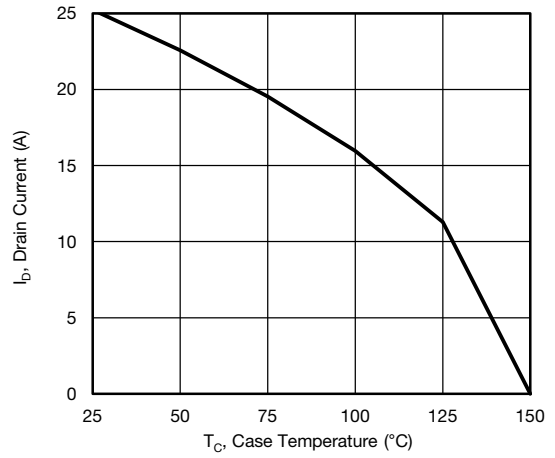


Fig. 10 - Maximum Drain Current vs. Case Temperature

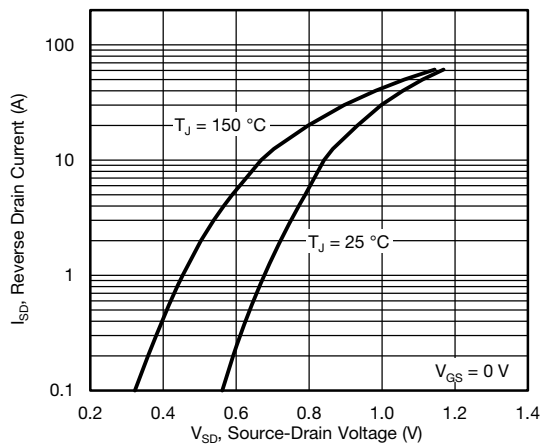


Fig. 8 - Typical Source-Drain Diode Forward Voltage

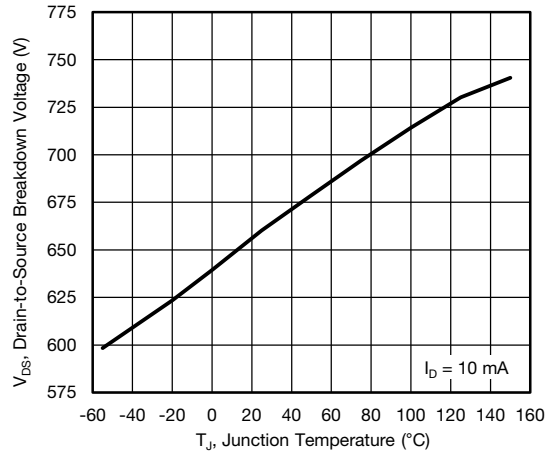


Fig. 11 - Typical Drain-to-Source Voltage vs. Temperature

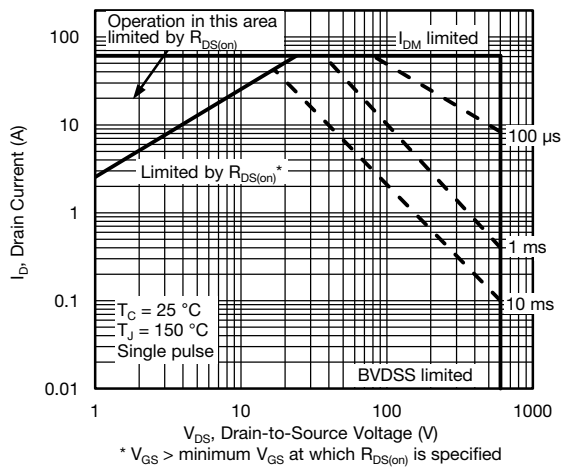


Fig. 9 - Maximum Safe Operating Area

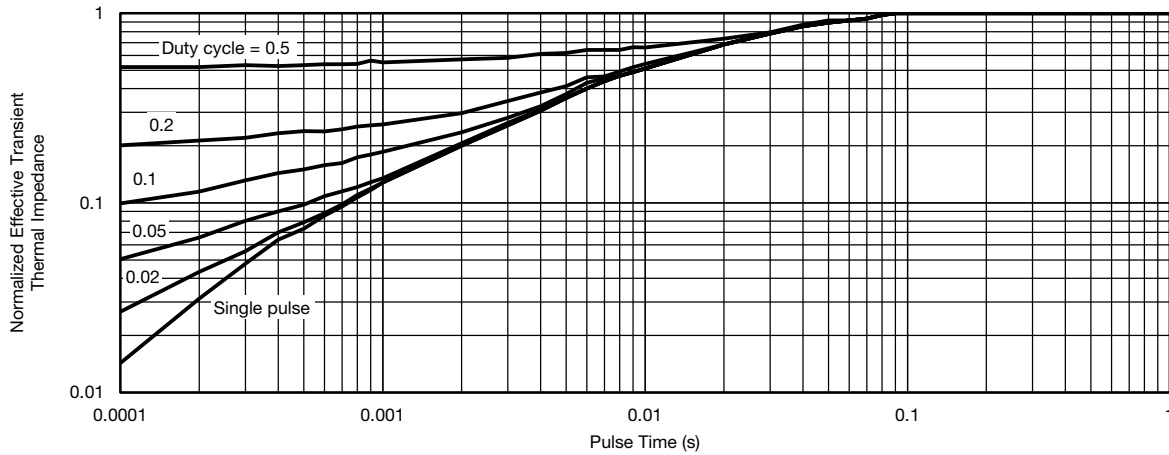


Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case

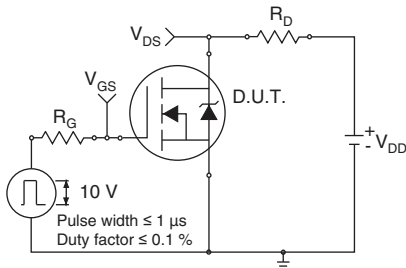


Fig. 13 - Switching Time Test Circuit

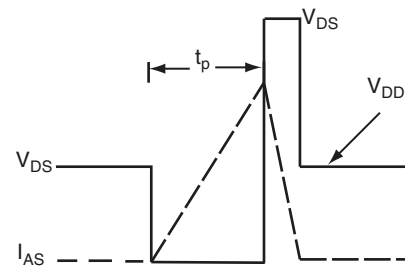


Fig. 16 - Unclamped Inductive Waveforms

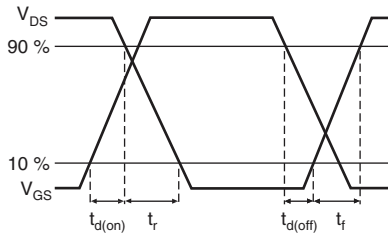


Fig. 14 - Switching Time Waveforms

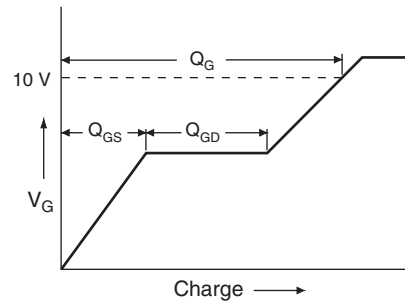


Fig. 17 - Basic Gate Charge Waveform

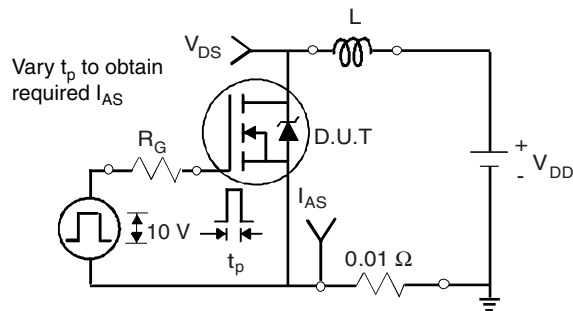


Fig. 15 - Unclamped Inductive Test Circuit

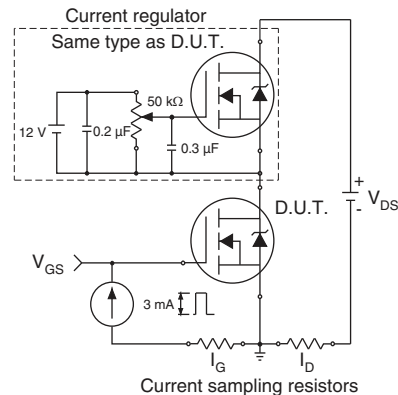
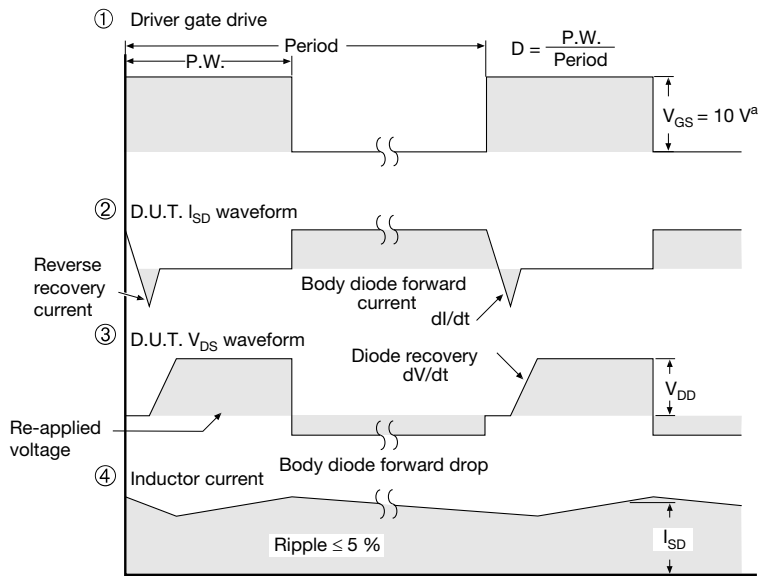
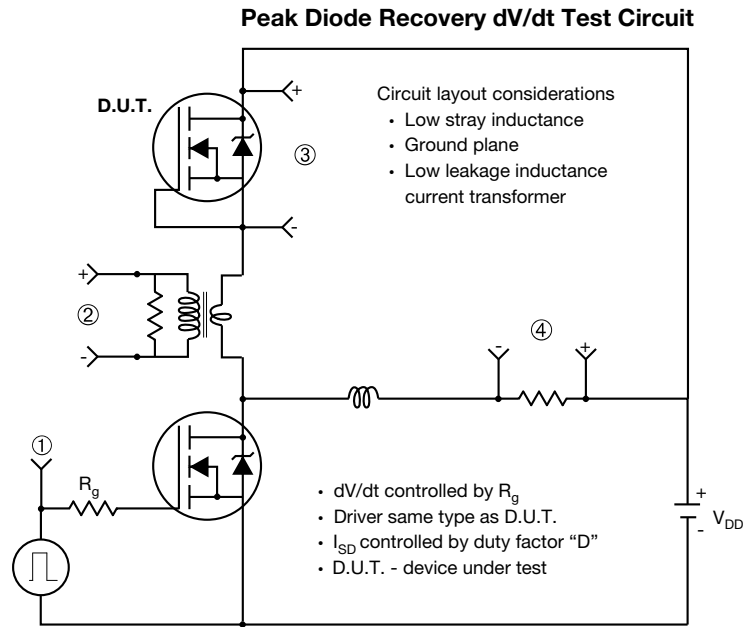


Fig. 18 - Gate Charge Test Circuit



Note

a. $V_{GS} = 5 V$ for logic level devices

Fig. 19 - For N-Channel

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TO-220-1



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.24	4.65	0.167	0.183
b	0.69	1.02	0.027	0.040
b(1)	1.14	1.78	0.045	0.070
c	0.36	0.61	0.014	0.024
D	14.33	15.85	0.564	0.624
E	9.96	10.52	0.392	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.10	6.71	0.240	0.264
J(1)	2.41	2.92	0.095	0.115
L	13.36	14.40	0.526	0.567
L(1)	3.33	4.04	0.131	0.159
$\varnothing P$	3.53	3.94	0.139	0.155
Q	2.54	3.00	0.100	0.118

ECN: E21-0621-Rev. D, 04-Nov-2021
DWG: 6031

Note

- M^* = 0.052 inches to 0.064 inches (dimension including protrusion), heatsink hole for HVM



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